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In Memoriam: Donald K. Hsu, Ph.D.

We mourn the passing of Donald K. Hsu, Ph.D., a valued member of our BAASANA.ORG academic community, who left an indelible mark on our BAASANA.ORG conference. His contributions to our field were numerous, and his dedication to sharing knowledge was evident in his enthusiastic participation as a presenter, session chair, and engaged attendee. Dr. Hsu's presence will be deeply missed, but his legacy will continue to inspire us. We extend our sincerest condolences to his family, colleagues, and friends.

Worker and Workplace Coexistence and Industry Collaborations

Professor Nazrul Islam
Professor of Business & Director of Research Degrees Associate Director,

UEL Centre of FinTech. Worker and Workplace Coexistence and Industry Collaborations.

Recognized by the White House https://www.uel.ac.uk/about-uel/news/2024/march/office-us-president-recognises-uel-research

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Personal and Organizational Bases of Power in Higher Education Institutions; Analysis of For-Profits and Not-For-Profits

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Abstract
Two important measures of organizational effectiveness relate to perceived (a) Personal Bases of Power and (b) Organizational Bases of Power within an organization. Bases of power refer to distinct types of power that can influence employee attitudes, behaviors, and performance, thereby impacting organizational culture and effectiveness. This study analyzes these two measures among faculty and administrators affiliated with for-profit and not-for-profit higher education institutions worldwide.

METHODS: Perceptions of Organizational Bases of Power and Personal Bases of Power were assessed by online survey of 52 higher education faculty and administrators from institutions in more than 16 countries using the Human Synergistics International Organizational Effectiveness Inventory® (OEI®).

RESULTS: Total mean scores were less desirable than established Constructive benchmarks (derived from corporations with Constructive cultures) for both measures and were below the 50th percentile (historical average from normative data) for Personal Bases of Power. Further

subgroup analysis revealed that perceptions of Organizational Bases of Power were more favorable than the Constructive benchmark among females (vs. males), faculty (vs. administrators) and public not-for-profits (vs. private not-for-profits, public for-profits and private for-profits). Perceptions of Personal Bases of Power were better than the 50th percentile among females (vs. males), administrators (vs. faculty), and for-profit institutions.

CONCLUSION: Perceptual discrepancies between genders, professional roles and higher education institutional models may stem from differences in worldviews and values. We recommend implementation of organizational change programs that target the causes of poor perceptions of personal and organizational bases of power in higher education institutions by modifying the use of personal expert, referent, and exchange powers, and organizational legitimate (position), reward, and coercive powers. Gaining insight and aligning the bases of power metrics with the ideal values of higher education institutions can promote constructive cultural styles and yield improved organizational outcomes.

State of The World from An Academic Viewpoint, Compilation and Analysis

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Abstract
Specific focus: BRICS+, ASEAN plus x, MERCOSUR, CARICOM, AU, The Arab League, NAFTA-USMCA, EU, UK and the Commonwealth... Indeed, the world is already multipolar. There is ongoing cooperation, competition and conflict. The multinationals are doing what they do best. The intergovernmental and nongovernmental organizations contribute significantly. There are local wars. Nobody wants a world war, remembering that the losses in the previous ones were tremendous. Negotiation techniques have been tested (for example at the UN and Harvard) and they work.

Note 1: My brother Sam Owarish, Ph.D., Mechanical Engineering, is my adviser and source of encouragement.
Note 2: I took advantage of Generative AI and Portfolio and give due credit to the entities concerned.
Note 3: I interacted with BARD AI (Google) on World Issues and the answers to my use of prompt engineering (problem formulation) are here:
https://internationalinstituteforstrategicresearch.info/world-issues-2024/

Introduction

Caveat: Charles Dickens said that it is the best of times. it is the worst of times. This means that we have to work on the best and improve them and we have to work on the worse to make things better. It is our purpose in life. We keep in mind those who unfortunately are blindsided, perhaps with hate. We re-invented AI and the impact is all encompassing. Could we re-invent international relations with **new elements**, maintaining **traditional** useful ones? Our academic viewpoint means that we keep on learning in context. At the end of WW2, the world was unipolar since with the Grand Alliance, Russia and China were parts thereof with

the US., UK., and France. Later on, with Russia expanding its influence in the Soviet region led to a bi-polar world. Then the Soviet Union reformed into several States in what is known as 'perestroika 'in other words, in the former Soviet Union, the policy or practice of restructuring or reforming the economic and political system. First proposed by Leonid Brezhnev in 1979 and actively promoted by Mikhail Gorbachev, perestroika originally referred to increased automation and labor efficiency, but came to entail greater awareness of economic markets and the ending of central planning. This movement was accompanied by 'glasnost', in other words personal freedom. Today, the world is multi-polar. Traditional institutions evolve to grow, some disappear as new ones are emerging. Each region has its fundamentals and specificity.

Let us start with global trade and global tensions, according to the IMF Dollar remains dominant in global trade, but global tensions are fragmenting the world, says IMF (msn.com)
US China to have talks on AI U.S., Chinese officials to hold first high-level talks on AI in Geneva (msn.com)
Central Banks are choosing gold as a reserve/hedge, by passing sanctions The US dollar has become so weaponized that central banks are snapping up politically-neutral gold (msn.com)
Inflation hedge: farmlands This unconventional inflation hedge may be more effective than gold (msn.com)
CEO Dimon: The US and the West should engage with China since the two sides are competitors not enemy: JPMorgan CEO Jamie Dimon Says US And The West Should 'Fully Engage 'With China, Despite Differences (msn.com)
Geoeconomics (Stanford University) Q&A: 'Geoeconomics' makes sense of a turbulent world (msn.com)

Russia is all set to host the BRICS+ Forum 2024 meeting on June 21 and a delegation of 21 countries, including 200 mayors will attend the summit. The forum is held in the Kazan region of Russia where the alliance is looking to connect with leaders of the grassroots levels. On the heels of the summit, Russia's Deputy Foreign Minister Sergei Ryabkov provided the latest update about the forming of the BRICS currency. Chinese president calls on world powers to facilitate Russia-Ukraine negotiations.
China's Third Plenum will jolt the economy.

The Globe Project https://www.globe-project.eu/globe-project-spots-prospects-for-global-governance-facing-an-uncertain-future_17175#:~:text=The%20GLOBE%20research%20project%20conducted%20a%20survey,with%20intriguing%20findings%20on%20the%20current%20situation%2C

Most Powerful Countries in the World by Economy: **5. India,** ***GDP Current Prices (2024): $3.937 trillion, Real GDP Growth Rate (2024): 6.8%. GDP Per Capita (PPP) (2024): $10,120. GDP Per Capita Growth Rate (2024): 9.00%.*** India ranks 5th on our list of the 20 most powerful countries in the world by economy. It is also one of the fastest-growing economies in Asia. The country has a GDP of $3.937 trillion, with a growth rate of 6.8%. Moreover, the country's GDP per capita is growing at 9.00% during 2024. **4. Japan:** ***GDP Current Prices (2024): $4.110 trillion. Real GDP Growth Rate (2024): 0.9%. GDP Per Capita (PPP) (2024): $54,180. GDP Per Capita Growth Rate (2024): 1.78%.*** Japan ranks 4th on our list of most powerful countries in the world by economy. It is an East Asian country with a population of 124.04 million as of 2024. The GDP and GDP per capita of Japan are growing at 0.9% and 1.78% during, respectively, during 2024. **3. Germany:** ***GDP Current Prices (2024): $4.591 trillion. Real GDP Growth Rate (2024): 0.2%. GDP Per***

Capita (PPP) (2024): $67,240. GDP Per Capita Growth Rate (2024): 6.08%. Germany not only ranks as the 3rd most powerful country in the world by economy, but it is also one of the most innovative economies in Europe. The country is renowned for its high technology exports and has a GDP of $4.491 trillion as of 2024. **2. China:** ***GDP Current Prices (2024): $18.533 trillion. Real GDP Growth Rate (2024): 4.6%. GDP Per Capita (PPP) (2024): $25,020. GDP Per Capita Growth Rate (2024): 4.90%.*** China ranks 2nd on our list of most powerful countries in the world by economy. The country has a GDP of $18.533 trillion, which is growing at 4.6% in 2024. Moreover, China's GDP per capita is growing at 4.90%..

1. United States

GDP Current Prices (2024): $28.781 trillion. Real GDP Growth Rate (2024): 2.7%. GDP Per Capita (PPP) (2024): $85,370. GDP Per Capita Growth Rate (2024): 3.30%. The United States is the most powerful country in the world by economy. It is a huge country with a population of 337.12 million as of 2024. Moreover, the United States has a GDP of $28.781 trillion, which is growing at a rate of 2.7% during the current year.

These were the 5 most powerful countries in the world. We could also have a broader picture 20 Most Powerful Countries in the World.

The traditional systems

The United Nations does a tremendous job; at times politics can be an impediment. It has reformed and is re-inventing itself. The UN Regional Economic Commissions also play a significant role as well as UNDP at international level and at country level.

Significant efforts were made and UN Specialized Agencies established; each of them playing important roles:

FAO: Food and Agriculture Organization of the United Nations
ICAO: International Civil Aviation Organization
IFAD: International Fund for Agricultural Development
ILO: International Labour Organization
IMF: International Monetary Fund
IMO: International Maritime Organization
ITU: International Telecommunication Union
UNESCO: United Nations Educational, Scientific and Cultural Organization
UNIDO: United Nations Industrial Development Organization
UN Tourism: World Tourism Organization
UPU: Universal Postal Union
WHO: World Health Organization
WIPO: World Intellectual Property Organization
WMO: World Meteorological Organization
World Bank Group
IBRD: International Bank for Reconstruction and Development
IDA: International Development Association
IFC: International Finance Corporation

As examples, think that civil aviation worldwide will not exist without ICAO. ILO and labor standards; women in the work force, GDP per hour worked. World Trade Organization to resolve trade issues between and among countries. And so on.

Links & Files

UN website: List of Funds, Programmes, Specialized Agencies and Others
Model United Nations website: UN Family of Organizations
UNSCEB website: Board Members
UN Handbook

Ask DAG: Where can I find statistical information on staff working in UN Specialized Agencies and Programmes?
Ask DAG (Chinese): 什么是联合国专门机构? 联合国有几个专门机构？
Ask DAG (French): Quelles sont les institutions spécialisées des Nations Unies et combien sont-elles ?
Ask DAG (Spanish): ¿Cuántos y cuáles son los organismos especializados de la ONU?
UN Peacekeeping Operations (current missions) are:
MINURSO: Western Sahara
MINUSCA: Central African Republic
MONUSCO: Democratic Republic of the Congo
UNDOF: Golan
UNFICYP: Cyprus
UNIFIL: Lebanon
UNISFA: Abyei
UNMIK: Kosovo
UNMISS: South Sudan
UNMOGIP: India and Pakistan
UNTSO: Middle East
The UN's peacekeeping missions maintain security, protect civilians, and enable political solutions to conflict. The average UN peacekeeping mission lasts 31 months, but six missions have continued for longer than 26 years.
More, further in this document.
Also, think of the Non-governmental Organizations (NGOs) affiliated to the UN are doing a tremendous job.

The traditional and new ones interacting, they seem to compete but they could also cooperate.
From the **traditional world** which keeps on evolving, let us move on t the **new world** shaping up. First due credit to Jim O'Neill, a former Goldman Sachs economist, who coined the acronym BRIC in 2001 to describe the economic potential of Brazil, Russia, India, and China. O'Neill believed that by 2050 the BRIC economies would dominate the global economy. It is also important to see how the two worlds interact with each other, cooperating or competing or conflicting.

BRICS is an acronym for Brazil, Russia, India, China, and South Africa, and is an intergovernmental organization that was founded in 2009. The group was created to show that the world is multipolar taking its place next to Western Europe and North America.
BRICS+ includes 13 economies: Brazil, Russia, India, China, South Africa, Argentina, Egypt, Ethiopia, Iran, Saudi Arabia, and the United Arab Emirates.
BRICS+ aims to bring together some sort of worldwide integration. The new members made the original group stronger once it is effectively organized. The diversity within the expanded BRICS enriches the economic discourse and provides opportunities for shared learning and collaboration. BRICS+ can wield leverage in shaping global economic policies taking into account traditional power structures. It needs to define its currency.
Using local currencies BRICS makes a $260 billion trade transaction using local currencies (msn.com)
BRICS currency is coming soon, Iranian ambassador (msn.com)
The impact of BRICS expansion on the global economy (msn.com)
In 2023, Argentina announced that it will not join the group after all.

A touch of realism, using the Chinese currency for India? Is India planning to break away from the BRICS? For U.S.? (msn.com)
BRICS Summit 2024 BRICS makes headlines with new expansions – Here's where and who (msn.com)
What has the BRICS been up to lately? (msn.com)

African countries and BRICS African countries go crazy for the BRICS (msn.com)
The International Monetary Fund (IMF) has been reforming in areas such as: strengthening surveillance and crisis prevention, Improving IMF lending, Enhancing the framework for crisis resolution, strengthening support for low income countries, and Ensuring that the IMF is an open and learning institution.
Other areas for reform include:
Mechanisms for crisis prevention and adjustment
Rules and institutions for enhanced global cooperation on issues and policies affecting global stability
Building a more coherent global financial safety net
In 2021, the IMF approved policy reforms that include:
A 45 percent increase in the normal limits on access to concessional financing
Elimination of hard limits on access for the poorest countries
The Center for Global Development has proposed broad proposals to address the IMF's program credibility, including:
Creating an Emerging Markets Fund (EMF)
Modifying the G20 Common Framework to differentiate across debt classes in EMDE debt restructurings

Empowering the IMF to refinance outstanding debts from failed programs
Some economists argue that the IMF's economic reforms during the Asian financial crisis of 1997–98 allowed these countries to recover quickly and laid the foundation for sustained growth during the 2000s.

What are IMF Bailouts? Bailout: Bailout is a general term for extending financial support to a company/country facing a potential bankruptcy threat. It can take the form of loans, cash, bonds, or stock purchases. A bailout may (not) require reimbursement but is often accompanied by greater oversight and regulations.
Some say the International Monetary Fund (IMF) has become outdated, ineffective, and unnecessary. The IMF was established in the 1940s to stabilize the world economy, but has since taken on a more active role in managing global economic crises. Some critics say the IMF's conditions for loans are too harsh and have harmed developing countries. Others argue that IMF financing programs are ineffective and encourage imprudent investment and public policy decisions. The IMF has also been criticized for focusing on growth without considering the equitable distribution of resources among all groups of people.

What are the main criticisms of the World Bank and the IMF?
Focus on only growth It fails to consider the equitable distribution of resources among all groups of people. It's not always possible to have poverty reduction with strong growth. However, others say the IMF is needed more than ever as the world faces a debt crisis. The IMF has provided loans and purchases to countries such as Algeria, Kenya, Korea, and Zimbabwe, and some countries have increased their activity with the IMF.

The IMF has undergone change since its inception, and has over the years been called upon to advise and assist an ever-wider array of countries facing an ever-greater diversity of problems and circumstances.
Could the relative weight of the different currencies making the IMF SDR be changed based on relative GDP? As of August 1, 2022, the relative weights of the currencies in the IMF SDR valuation basket are:
U.S. dollar: 43.38%
Euro: 29.31%
Chinese renminbi: 12.28%
Japanese yen: 7.59%
Pound sterling: 7.44%
A revamped IMF would have higher quotas to back its activities, together with modernized distribution among member countries and greater access to borrowed financial resources. It would maintain a range of lending facilities to meet the different needs of its member countries.
Could the IMF and BRICS plus cooperate? Multilateral cooperation in the Bretton Woods institutions (the WTO, IMF, and the World Bank) may become one of the main modalities of the BRICS Plus interaction.
BRICS plus currency vs the US Dollar https://investingnews.com/brics-currency/
International Cooperation is the key word BRICS Wants to Shape Global AI Governance, Too (msn.com)
ASEAN basics: The Association of Southeast Asian Nations (ASEAN) is an international organization with 10-member countries in Southeast Asia that aims to:
Promote economic growth
Promote social progress
Promote cultural development
Promote regional peace and stability
Promote economic and cultural exchange
Establish relationships with foreign powers with similar aims
Promote active collaboration and mutual assistance in subjects of common interest
Assist member countries via training and research facilities

ASEAN was established on August 8, 1967 by member countries Indonesia, Thailand, Malaysia, the Philippines, and Singapore. The organization's emblem is blue, red, white, and yellow, which represent the main colors of the state crests of all the ASEAN Member States. The blue represents peace and stability, and the stalks of padi in the center of the emblem represent the dream of ASEAN's Founding Fathers for an ASEAN comprising all the countries in Southeast Asia.

The Association of Southeast Asian Nations (ASEAN) is an international organization that promotes economic and cultural exchange, peace, and stability in Southeast Asia among its ten-member countries:
Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

ASEAN Plus Three (APT) is a cooperation process that began in 1997 between the Association of Southeast Asian Nations (ASEAN), China, Japan, and the Republic of Korea (ROK). The goal of APT is to promote East Asian cooperation and build an East Asian community. The APT Cooperation Strategy (APTCS) covers areas such as food, agriculture, and forestry.

APT includes the following activities: Political-security cooperation, ASEAN Plus Three Foreign Ministers Meeting, ASEAN Plus Three Ministerial Meeting on Transnational Crime, and ASEAN+3 Bond Market Forum (ABMF).
In 2019, APT trade reached $890.2 billion, accounting for 31.6% of ASEAN's total merchandise trade. In 2019, foreign direct investment (FDI) from the APT countries to ASEAN reached $32 billion.
The 26th APT Summit was held in Jakarta on September 6, 2023. The summit was chaired by the President of Indonesia, and attended by ASEAN Member States, China, Japan, and the ROK.

The APT Cooperation Work Plan 2023–2027 includes the following activities: Framework Agreement (DEFA) by 2025, Enhancing cybersecurity cooperation, Online consumer protection, facilitating cross-border data flow, and Recognizing the importance of sustainable growth in trade and digital economy.

The APT countries share common interests, opportunities, and home. For example, the leaders have said that relevant parties should join hands to cope with global challenges such as climate change, energy, and food security.
The BRICS-ASEAN Chamber of Commerce believes that the BRICS bloc and the Association of Southeast Asian Nations (ASEAN) can develop a strategic alliance to help develop the ASEAN economy. The BRICS bloc includes Brazil, Russia, India, China, and South Africa, while ASEAN is a trade bloc that includes ASEAN members and their major trade partners in East Asia and Oceania. The BRICS-ASEAN Chamber of Commerce believes that this alliance could include: Sharing and exchanging resources, Trade, Investment, Technology transfer, Business opportunities, and Partnerships.
Some say that BRICS can be an important tool to increase exports in new markets, including the Middle East, South America, and Africa. Others say that Indonesia would achieve improved energy security as part of BRICS. ASEAN countries have been improving ties with Russia to access its markets and source cheap energy and commodities. In 2021, Russia imported some $2.6bn worth of goods from Indonesia.
ASEAN preference between China and US Southeast Asia's Preferred Ally Switches in Favor of China (msn.com)

MERCOSUR the Southern Common Market, is a political and economic bloc of South American countries. It was established in 1991 by Argentina, Brazil, Paraguay, and Uruguay. The goal of MERCOSUR is to allow member nations to act as a single economy on the world stage.

MERCOSUR's objectives include: creating a common market, spurring development, bolstering democracy, boosting international trade, encouraging internal economic development, maintaining internal human rights and democracy. MERCOSUR has also signed free trade agreements with several countries, including Chile, Colombia, and Peru, as well as Israel, Egypt, Lebanon, and the Palestinian Authority.
Venezuela and Bolivia have since joined MERCOSUR, but Bolivia is still in the process of accession. The official working languages of MERCOSUR are Spanish and Portuguese, with Guarani added in 2006.

The MERCOSUR flag is made up of a white rectangle and the Mercosur emblem. The emblem is composed of four blue stars located in a curved green line, representing the constellation of the southern transept that emerges from the horizon.

CARICOM The Caribbean Community (CARICOM) is an organization of 20 Caribbean countries and dependencies that promotes economic cooperation and integration. The organization was established in 1973 by the Treaty of Chaguaramas, replacing the former Caribbean Free Trade Association (CARIFTA). CARICOM's current member states are: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica. Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago.

CARICOM's main goals include:
Improving standards of living and work
Full employment
Accelerated economic development
Expansion of trade and economic relations
Enhanced international competitiveness
Increased production and productivity
Enhanced coordination of member states' foreign policies
The African Union was established to promote the unity and solidarity of African countries, defend state sovereignty, eradicate colonialism, promote international cooperation, and coordinate and harmonize Member States' policies. It does say to promote international cooperation. SADC (Southern Africa Development Community) countries linking countries in southern Africa; and COMESA (Common Market for Eastern and Southern Africa).
The League of Arab States (LAS) shares a common mission with the United Nations (UN): promoting peace, security and stability by preventing conflict, resolving disputes and acting in a spirit of solidarity and unity.

Founded in 1945, the Arab League is a loose alliance of nearly two dozen Arab countries that have pledged to cooperate on economic and military affairs, among other matters.
The league makes decisions on a majority basis, but there is no mechanism to compel members to comply with resolutions. It has been criticized for its internal conflicts and collective inaction on important international issues.
The Palestinian cause has perhaps animated the league more than any other issue, culminating in the 2002 Arab Peace Initiative. However, several members have normalized relations with Israel outside the agreement. Yes, the Arab League, or League of Arab States (LAS), promotes international cooperation between its member states on issues of common interest.

Role of Jordan and Egypt on the issue of Palestine.
NAFTA-USMCA: The United States-Mexico-Canada Agreement (USMCA) replaced the North American Free Trade Agreement (NAFTA) on July 1, 2020. The USMCA has the same basic principles of free trade as NAFTA, but with some modernization and adjustments. In 2021, trade flows in North America reached $1.3 trillion, and from January to May 2022, trade in the region reached $642.6 billion.
https://www.cfr.org/backgrounder/naftas-economic-impact
https://pubmed.ncbi.nlm.nih.gov/17208827/#:~:text=The%201994%20North%20American%20Free,text%3B%20the%20political%20and%20diplomatic

https://www.investopedia.com/articles/economics/08/north-american-free-trade-agreement.asp#:~:text=In%20many%20ways%2C%20NAFTA%20led,certain%20sectors%20received%20employment%20boosts.
The European Union (EU) is a political and economic union of 27 European countries. The EU was established in 1957 to promote trade and economic integration between its member countries. The EU's motto is "United in diversity".
The EU's focus is the single market, which allows goods, services, capital, and people to move freely within the EU. The EU promotes democratic values in its member nations and is one of the world's most powerful trade blocs. Nineteen of the countries share the euro as their official currency.

The EU's values are set out in the EU treaties and the Charter of Fundamental Rights of the European Union. The EU's core values include:
respect for human dignity, freedom, democracy, equality, the rule of law and respect for human rights, including those of minorities
The EU's national anthem is "Ode to Joy" by Ludwig van Beethoven, arranged by Herbert von Karajan. The anthem has been the EU's official anthem since 1985. It is meant to represent all of Europe rather than just the organization, conveying ideas of peace, freedom, and unity. Macron, President of France, called for a renewal of the EU in order for it to maintain its vitality.

The European Union (EU) and the International Monetary Fund (IMF) have a long-standing partnership that focuses on global policy issues, including macroeconomic stability, fiscal policy, and debt. The partnership supports regional capacity development centers, global thematic funds, and bilateral programs. The EU is the largest external contributor to IMF capacity development, having contributed €328,400 million between 2009 and 2023. The EU also supports the IMF's multi-donor thematic funds, which address global economic and financial challenges. These funds include support for collecting more and spending better, improving economic policymaking, and modernizing resource management.
The EU-IMF partnership helps countries achieve sustained progress toward the Sustainable Development Goals (SDGs). The partnership tackles big issues so that countries can become more inclusive. The EU supports programs that help countries, including: The Tax Administration Diagnostic Assessment Tool, The PIMA tool on public investment management, The management of natural wealth resources, and strengthening domestic revenue mobilization.

UK and the Commonwealth: The Commonwealth originated with the 1931 Statute of Westminster, and its original members were the United Kingdom, Canada, Australia, New Zealand, South Africa, Newfoundland, and the Irish Free State. The Commonwealth has grown through the decolonization of the British Empire, with over 20 former Crown colonies joining the organization between 1957 and 1970.
The Commonwealth is home to almost one-third of the world's population, with over 2.5 billion people living in its 56 countries. The Commonwealth also campaigns internationally for special attention to the unique development challenges that small states face.
The UK government works with the Commonwealth Secretariat to ensure that the Commonwealth is able to:

Promote democratic principles and human rights
Support the economic development of poorer member states
Help provide a voice to some of the world's smallest and most remote sovereign states

In 2022, UK exports to the Commonwealth were worth £83 billion, while British imports from the Commonwealth were worth £74 billion. The UK had a trade surplus with the Commonwealth of £8 billion.

War, possibility of war, conflict
War between Russia and Ukraine: possibility of a negotiated settlement. Turkey could be a mediator. China is proposing a peace conference provided that the two sides participate. The UN could establish a DMZ (de-militarized zone) between the two sides.
Conflict between China and Taiwan: a war is not needed. The two sides can agree to cooperate. https://www.msn.com/en-us/money/other/china-woos-taiwan-with-investment-package-ahead-of-presidential-inauguration-as-xi-jinping-eyes-peaceful-reunification/ar-BB1mzzj6?ocid=msedgdhp&pc=U531&cvid=ec9be381064b49579fe64eddc0c7530f&ei=41
North Korea and South Korea: a settlement does not seem possible. In that case, maintain the DMZ. Yet, the two sides cooperated during the Olympic Games. North Korea new alliance with Russia. Israel and Palestine: the conflict could grow. Iran is getting involved in some ways. Escalation is not needed. The majority of States support a two-State solution. Nobody wants the conflict to escalate to a world war.

From June 13–15, 2024, Italian Prime Minister Giorgia Meloni convened G7 leaders in Apulia, Italy. The high-level convening comes against the backdrop of a considerable array of global challenges, including war in Ukraine, ongoing conflict in Gaza, climate disasters, and a mounting sovereign debt crisis in the Global South. Amid a resurgence of authoritarianism worldwide, renewed geopolitical tension, and existential climate crisis, this G7 summit represents more than just another leaders 'forum: It is a critical opportunity to reinforce democratic values and restore trust in international institutions through decisive, targeted multilateral action. Here are five critical priorities the G7 should address at the summit: use Russian frozen assets to help Ukraine, focus and coordinate food security efforts, chart a path to Israeli-Palestinian security and peace, plan UN Cop 29 on climate change make multilateral institutions work for all. The G7 summit in Apulia represents a pivotal opportunity for the world's foremost democracies to collectively tackle pressing global challenges. By prioritizing these interconnected issues and enhancing collaboration, the G7 can demonstrate cohesive leadership, paving the way for a more secure, prosperous, and democratic future. Ukraine Peace Summit also held in June with efforts to find the path for peace. The Summit has positive results with some countries abstaining. The effort will continue at the next Summit. The 2024 Washington summit is an ongoing meeting of the heads of state and heads of government of the thirty-two members of the North Atlantic Treaty Organization, their partner countries and the European Union, which is being held in Washington, DC, United States, on 9–11 July 2024. Wikipedia

Conclusion:
The intergovernmental organizations are doing their best and the non-governmental organizations as well. The old and the new could work together and generate synergy. Among the challenges examined by GLOBE researchers there are the governing structures of the international organizations, limited resources in funding, or the resistance to change in their processes: "Institutional configurations of global governance are dogged by old structures and designs which were established when globalization was much less relevant and global policy problems less demanding and less all-encompassing", confirm the researchers in the final report of the project. GLOBE researchers, expose the challenges of global governance in the near future. International actors across all sectors are confronted with an ever-so-uncertain future that will most likely require new mechanisms for the successful

interaction between International organizations, other global actors and nation-states in a globalized world. Increasing network creation between international organizations and other global actors -public and private- will be needed, to be able to adapt to a changing environment. For another part, budgetary constraints and fundamental reforms on decision-making and governance structures within their own institutions are needed to be able to adapt to a dynamic interaction in global governance. Four possible future scenarios for global governance in 2030 were foreseen, based on the findings in GLOBE, and defined as drifting, shifting, rising, and flowing. The drifting scenario is described as worsening tension between the US and China leading to a major world disruption. The shifting scenario describes an intensifying North-South conflict with unstable alliances. In contrast to that, the rising scenario is defined by the weakening power of nation-states in international affairs, creating space for other actors to rise. The last scenario, defined as flowing scenario, feeds into the latter perspective and assumes a multipolar world with inclusive global governance actions. The GLOBE researchers agree that future Global Governance will be confronted with a mix of all four scenarios, and the challenge remains in estimating how much room each scenario will take in the next decade leading up to 2030 and beyond.
BRICS plus, improved as needed, could cooperate with the IMF, just like the EU is doing; each side maintaining its specificity. The US played the lead in setting up international governmental organizations after WW2. The world has since evolved and is now multipolar. There are more players. The IMF and Growth of India and China IMF raises its Asia growth forecast for 2024, highlights India's growth and China stimulus as key drivers (msn.com)

Case Studies in Artificial Intelligence, Information Systems Management Architecture, International Management and Job Review

Donald K. Hsu, Ph.D.
Dominican University, Orangeburg, New York, USA

Abstract
Harvard Business School MBA and Executive MBA programs created Case Studies for its students. Using Case Studies for Undergraduate and Master programs provided good outcome. For PhD candidates, they do quantitative or qualitative research for real world Case Studies. But there were few Case Studies in the literature for Artificial Intelligence, Information Systems Management Architecture, and International Management at Dominican University, International Management was offered for onsite Undergraduates. Artificial Intelligence was offered onsite to master/undergraduate students, at Pace University. Information Systems Management Architecture was offered to doctoral students online at the University of Phoenix. Doing Case Studies in these courses, online or onsite, with Undergraduates, Masters, PhDs, provided a sound foundation for critical thinking, and team building skills. Student reviews were good to excellent. This paper gives a summary.

Keywords: Artificial Intelligence, Information Systems Management Architecture, International Management, Real-World Case Studies, Job Review

(A) Dominican University*

Dominican University is located 14 miles northwest of New York City. Donald Hsu joined Dominican College in 1988 as an Associate Professor in the Business Division. In Spring Semester of 2024, the College enrolled 2000+ students. The Business Division offers Bachelor of Science programs in Finance (FI), Marketing (MK), Information Technology (IX), International Management (IM), and Sports Management (SM). Master's Degree Business Administration (MBA) was approved by the State of New York in 2008. Hsu served as the Director of Business Administration Division from 1990 to 1996, and taught courses in IX, MK and IM curriculum.

MG 355 International Management

8 people registered in Spring Semester 2024. Three majors in IM, one in Finance, two in Management, two in IX. Sweeny and McFarlin (2015) wrote the textbook. This course aims to investigate specific issues in the governance of multinational enterprises. Topics include foundations for international management, managing across cultures, strategic planning, managing political risks, organizing operations, decision making controlling, personnel selection repatriation, training organization development, labor relations, communications, motivating human resources, Hamlet et al (2016), Hsu (2020), Owarish and Hsu (2018).

Class meets in person onsite, Friday 8:15 to 10:40 am, once a week. All 13 chapters were covered. In addition to PowerPoint lectures and discussion, students did in-class labs on 1) Business Week, 2) CNBC, 3) Financial Times, 4) Forbes, 5) Fortune. They work on their own. But they can get help from other students for these labs. For the lecture class, PowerPoint slides were employed to cover the content of each chapter. Just reading the slides bore them. So read a few lines, and then ask them questions:

Why is Apple making iPhones and iPads in China? Why is Apple moving to India now? Name the top five automakers, banks, asset management firms, retailers, and oil companies in the world. Name the four most populated countries in the world. How many people are in the European Union? With so many Chinese Electric Car makers, can Tesla meet the

competition? What is BRIC? Is selling products in the USA the same as selling in BRICs? Can you make money starting an import/export company today? If yes, how? Why does the USA have such a huge military budget? Is Ukraine war good for business, why or why not? How do you think the endgame is for Ukraine war? Define FDI. Why is the exchange rate important in international management? This type of question keeps the lecture alive, and students are challenged to find answers. For the final projects, students did extensive Case Studies on non-US world billionaires, company core business, sales, profit, financials, SWOT analysis, competitors, and future, see Table 1.

(B) Pace University**

Pace University is a private university with three campuses in New York: Pace University in New York City, Pace University in Pleasantville, and Pace Law in White Plains. It was established in 1906 as a business school. Pace enrolls about 13,000 students in bachelor's, master's and doctoral programs.

Pace University offers about 100 majors at its six colleges and schools, including the College of Health Professions, the Dyson College of Arts and Sciences, Elisabeth Haub School of Law, Lubin School of Business, School of Education, and Seidenberg School of Computer Science and Information Systems

CS 627/CS 385 Artificial Intelligence

CS 627 is offered for the 29 students in Computer Science, Master program. CS 385 is for 9 students in Computer Science, Undergraduate program. It is a four-credit course. All 38 students attended the same class in person, Monday evening, at One Place Plaza, New York City, Spring 2024.

Course Description: Theory, data structures, algorithms related to artificial intelligence (AI) and machine learning. Topics include cognitive processes, heuristic vs. algorithmic methods, state space and problem reduction, search methods, theorem proving, natural language processing, pattern recognition, machine learning, neural network, AI applications in real world situations.

Learning Outcomes for CS 627/CS 385, Artificial Intelligence:

- Use heuristic programming to solve problems
- Design intelligent agents using a variety of search algorithms
- Learn the techniques used in machine learning
- Explain neural networks and decision trees
- Understand the methods used in computer games
- Translation as encoding and decoding
- Define computer vision and language translation
- AI applications and jobs in real world

Master students came from India, undergraduates were Americans. This author taught courses for 35+ years but did not teach both in the same course. It turned out the Indian students with work experiences from India, did better work in general. During classroom discussion, India students performed better too.

The selection of textbook was challenging. AI has been around since 1957. With so many books, papers, videos, films, the public information is overwhelming. This author emailed several computer science chairs and colleagues. It seems that everyone is using Russell and Norvig (2020). But this book was just too much math, not enough AI real world

applications. This author did research, found out many of AI doctoral thesis were pages of pages of mathematical formulas, calculus, etc. There were no real-world applications. After extensive research, Mitchell (2020) was chosen as the textbook. On Amazon, this book got 490 positive reviews.

OpenAI released ChatGPT on November 30, 2022. With Microsoft billions of investments, OpenAI has a $86 billion valuation, in AI, Cloud Computing and related business. Amazon, Apple, IBM, Facebook, Google, Microsoft, embracing AI. Why? It is the buzzword for marketing their product and services.

Every week, students attended in person class, asked/answered questions actively. There was a weekly post from the chapter every week. Three homework assignments were graded. For the 10 questions homework, 5 were team and 5 were individual. They worked with their team members and manager to submit answers for team questions. This strategy worked out well.

Final project consists of papers and PowerPoint presentations: (1) Surgical Robot, (2) Facial Recognition, (3) Game AI, (4) Python AI, (5) Driverless Car, and (6) Metaverse, (7) Scale AI, (8) Quantum Computing. The final paper grade is the same for the group. But PowerPoint presentation grade is individual. 38 people with 4 or 5 in each group. They did great work.
Students enjoy the learning very much.

(C) University of Phoenix**

University of Phoenix[(UOPX) is a private for-profit university headquartered in Phoenix, Arizona. Founded in 1976, 76,000+ students, the university confers degrees and certificates at certificate, associate, bachelor's, master's, and doctoral degree levels. It is institutionally accredited by the Higher Learning Commission and has an open enrollment admissions policy for many undergraduate programs. The school is owned by Apollo Global Management and Vistria Group.

UOPX has 40 campuses and learning centers offering 100+ degree programs. Its main campus is in Phoenix, Arizona. The New Jersey campus was in Jersey City.

In February 2008, this author went through a rigorous 4-week, 16-hour training session and was qualified to teach UOPX courses. The training was mandatory for all instructors regardless of prior teaching experience. Since May 2008, taught: Algorithm Logic for Computer Programming, College Mathematics, Creative Mind, Critical Thinking, Essentials of Personal Finance, Finance for Business, Global Information Systems Management (Doctoral), Information System Security, Integrated Business Topics, Java Programming II, Macroeconomics, Management Negotiations, Marketing, Marketing Research, Hsu (2006), .NET I, Organization Behavior, Hsu (2008), Organizational Information Systems Management (Doctoral), People Science Environment, Public Relations, Quality Management Productivity, and Research Information Utilization. Most of these undergraduate courses were taught at UOPX Jersey City campus, in person. Due to Covid 19, Jersey City campus was closed August 2021.

This author learned about UOPX Doctoral mentoring online program and was approved to mentor doctoral students. Since May 2016, 20 students have received their doctoral degrees, Hsu (2023), CDS (2024).

Published 18 papers and received OSS grants: (1) "Critical Thinking, Public Relations and Integrated Business Topics", Schmidt and Hsu (2009), (2) "Personal Finance", Levit and Hsu (2011), (3) "Research Information Utilization", Gabriel and Hsu (2013), (4) "People Science Environment", Hsu (2013), (5) "Algorithm Logic for Computer Programming", Hsu (2014), (6) "Case Studies in Operating System and Global Marketing", Hsu (2015), (7) "Android Apps Development, Big Data Viral Views and Channel Distributions", Safrova and Hsu (2015), (8) "Case Studies in Emerging Market and Personal Finance", Hsu (2016), (9) "Leadership and eLeadership: An Analysis of Contingency Factors and Considerations", Hamlet et al (2016), (10) "Case Studies Undergraduates to PhDs: Big Data, C#, Java, Environment and Global Marketing", Hsu (2017), (11) "Quantitative Analysis: PhD in Business Administration or Management", Hsu (2017), (12) "IBM SPSS Data Analytics, Case Studies in C#, Java and Electric Cars", Hsu (2018), (13) "PhD SPSS Online Mentoring & Case Studies in CEE Countries, Java, Project Risk Management", Hsu (2018), (14) "New Dynamics in International Relations: Best of Times, Worst of Times", Owarish and Hsu (2018), (15) "Is PhD a Worthwhile Investment? Case Studies in Global E-Commerce, Java, Quantitative Reasoning, Sales Management", Hsu (2019), (16) "PhD Qualitative Delphi Research, Case Studies in Channel Distribution, Electric Vehicles and Java Programming", Hsu (2019), (17) "Doctor of Education Leadership, Doctor of Healthcare Administration, Macroeconomics, Case Studies in Global E-Commerce, International Management and Sales Management", Hsu (2020). and (18)
"Doctor Management Organization Leadership, Case Studies in Artificial Intelligence, Java Programming, Management CEE Countries and Research Method", Hsu (2023).

IST/733 Information Systems Management Architecture

Description: Upon completion of this course, learners will be prepared to manage and lead the analysis and planning of strategic and tactical information systems that address the considerations of all IST domains examined in the IST specialization courses. Additionally, this course will include an examination of potential dissertation topics from the domains and spectrum of organizational levels explored in this program.

Learning Outcomes

Develop an IT leadership strategy that incorporates the different IT domains and considers the alignment of people, process, and technology to enable the corporate strategy.
Align benchmarks and measures of IT performance with performance measures used by organizations.
Apply IT and data management governance to ensure legal and ethical compliance.
Week 2 – Signature Assignment: Leadership Strategy Executive Presentation
Week 4 – Signature Assignment: IT Alignment Executive Video Presentation
Week 6 – Signature Assignment: IT Governance and Compliance Research Paper for Executive Presentation

Pearlson et al (2020) wrote the textbook. 6 people registered for this doctoral level course. Students were working adults. They had 10 to 20 years of corporate IT experience. The weekly discussion was of high quality. The course ran for eight weeks. Each week,

students read the materials at UOPX portal, submitting answers. The signature assignment was 150 points, for a total of 1000 points. The role for the faculty was to grade them, providing positive feedback as needed. All work is done asynchronously online. There was no Zoom meeting, due to different work schedules and locations, Zoom (2024).

One person did not participate, she was removed. The Final Case Study was through extensive research and analysis on the Information System Management Architecture for Amazon, Huawei, IBM, Samsung, University Maryland Medical Systems. They did excellent work. Students love the course.

(D) Job Review

This author requires all seniors in International Management or Management majors, to create a free Linkedin (2024) profile. Then they sent invitations and were connected to this author. It is the best way for them to find paid or non-paid internship, part-time or full-time jobs. When the students got hired, they updated their Linkedin profiles. Linkedin will send a notice. This author will send Congrats to the student immediately. This worked extremely well to track the status of their current jobs or new jobs.

Students that majored in International Management got full time jobs or are studying MBA. Table 2 and Table 3 provided the list. As the mentor/professor for four years, this author is very proud for their remarkable achievement.

Conclusion

Students/professionals learn the theory and need to connect it to the real world. 52 people completed Artificial Intelligence, International Management, Information Systems Management Architecture, at three Universities. Teaching and learning strategies included in-class use of Business Week, CNBC, Financial Times, Forbes, Fortune, Harvard Business Review, Internet Search, and YouTube. Final projects involved a written paper for a specific Case Study and the PowerPoint presentation by a team or an individual. These tools and reports contributed to the success in an E-Learning environment. Students/professionals raved about the experiences.

Acknowledgment

Prof. Ivan Rudolph-Shabinsky at Dominican University; Dr. Lixin Tao at Pace University and Dr. Herman van Niekerk at UOPX, provided their guidance and support.

*Full-Time Position **Part-Time Consultant

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Table 1	**MG 355 International**	**Management**	
	Final Projects	**5/10/2024**	
Group A	***Topic***	***Group E***	***Topic***
	Carlos Slim Helu		**Amancio Ortega**
Gomez	**Amer Movil, Mexico**	**Mena**	**Zara, Spain**
Group B	***Topic***	***Group F***	***Topic***
	Mukesh Ambani		**Giovanni Ferrero**
Reyes	**Reliance, India**	**Flynn**	**Nutella, Italy**
Group C	***Topic***	***Group G***	***Topic***
	Francoise Meyers		**Masayoshi Son**
Reilly	**L'Oreal, France**	**Solano**	**Softbank, Japan**
Group D	***Topic***	***Group H***	***Topic***
	Zhang Yiming		**Bernard Arnault**
Obanyoun	**ByteDance, China**	**Keyser**	**LVMH, France**

Table 2 **Name (Last, First)**	**Company**	**Position**	**Major**	**Graduation**
Acosta Daniel*	Golf Academy	Assistant Golf Coach	Sports Management	Jan 2021
Beutel Nicholas	**Saddle River Public Works**	**Management Trainee**	**International Management**	**May 2021**
Beltre Jeantil	ButterflyMX	Accounting Specialist	Finance Math	May 2021
Bobian Marquis	**Enterprise Rent-a-car**	**Management Trainee**	**Management**	**May 2021**
Butler Kendale	**Mavis Tire**	**Assistant Manager**	**International Management**	**Aug 2021**
Cirrincione Adell	Ned Stevens Gutter Cleaning	System Developer	Computer Information Sys	May 2021
Cobbs Christopher	Columbia U Public Health	Service IT Technician	Computer Information Sys	May 2021
Contero Anthony	**Everyday Success Team**	**Digital Marketing Executive**	**International Management**	**May 2021**

Copman Jason*	Woods Golf Club	Outside Operations	Management	May 2021
Corson Meghan	Active International	Digital Media Assistant	Marketing Management	Jan 2021
Descorbeth Randolph	eXp Realty	Real Estate Sales	Financial Management	May 2021
Doll Tyler*	Northern Illinois University	Goalkeeper Coach	Management	May 2021
Dorcemus Tatiana	**Penske Truck Rental**	**Manager Trainee**	**International Management**	**May 2021**
Falco Steven	Dominican College	IT Support Technician	Computer Information Sys	May 2021
Garcia Bruno	**Garcia Construction**	**Manager New Business**	**International Management**	**May 2021**
Giraldi Matthew	Kassin Sabbagh Realty	Real Estate Sales	Marketing Management	May 2021
Guerra Kyla	**TKW Beauty**	**Sales Marketing Specialist**	**Management**	**May 2021**
Joseph Alee	Active International	Direct Media Assistant	Marketing Management	May 2021

Lugo Angel*	**Nassau Community College**	**Assistant Tennis Coach**	**International Management**	**May 2021**
Piedra Jamie	**Enterprise Rent-a-car**	**Management Trainee**	**International Management**	**May 2021**
Robert Jennifer	**Society of the Arts**	**Project Manager**	**Management**	**Jan 2021**
Sandusky Eric	XiltriX North America	Business Development	Financial Management	May 2021
Stevens Joshua	**Hickory Dickory Decks**	**Management Trainee**	**Management**	**May 2021**

LinkedIn profile and private communication with Donald Hsu, 1/17/2022

Table 3 Graduated Business Majors, 12/31/2022, Donald Hsu, 4/10/2023

Last	First	Major	LinkedIn or other
Bowman	Khalid	SPMGT	no info
Cabezas	**Joshua**	**INTMG**	**MBA Dominican**
Casares Martinez	**Maximino**	**INTMG**	**MBA Dominican**
DeMille	Ryan	SPMGT	no info
Ellis	Cyrious	SPMGT	no info
Gifford	Patrick	ITI	Store System, FT
Gray	Ewan	FINMG	Soccer Math, yr 5
Hammond	**Jada**	**MGT**	**Mgr Chuck Cheese, FT**
Hamilton	**Shamar**	**MGT**	**Acctg, M Hilton, FT**
Knipl	**Shannon**	**INTMG**	**Junior Buyer, Werfen, FT**
Kwok Yin Siong Yen	**Anthony**	**INTMG**	**Mgt Trainee, Penske, FT**
Lyons	Jean Paul	MKTNG	no info
Mckeever	Jack	MGT	Insurance Agt, New York Life, FT
Mezon	Jose	ITI	Analyst, Mt Sinai, FT
Pacione	**Maddison**	**INTMG**	**Admin, Katz G Free, FT**
Patterson	Tyler	ITA	Banking IT, FT
Poterbin	**Jaden**	**INTMG**	**Acct Rep, CG Creation, FT**
Plasky	Corey	SPMGT	looking for job
Pratts	Noelia	MGT	no info
Quinones	Arthur	MGT	no info
Rodriguez	Isaiah	SPMGT	no info
Rosario	Angel	ITA	no info
Roundtree	Brandt	MGT	MS Organ Lead Domi
Salvarezza	**Giacomo**	**MGT**	**Consultant Barabino, FT**
Sanders	**Brian**	**INTMG**	**MBA Fairleigh Dickinson**
Sennon	Keana	MGT	Restaurant Manager, FT
Taveras	Mariel	MGT	no info
Thelismond	Bryan	MGT	Sales Verizon, FT

Thurston	Jada	MGT	no info
Tovar	Jhosep	SPMGT	no info
VanBuren	Gavin	ITI	Dominican IT Support
Williams	**Jocelyn**	**INTMG**	**Work Family Business, FT**
Zhu Sanchez	Antonio	MGT	no info

Financial Mgt	1
Marketing Mgt	1
Information Tech	5
Sport Mgt	6
International Mgt	8
Management	12
Total	**33**

Social Media in Cross Cultural Contexts: Implications for International Higher Education

Mary Kate Naatus & Dr. Katsumi Kishida
Seton Hall University

Joy De los Reyes
Ramapo College

Abstract
This study aims to investigate the distinct patterns of social media usage among college-age students across various cultural contexts worldwide. As social media continues to shape the dynamics of communication, identity formation, and social interaction, understanding its usage among this demographic cohort can provide valuable insights for organizations and marketers, particularly in the context of higher education. By employing a comparative approach, this study seeks to uncover both commonalities and divergences in social media behaviors, preferences, and impacts among college-age students from different regions around the world. Through qualitative and quantitative methodologies, including surveys, focus groups and interviews, this research aims to provide new insights into the role of social media in the lives of college-age individuals across diverse cultural landscapes. The outcomes of this research are presented with a focus on college educators engaged in international education and organizations aiming to comprehend and address the preferences and nuances of this globally interconnected and culturally diverse demographic.

Exploring Corporate Capital Structure and Overleveraging in the Pharmaceutical Industry

Samar Issa & Hussein Issa
Saint Peter's University

Abstract
This paper develops an empirical model of corporate capital structure, optimal debt, and overleveraging, covering the time span 2018 to 2000 across the pharmaceutical industry. Estimates using a sample of twenty firms, the model sheds light on an industry-specific default risk, measuring overleveraging as the difference between actual and optimal debt. The calculated corporate excess debt has largely been moving up, spiking around the global financial crisis in 2008 and starting to recover more recently. The analysis presented in this paper reveals a concerning trend in the pharmaceutical industry, with corporate excess debt steadily increasing over the past two decades, particularly peaking during the 2008 crisis. This suggests that excess debt, rather than its mere presence, played a significant role in the financial meltdown of 2007–2009. These findings have broader policy implications for future macroeconomic scenario assessments, highlighting the importance of understanding industry-specific default risk and optimal debt levels.

Keywords: corporate instability; pharmaceutical sector; credit flows; financial crisis; excess debt; early warning signals

Credibility Keywords for Recommending AI Generated Content

Penn P. Wu
DeVry University

Abstract
Citing AI-generated content as reference source is now a practice in academia. Unlike published journal articles, AI-generated content is inconsistent and may be traceable. They are results of generative algorithm without consciousness and self-awareness, and thus could be a paradoxical state of writing. While Penn State, Brown University, MIT, and many other educational institutions begin teaching writers how to properly cite generative AI resources with APA and MLA styles, little efforts have been spent on using keywords to suggest credibility of the cited AI-generated content. This paper proposes the use of credibility keywords when citing or quoting AI-generated content. Keywords like Scientific fact, Scholarly sources, Common knowledge, Perspective, and Opinion can reflect the degree of relevancy of the AI-generated content.

Keywords: Gen AI content, Gen AI citation, Gen AI reference, Gen AI quotation, Gen Al credibility

Worry Wisely about AI: Exploring the Possibilities of Business and Education AI Applications

Mary Sanders, Ph.D., Makrina Feagins, *Mack Jackson Jr*., Ph. D; Jan Urban-Lurain
DeVry University

Abstract
Panel Discussion: Are you wondering about how AI and Generative AI is reshaping our world? How business, education, our ethics, and ourselves are being transformed as a result of Generative AI and Large Learning models? Is it possible for the human mind and AI to be complementary forces and not the fulfillment of a Win-Lose game? In this panel, four colleagues with backgrounds in Higher Education, AI Creation, Cyber Security, Change Management, and Group Process Design/Facilitation will consider these transformative opportunities, challenges, and possible consequences of integrating AI and Machine Learning Models into business and education organizations and practices. Some further questions to be considered include: What should educators be considering for educational methods, Academic integrity, Academic Freedom, and career development strategies? How will the use of prompting questions influence the way we think, teach, and learn? What are the cybersecurity threats that we need to understand and manage? Beyond the medical advances of neuro-links, are there ethical issues need our consideration?
The session will include an opportunity for conference participants to join the discussion and share their own insights and experiences.

Team Teach in the Online Classroom or Team Teach in the 21st Century Classroom

Michelle Cranney, DHSc, Sheila Sampath, DBA & Gregory Zaleski
DeVry University

Abstract
Panel Discussion: In this panel presentation, Presenters will discuss their experiences as part of a Team Teach model in an online class at DeVry University. Team Teach has been an integral part of their pedagogy for the past four years in the College of Health Sciences. In this model, two or more professors collaborate to deliver Live Lessons using an online learning platform.

The benefits of Team Teach impact students and faculty in many ways. Students get a sense of belonging by interacting, encouraging, congratulating, and empathizing with one another during Live Lessons. The ability to collaborate and learn from peers provides opportunities faculty normally would not get to experience when teaching on their own. Faculty expertise coupled with the benefits of online learning platforms create the perfect environment for active learning. The Team Teach approach provides a flexible framework to meet the needs of faculty and students. It creates an environment which ensures a consistent delivery of content. Students learn teamwork by watching their faculty work together to meet learning objectives.

Although Team Teach has many benefits, it also presents challenges. This model is thought of as a time saver, however, it requires more time planning, collaborating, and strategizing. Challenges occur when faculty within a team do not share the same perspective and mindset. This lack in communication and creativity stifles the effectiveness of class content. For the Team Teach model to be effective, the faculty involved need to have a high level of trust and respect for one another. The students 'feedback from the end of course surveys is not always specific. Therefore, survey results can be difficult to analyze.

Despite the challenges, the model provides so many benefits to the faculty and students that it has become the effective, preferred approach to education in Health Sciences at DeVry University. Through effective leadership and training, the learning curve has been managed and reduced into a more supportive nature where faculty and students are thriving.

Overall, the collaborative efforts of faculty involved in Team Teach has been met with positive results. Results of a documented Team Teach program show Faculty felt encouraged to try new things in the classroom while having equal peers to collaborate. They enjoyed having someone to bounce ideas off, or to get a second opinion from. Student comments have indicated positive outcomes as they reported having a deeper understanding of the concepts and feeling better prepared for their careers. They also appreciated the varied expertise and perspectives offered by the faculty. Students consistently attended live lessons, and the playback feature provided an opportunity for students review lessons again at their convenience with thousands of rewatched classes.

To Examine the Role of Characterization In The Construction Of Personality Of The Main Characters In Watoto Wa Mamantilie And Daladala Kutoka Mbagala

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Abstract
This paper examines how the main character portrayal influences the development of the personalities in Emmanuel Mbog's Watoto wa Mamantilie and Mussa Shakinyashi's Daladala Kutoka Mbagala. The research adopts a qualitative approach and integrates Freuds Psychoanalytic Theory (1890) and Propps Theory of Narrative (1895) as a combined analytical framework to examine the characters; expressions, the authors; narrations, and performances within the chosen texts.

The study embraces the constructivist paradigm, a philosophical and theoretical framework employed across diverse fields such as education, psychology, sociology, and epistemology. This paradigm fundamentally posits that individuals actively shape their comprehension and understanding of the world through their personal experiences, beliefs, interpretations, and interactions with their surroundings.

The researcher employed this paradigm to designate the primary data source. Close reading enabled a comprehensive analysis of these texts, particularly on main character portrayal and personality development. Validation of Popp's (1985) view affirmed that main characters often mirror the author's persona. This paper underscores the pivotal role of characterization in shaping central personalities within literature,
contributing significantly to our comprehension of this aspect in literary works.

Keywords: characterization, main characters, personality.

INTRODUCTION

Literary works like novels, plays, and poems represent the events described within the narrative that mirror actual realities, constituting a significant aspect of the extensive cultural landscape that shapes and mirrors societal truths (Klarer 2004). This paper deals with two novels. Characters play a vital role in a novel by adding depth to the psychological dimension of the storyline, thus animating the narrative (Pope 2005). They give meaning to the narrative, providing readers with motivation to be engaged in the unfolding events of the novel. Main protagonists, in particular, exert a significant impact on the novel, embodying the fundamental messages the novel seeks to impart to its readers. The connection between character and personality is intimate, as personality characteristics significantly shape a character's conduct and choices, preserving their uniqueness and mental disposition (Charters 2011).

Characterization encompasses a character's bodily features, characteristics, viewpoint, demeanor, internal musings, choices, and conduct. Characterization therefore, is a fundamental element in literature that involves the creation and development of characters within a story. It plays a crucial role in constructing the personalities of the main characters, shaping their motivations, actions, and overall effect the narrative. Characters within narratives often act as conduits for conveying feelings via their actions, including emotions like remorse, animosity, affection, envy, unease, and apprehension. Reams (2015) states that, characters play a crucial role in narratives, imparting significance to the storyline and giving readers a motive to immerse themselves in it. When characters lack the ability to captivate the reader's attention or involve them, other elements of the narrative lose their impact.

Hence, characters are of paramount importance in any narrative. Characterization refers to the technique utilized to assess the growth and persona of the central character. It entails crafting a lively portrayal of a make-believe individual, encompassing their attributes, qualities, and drives (Feisal, 2011).
Characterization involves presenting and evolving a character. Characterization helps establish a character's unique identity and individuality by providing details about their appearance, background, beliefs, values, preferences, and behaviors. These aspects differentiate one character from another and contribute to their distinct personality.

Peckering & Jeffry (1981) claim that, characterization encompasses the depiction and evolution of a character. There are two distinct methods for characterization: explicit characterization and implicit characterization. Explicit characterization occurs when the author informs the audience about the character's personality, often employed in novels. On the other hand, implicit characterization involves the author illustrating aspects that unveil the character's personality, commonly utilized in a story. Methew (2013) agrees with Peckering & Jeffry (ibid.) by pointing out two clear-cut methods of characterization: direct and indirect. Direct characterization is when the writer straightforwardly informs the audience about the character's traits and is frequently used in written works like novels. Conversely, indirect characterization is utilized in films and centers on disclosing the character's personality through their dialogue, thoughts, deeds, and appearance (Burroway 2000). Kimambo (2015) Agrees with the concept of two fundamental types of characterization: explicit and implicit. Explicit characterization entails direct information offered by the author, whereas implicit characterization depends on information conveyed to the reader through alternative means.

Hence, this paper primarily concentrated on analyzing characters, particularly delving into the primary trait exhibited by the main characters in the two novels. The selection of *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala* were deliberate, as they effectively depicted their symbolic representation of reality. The two novels illuminate the obstacles children encounter while pursuing their aspirations and delve into how main characters such as Peter and Fikara provide moral and financial assistance within their family dynamics. The paper aimed to analyze how characterizations shape the personalities of the main characters, as portrayed in the two chosen novels *Watoto wa Mamant'ilie and Daladala Kutoka Mbagala* and identify the most prominent characteristic using the indirect characterization method proposed by Burroway (2000).

This paper seeks to explore the role of characterization in construction of the main character and how it contributes to shaping the personalities of key figures in the chosen novels, considering their societal way of life, financial situation, social standing, and aims to understand the factors influencing the formation of their characters.
Peter and Fikara exhibited distinct character attributes throughout different stages of their lives, embodying the struggles of being from low-income families dealing with pervasive poverty and a precarious existence. Peter portrayed a son's persona, while Fikara embodied the demeanor of a daughter from an underprivileged family, devoid of conceit, pride, and defiance. Their time in school was marked by profound poverty, presenting numerous challenges and adversities. These complex and harsh life circumstances gradually led to financial instability, restricted educational opportunities, diminished academic performance, and social and emotional hardships. Despite these tribulations, Peter and Fikara displayed resilience, reflecting the pioneering determination of impoverished Tanzanian children against the odds of fate. This essay also analyzes the fates of other main characters *in Watoto wa Mamant'ilie and Daladala Kutoka Mbagala* combined with their social background,

social status and the changes of their personalities. To a certain extent, this paper demonstrates that children from poor families often experience financial strain, instability, and insecurity. They may lack resources for school supplies, extracurricular activities, or even basic necessities. This financial instability can lead to stress and anxiety, affecting their focus and performance in school, that helps readers deeply interpret the vividness and full dimensions of the main characters in *Watoto wa Mamant'ilie and Daladala Kutoka Mbagala.* The study aimed to examine the role of, characterization as a powerful tool in literature that helps authors to construct and present rich, multifaceted personalities for main characters. It aimed to examine how characters, with their distinct traits and behaviors, contribute significantly to the overall narrative, enabling readers to connect emotionally and intellectually with the story

Methods

2.1 Study Area

Emmanuel Mbogo, a distinguished author of literary works such as novels and plays. Among his novels and plays, the ones that has gained him the most popularity is *Moran*i, as well as the novel *Watoto wa Maman'tilie*, both of which are extensively used in the Tanzanian education curriculum. Apart from him is Mussa Shekinyashi, very junior writer whose novels are very interesting. This study was specifically done on these two writer's novels namely *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala.*The selection of these two novels was based on two primary reasons. Firstly, the researcher sought precise insights from the authors regarding the role of characterization in shaping the personalities of main characters in novels. In this context, both authors were chosen as valuable resources due to their significant expertise and contributions to the understanding of characterization's role in constructing the personalities of main characters in novels. The second reason for this choice was the researchers' desire to thoroughly analyze and investigate grounds that main characters and their personalities drive the plot and conflict in a story (Fierro,2014). Specifically, how main characters' traits and behaviors often lead their clashes, decisions, and events that move the narrative forward. Conflict arises from differences in personalities, goals, or beliefs among characters. Academically, the writer believes that this paper will significantly contribute to filling the gap on characterization and the construction of the main characters' personality, especially considering that many studies that have focused on ethics in general. The topic of characterization and the construction of the main characters' personality still requires further investigation. Therefore, this paper will serve as a valuable reference for another writer.

2.1 Data Collection and Analysis

This study utilized a descriptive case study approach, focusing on two specific novels: *Watoto wa Mamantil'ie* by Emmanuel Mbogo and *Daladala Kutoka Mbagala* by Mussa Shekinyashi. Primary data was collected from these novels. The choice of this research design was influenced by the nature of the study within the literary field, demanding in-depth descriptions, elaborations, explanations, and definitions of the performances and personality traits of the main characters. The study's findings are presented using definitions, descriptions, detailed explanations, and elaborations, aligning with Kothari (2014), who highlighted that a descriptive case study involves a focused and comprehensive examination of propositions and questions concerning phenomena from the very beginning.

Target population for this study was two novels as mentioned above. The sampling technique used in this study was purposive sampling. As stated by Leedy & Ormrod (2010), purposive or deliberate sampling, is a non-probability sampling technique widely used in qualitative

research. It involves selecting individuals or cases that possess specific characteristics or meet particular criteria relevant to the research purpose and objectives. As for a literary work, the selection of only one or two authors is a technique preferred by several researchers to get specific information from specific resource was used to get the required data for this study. Therefore, two novels namely *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala*was chosen, the study deliberately chose these novels to extract targeted information. The aim was to gather and analyze words, phrases, sentences, clauses, and paragraphs from each novel that depict the main characters' appearance, themes, actions, images, and symbols. Additionally, the interpretations that convey the construction and portrayal of the main characters' personalities were included in the analysis. The approach involved a meticulous reading of the novels, employing both textual analysis and incorporating selected personality traits from Froud's personality theory and Popp's Narrative theory for a comprehensive data analysis.

For the textual analysis, the researcher commenced by handpicking *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala*, aligning with the research objectives. Subsequently, the researcher outlined the specific elements for analysis, delineating units and categories. The units of scrutiny encompassed words, phrases, sentences, clauses, and paragraphs portraying the main characters' personality and its construction within the chosen texts. The defined categories for analysis fell into two primary groups. The first group encompassed personality traits, such as thinking style, feelings, and emotions. The second group encompassed the main characters depicted in the selected texts.

Furthermore, the researchers established a set of coding guidelines. In this phase, each analytical category received a designated letter, and all units falling within a particular category were assigned the same letter as their code. Finally, the researchers employed these coded texts to illustrate the outcomes through percentage-based tables and conducted a comprehensive descriptive analysis. The analysis was guided by selected personality traits from Freud's psychoanalytic theory and Popp's Narrative theory, ultimately leading to the formulation of conclusions. Throughout this process, the findings were visually represented via percentage in a table, accompanied by explanations and detailed descriptions. These elucidations served to interpret and scrutinize the themes conveyed through the main characters, their actions, images, symbols, words, narrations, and interpretations concerning the construction of their personalities, as derived from the data gathered from the two novels. The results are presented in two separate Tables. The first table contains of data about the number of main characters in the selected novels. The second contain personality traits and the tools that used to measure performance relevant traits which are classified into three broad categories such as 'Relationship with people,' 'Thinking Style, Feelings,' and 'Emotions as revealed in the novels.

Table 4.1 Characterization and construction of the main characters' personality in Emmanuel *Mbogo's Watoto wa Mamantilie* and Musa Shekinyashi's *Daladala kutoka Mabagala.*

ST	NMCPB	TNMC	TNMC	NCMG	TNAC
WM	**Peter**	4(9%)	28(65%)	11 (26%)	43 (100%)
	Maman'tilie				
	Zita				
	Kulwa				
DKM	**Fikara**	1(6%)	13(72%)	4(22%)	18(100%)

In table 1, the findings revealed that, the total number of main and minor characters in the selected texts. In *Watoto wa Maman'tilie* main characters were 4 (9%), minor characters which were of two types, those used proper nouns 28 (65%) and those used common noun 11 (26%) make a total of 43 (100%). To elaborate of proper nouns and common nouns, to begin with proper nouns are specific names while common nouns in both stories were names that used to refer to general and non-specific people. In *Daladala kutoka Mbagala* main characters was 1 (6%) minor characters that used proper noun were 13 (72%) and 4 (22%) that used common noun hence make the total of 18 (100%). The data show in both novels that, characterization is a powerful tool in literature that helps authors construct and present rich, multifaceted personalities for main characters. These characters, with their distinct traits and behaviors, contribute significantly to the overall narrative, enabling readers to connect emotionally and intellectually with the story.

Table 4.2 The percentage of the main characters' personality traits in Mbogo's *Watoto wa Mamantilie* and Shekinyashi's *Daladala Kutoka Mbagala*

SN	Main Character	Novel	List of personality Traits (abbreviated) shown by the main character only								TQ	(%)
			RwO			TS			Fes			
			IF	Sc	Ep	An	Cc	St	E	Dm		
1	Peter	MW	1	6	4	4	4	2	2	2	25	62.5%
2	Fikara	DKM	2	2	3	2	2	1	2	1	15	37.5%

The findings show that, through characterization, authors delve into the psychological aspects of characters, exploring their thoughts, emotions, fears, desires, and motivations. This depth allows readers to understand the complexities and intricacies of the characters' personalities (Table 2). The main characters and their personalities that were depicted to reveal personality resulted to be the driver of the plot and conflict in the selected stories. Their traits and behaviors often lead to clashes, decisions, and events that move the selected stories forward. Conflict arises from differences in personalities, goals, or beliefs among main characters. The

findings show that well-developed main characters evoke emotions and empathy from readers. When readers can relate to or understand a character's personality, struggles, or triumphs, they become emotionally invested in the story (Table 2).
Feeling empathy for the main characters in the stories deepened on readers' connection to the narrative, something that evoke emotions and understanding of the characters' personalities, struggles, and triumphs. This emotional investment stems from the authors' effective characterization, enabling the depiction of the main characters' development and growth in response to experiences, challenges, or relationships in both texts, showcasing the transformative nature of their personalities (Bennott & Royle, 2004). All main characters represented larger themes, ideas, and messages in these two selected stories. Their personalities and actions were used to convey moral, social, and philosophical messages that the author aimed to communicate to the readers. Authors of these texts used characterization to create main characters with whom readers can identify and those they can root against. That added depth and engagement to the narrative as readers become emotionally invested in the fate of the main characters. The main characters in the selected texts served as symbols or allegorical representations of abstract concepts, societal roles, or historical events. Through their personalities and actions, authors were enabled to convey deeper meanings and insights. The taken main characters with believable personalities contributed to the realism and authenticity of the story. Due to that audiences were more likely to engage with a narrative if the characters' act in a way that aligns with their established personalities. Engaging and multi-dimensional main characters captivated readers and maintain their interest in the story. Therefore, the main characters in both stories revealed that a well-constructed character with a compelling personality keeps readers invested in the unfolding events.

Discussion
Watoto wa Mamant'ilie and *Daladala Kutoka Mbagala* are stories address poverty so that to convey social commentary, promote empathy and understanding, authentically representation of experiences, that create and compel people to understand reality in the society. They are the kind of stories that explore main characters' development, provide historical or cultural context, represent real-life experiences, and advocate for social change.
Mbogo and Shekinyashi are authors, like any other writers from any region, they have explored diverse themes in their works. In their novels both do address poverty, it's important to note that the continent has a rich literary tradition covering a wide range of topics. Poverty may be a recurring theme because it reflects social realities, challenges, and inequalities that authors feel compelled to address in their narratives. However, it's essential to explore a variety of African literature to appreciate the breadth and depth of themes explored by different writers.
The two writers use their novels to address themes of poverty something that have contributed significantly to the world of literature and societal awareness in Tanzania. In *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala*the paper has revealed some of achievements made by the authors in their novels.
The following is a brief discussion on how the two writers managed to characterize and construct their main characters' personality in the two novels *Watoto wa Mamant'ilie* and *Daladala Kutoka Mbagala.*
Through the main character's relationship with other characters both authors used the two novels to shed light on the socio-economic challenges faced by African communities, fostering awareness and understanding both within and outside the continent. By portraying the impact of poverty, these novels may inspire readers and policymakers to address issues related to economic disparities, access to education, and social justice.

Mbogo and Shekinyshi managed to construct main characters with a unique thinking style that portray them with ability to analyse things, create, and make some changes. The two novels try to humanize the experiences of people living in poverty, providing nuanced perspectives and challenging stereotypes. That usually foster empathy and bridge cultural gaps. On the side of cultural representation, these novels contributed to a diverse representation of cultures and experiences, countering stereotypes and showcasing the richness of African societies beyond a single narrative (Smith 2016).

Many African authors addressing poverty have received international acclaim, contributing to the recognition and appreciation of African literature globally. Therefore, these two novels demonstrated a powerful educational tool, offering insights into historical and contemporary issues, encouraging critical thinking, and prompting discussions on poverty and its complexities. On the issue of emotion and feeling the two authors constructed their main characters with personality that accommodate that. They have constructed main characters that fight to overcome poverty something that serve as inspirational figures, encouraging readers to believe in the possibility of change and resilience.
The role of characterization in construction of personality of the main characters' is further illustrated as follows.
"Wote ambao hamjalipa ada na hamna sare, hakuna shule! Nisizione sura zenu bila ada na sare" (Uk. 1)
English translation
"There is no school for all of you who have not paid fees and do not have uniforms! I don't want to see your faces without fees and uniforms, (Pg. 1)"

The above quotation reveals the introductory section of a story that portray how the main character encounter life challenges at the very beginning of the story. At this part Peter faces the order that chases away him from school. Even though the head teacher directed the order to all students at Mapepela primary school, the order carried a devastating weight for the central character, Peter. In the narrative, Peter's parents, Mzee Lomo lomo (his father) and Maman'tilie (his mother, known as a street food vendor, underlining her societal role), couldn't afford to cover school fees or purchase uniforms for their children. For Peter, this utterance signaled the end of his education and dashed his hopes of escaping the clutches of severe poverty.
"Zita Lomolomo, darasa la sita, na Peter Lomolomo, darasa la tano, walikumbwa na tangazo la mwalimu Chikonya. Baba yao mzee Lomolomo alikuwa hajawalipia ada wala kuwanunulia sare (Mbogo 2002a: 1).
English translation
"Zita Lomolomo, standard six, and Peter Lomolomo standard five, affected by the announcement given by teacher Chikonya. Their father Mzee Lomolomo hadn't bought them school uniform and also hadn't paid fees (Mbogo, 2002a: 1).
English translation
"Zita Lomolomo, standard six, and Peter Lomolomo standard five, affected by the announcement given by teacher Chikonya. Their father Mzee Lomolomo hadn't bought them school uniform and also hadn't paid fees (Mbogo, 2002a: 1).
Through the above portrayed quotation, theannouncementsignifiesthe end of Peter's aspirations for a better future. Subsequent to this incident, the narrative unfolds a sequence of events showcasing Peter's dire poverty, the inadequate access to social services in his residence known as Manzese, and the challenges he faced after leaving school. The story also illustrates the struggles of his family members, beset by illnesses without proper medical

attention, grappling with substandard living conditions, insufficient food, and inadequate shelter, among various other hardships.

Consequently, Peter found himself compelled to wander the city, engaging in a relentless battle to scrounge for scraps amidst the city's refuse sites. Essentially, both the family as a whole and Peter, in particular, were thrust beyond what could be deemed possible or tolerable. Nonetheless, the novel doesn't depict Peter as a mere passive victim of his circumstances (Millon, 1985). It portrays him as an individual fiercely contending to endure amidst these intolerable conditions. This can be illustrated clearly in below quotation:
Wiki ya pili sasa tangu Zita na Peter wafukuzwe shule. Kila kukicha Mamant'ilie na Zita wanachukua sufuria, maharage, unga na kuni hadi Kiwanda cha Urafiki. Hawarudi mpaka jioni, wamechoka wananuka kutunzi la moshi na vipesa vya sukumia wiki. Lakini ada? Sare? Wapi! Jambo hili lilikuwa lina msumbua akili Peter. Kuna siku halali. Kuna siku hushinda njaa (Mbogo, 2002a. 14)
English translation
Two weeks had gone since Zita and Peter had been chased away from school. Every morning Mamant'ilie and her Zita carried pots, beans, flour and firewood to Urafiki industry. They didn't come till evening tired, smelling smokes earned few amounts to run the week. No school fees? No uniforms? Nothing! That was one among of the things gave Peter a headache. Some other days he failed to sleep. Some he stayed hungry the whole day (Mbogo, 2002a: 14).

The above quotation indicates that the novel employs various incidents to illustrate both role of characterization in construction of personality of the main character and the whole journey in life as portrayed in text. The main characters within the story sometimes sing songs, while in other instances; listens music via a radio cassette player. Occasionally, they offer their thoughts or engage in conversations about the songs they sing or hear, but at other times, they remain silent. Due to the recurring and pivotal role of musical elements in this narrative, it is imperative to delve into how the author molds the main characters' personalities, fostering a deeper comprehension and heightened appreciation of the novel. Therefore, in this exposition, I scrutinize Emmanuel Mbogo's work, *Watoto wa Maman'tilie*,to reveal the role of characterization in shaping the personalities of the central characters, interwoven with various literary devices that represent these encounters. The below quotation illustrate that:
Baada ya kula alichukua kikombe na sahani. Alikwenda uani, akavisafisha. Zenabu alimuuliza, "Umeshiba?" "Nimeshiba dada." Peter alivisafisha, akavirudisha vyombo chumbvani. Mara huko mtaani akasikia ngoma ya mdundiko ikipita
Wamo
Eee!
Wamooo!
Eee!
NGOMA*: Ndi-ndi-ndilili*
Ndi-ndi-ndi!
WIMBO. *Mume wako sikumwita*
Kanisimamisha mwenyewe
Kaiona dizaini na
Hii shepu yenyewe.
Mtaa wa Manzese
Kuna mgome-mgome
Na huo umbea wenu
Shoka yangu mkome

Nipeni shilingi yangu
Nikanunue kibwaya
Ninasimangiwa kula
Kula kwenyewe kwa kaya.
Umasikini mbaya
Tena unatia haya
Ningelikuwa tajiri
Mbona ningegaragara(Uk. 14 &16).

English translation

Having finished eating he took that cup and plate. He went at the back yard and cleaned them. Zenabu asked "Are you satisfied?" "I'm satisfied dear sister." Peter cleaned and returned them in the room. He heard people singing and playing drums in the street passing by.
They're in
Eee!
They're in!
Eee!
DRUMS*: Ndi-ndi-ndilili*
Ndi-ndi-ndi!

WIMBO. *I didn't call your hubby*
He approached me himself
He saw my design and
This shape of mine.
Manzese Street
There is mgome-mgome
And that gossips of yours
Stay away from my exe
Give me my shilling
To buy a short cloth
I'm being discussed just for food
The food of the house.
Poverty is not a good thing
Then it embarrasses
If I were rich
I would lie down several times (Pg. 14 &16).

Similarly, Shekinyashi represent role of characterization in constructing personality of the main character in*Daladala Kutoka Mbagala,* the story explored themes of poverty for several reasons, rooted in it to depict and analyze various aspects of human society, behavior, and the human condition: The story use its main character to critique societal norms, structures, and inequalities. By depicting poverty this shed light on the injustices, and disparities present in a society, encouraging readers to reflect on these issues. The author of the story managed to construct main character's personality that suit the massage he wanted to portray to the society. The part briefly portrays Fikara's challenges in her life as follows:
"Nilishakwambia hapa kwangu sitaki kukuona tena. Hii siyo nyumba ya walevi-mbwa kama wewe. Mwanaume gani wewe? Kila siku pombe tu. Toka bwana!" (Uk. 4)
English translation

"I've already told you in my house I don't want drunken people any more. This is not a house for poor drunkard like you. What kind of man? Daily alcohol. Go away!" (Pg. 4)
The above portrayed data vividly shows how Fikara suffer in *Daladala Kutoka Mbagala* . Shekinyashi write about poverty in order to foster empathy and understanding among readers who do not have firsthand experience with it. By delving into the lives of impoverished main characters by the name Fikara, Shekinyashi aimed to evoke compassion and awareness, bridging the gap between different social and economic backgrounds.
The story targeted to portray poverty as a pervasive reality for many individuals and communities around the world. Shekinyashi using his book aimed to authentically represent the experiences, struggles, and resilience of main character (Fikara) living in poverty, providing a platform for her story to be heard and understood.
Mama asingethubutu kuondoka pekepeke yake katika kiza kile. Mtaa wetu unasifika kwa wakabaji na wabakaji. Na si wakabaji rahisi bali wakabaji wenye ubunifu wa hali ya juu. Na saa hizi ndiyo nyakati zao za mawindo. Hapo zamani walikuwa wanakaa kwa makundi wakivizia watu wanaodamka alfajiri kuwahi madaladala kisha wanawavamia na kuwapora walichonacho ikiwemo pesa (Uk. 8)
English translation
Mom couldn't try to go alone in that dark. Our street was very famous for thieves and rape suspects. Not ordinary thieves and rape suspects rather very skillful thieves. At this hour was their hunting time. In those days they were grouping themselves targeting people who wake up early in the morning to catch min buses then stole their belongings including money (Pg. 8).

The above portrayed data shows Shekinyashi using poverty to serves as a backdrop for conflict and drama in *Daladala Kutoka Mbagala*. The struggles associated with poverty normally creates compelling narratives, tension, and main character development that captivate readers and drive the plot forward.

The above quotation reveals that, waking up early in the morning have both positive and negative impacts on a secondary school student girl (Shekinyashi, 2020). Early risers often have more time in the morning for focused study and preparation, potentially leading to better academic performance. Waking up early helps in establishing a consistent daily routine, which can contribute to better time management and organization. Getting up early can lead to increased alertness during morning classes, potentially enhancing the learning experience. Apart from that is the negative side as portrayed in the novel. That is also illustrated in below quotation:
"Fikara, amka mwanangu. Huu ndiyo muda wa kujiandaa kwenda shule," nilisikia sauti ya mama kwa mbali huku akinitingishatingisha. Nilijisikia hasira ya hali ya juu. Nilitamani niangue kilio cha uchungu, maana muda ule usingizi ulikuwa unanivuta kisawasawa. Kulikuwa na ubaridi wa namna yake (Uk. 1).
English translation
"Fikara, wake up my daughter. This is the right to time to get prepared for school," I heard mom's voice very far from me while shaking me many times. She angered me that much for what she was doing. I felt like giving out a very loud and bitter cry, by that time sleeping was very sweet. It was cold that much (Pg. 1).
The above quotation described Fikara's challenge called sleep deprivation. The story portrays Fikara's mother waking up her that early morning something in Tanzaniani culture is not accompanied by going to bed early, according to Shekinyashi (ibd.) it leads to insufficient sleep, impacting concentration, memory, and overall health. Not only that but also Fikara is

portrayed facing something called fatigue and Irritability. Inadequate sleep results in fatigue and irritability, affecting her mood and ability to interact positively with peers and teachers. Main character was drowned facing poverty while undergoing significant development and growth as she grapples with adversity, survival, and societal expectations. That allowed Shekinyashi through his story to explore complex main character arcs and themes related to resilience, determination, and personal transformation. Apart from that, Shekinyashi used poverty as a crucial aspect of historical or cultural settings in his story. He used it to provide context for a particular time period and place, highlighting the socioeconomic conditions that influenced the lives of individuals during that era (Robert, 2002).

Therefore, Shekinyashi used his work to raise awareness about poverty and advocate for social change. By portraying the harsh realities of poverty, he hoped to inspire action and contribute to efforts aimed at alleviating poverty and improving the lives of those affected. The following is a brief discussion of how characterization helped the two authors when constructing main characters in their novels.

Characterization is the process of creating and developing characters within a story. It involves the author's use of various literary techniques and details to bring characters to life, making them believable, relatable, and multidimensional. Characterization helps readers understand the motivations, traits, emotions, and actions of the characters, allowing them to form a connection with the story.

The narrator or a character provides a summary and description to the reader regarding another character's appearance and personality. The author explicitly conveys information about the character. This can be accomplished through the narrator, another character, or the character themselves. Indirect characterization involves the use of narrators and characters to detail a character's physical appearance or clothing, giving hints about their personality. For instance, a recurring gesture or facial tic normally suggest a character's arrogance and nervousness (Web, 2015). The reader needs to infer the character's traits based on their thoughts, actions, speech (including word choice and manner of speaking), appearance, and interactions with other characters. Additionally, how other characters react to that specific individual offers insights into their nature. This method is commonly utilized in prose. Characterization in novels differ from that in a play due to the setting nature of storytelling or writing (Burroway 2000). Important point to note in this study is that, both writers Mbogo and Shekinyashi in most cases constructed their main characters' personality in a way they deliver the intended message. Therefore, from this construction both authors affirm Sigmund's psychoanalytic and narrative ideas on the personality construction in literary works to be very much important.

Conclusion

This paper dealt with the characterization and the construction of the main characters' personality in *Mbogo's Watoto wa Mamant'ilie* and Shekinyashi's *Daladala Kutoka Mbagala*. The analysis of the two texts revealed that characterization in literary work play an important role. It serves as the pillar that stands between character's actions, words, and thoughts to the readers by allowing them to relate and understand the main characters' personality on a deep level. The way how the two authors constructed their main characters' personality was observed through their actions, speeches, behaviors, and psychological framework. The analysis showed that both authors use a variety of techniques to achieve effective characterization. These included the provided detailed description of the constructed main characters' appearance, delving into their background, and their exposition in the selected texts.

Through these techniques the analysis revealed that, authors have ability to get audiences insight into the characters' inner working, enabling a more profound emotional connection with the stories protagonists and antagonists alike.
The analysis also revealed that characterization and the construction of the main characters' personality in novels depend on descriptive elements, where characterization relies on the use of descriptive elements to convey main character's personality. These elements include the main character's appearance, behavior, and inner thoughts. By carefully choosing and describing these elements, authors shape the personality of the character, allowing readers to form a mental image of who the character is.

Furthermore, Mbogo and Shekinyshi present the notion of revelation through actions and dialogue. They managed to reveal main character's personality through their actions and dialogue. They made characterization by creating situations where their main character's traits, beliefs, and values were demonstrated through what they do and say. The consistency of those actions and dialogues contributed to a coherent and well-defined personality for their main character.

Another issue that is observed in the analysis of Mbogo and Shekinyashi's novels is the idea of internalization of traits. Their characterization involved internalizing the traits of their main character. That means understanding their main characters' motivations, fears, desires, and conflicts. That means the construction of main their main characters' personality involved delving into their internal world and determining how their unique combination of traits shaped their behavior and decisions.

Through this study, researchers found out that the character arcs and development are things which are important in characterization. That characterization is not static; it often involves character arcs and development. The construction of main characters' personality includes considering how the character evolves over the course of the narrative. Main characters need to undergo changes, learn from experiences, or face challenges that alter their personality. This dynamic aspect of characterization contributes to a more engaging and realistic portrayal of characters.

On top of that the study also revealed the idea that known as reader engagement and empathy. Well-constructed main characters with distinct personalities are more likely to engage readers. Readers can relate to characters whose personalities are carefully developed and consistent. The construction of a character's personality is essential for building empathy, understanding, and connection between the reader and the character.

Reffering to Froud's notion, characterization and the construction of main characters' personality are intertwined processes in storytelling. Therefore, Mbogo through *Watoto wa Mamant'ilie* and Shekinyashi's *Daladala Kutoka Mbagala* underline that characterization is the broader term that encompasses all the techniques used to bring main character to life, while the construction of main characters' personality is a specific aspect of that process, focusing on the development and portrayal of the character's inner traits and qualities. Both are essential for creating memorable and authentic characters in literature and other forms of storytelling

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Implications of Ubuntu values in Early Childhood Development in Africa – Lessons from Ujamaa Policy in Tanzania

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Abstract
This study explores the implications of Ubuntu values in Early Childhood Development (ECD) in Africa, with a focus on Tanzania's Ujamaa policy. Implemented in the 1960s, Ujamaa emphasized community-based interventions, holistic development, and African cultural values. The findings reveal that Ujamaa policy promoted collective responsibility, community participation, and cultural relevance in ECD, leading to improved child outcomes. The study concludes that Ubuntu values, as exemplified by Ujamaa, are essential for fostering strong community connections, sense of belonging, and inclusive education in ECD. The research highlights the importance of community ownership, cooperation, and cultural relevance in ECD, offering valuable lessons for African countries seeking to promote holistic and culturally responsive early childhood development.

Keywords: Ubuntu, Ujamaa Policy, early child development, Tanzania

Introduction
Ujamaa is among the core values of Ubuntu that represents major African aspects of life including education became a national policy through Arusha Declaration of 1967 to implement education for self-reliance and universal education in post-colonial administration of Tanzania influenced by the late Dr. Julius Kambarage Nyerere. Ujamaa viewed early development holistically through seven (7) domains: spiritual, mental, social, emotional, creative, natural, and physical. More important, Ujamaa policy restored African systems relevant for ECD through established collective communities that rendered conducive environment for early childhood Development.

General Objective
To review the implications of Ubuntu values in ECD through Ujamaa Policy of Tanzania

Specific Objectives
Exploring the capacity of Ujamaa Policy in realizing ECD
Connecting SDG 4 and Ubuntu values towards ECD

Findings
Results have shown that in the 1960s Ujamaa policy envisioned a child as a heart of community that deserves collective support for his/her holistic development through community-based intervention. Government of Tanzania ensured the investment in early child development was supported by the values of community participation, self-reliance, family hood, voluntarism, interdependency, cooperation, human dignity, ecology and cultural values. Child rights and child welfare was the center of the community plan and activities that entail all key aspects for early childhood development including culture, nutrition, values and ecology etc. Overtime, ECD became the part of community development where collective and holistic involvement of all community members was inevitable through direct involvement of parents, guardians, extended family and community members, and professionals. Ujamaa invested holistically in the five areas of child development i.e. Cerebral, Emotional, Physical, Social and Spiritual development. Community was collective responsible to realise these domains through provision of voluntary and active participation

in supporting food, positive parenting, supporting learning ecology, social and cultural practices. Despite of the achievements yet early child development during Ujamaa faced the challenge of colonial legacy and difficulties in building capacity.

Conclusion
As part of Ubuntu philosophy, Ujamaa policy centered on community strength in early childhood development bounded by history, ecology and cultural values necessary to facilitate the network of relationships and connections between children, families, neighbourhood, teachers, local leaders and the wider community. When these connections are strong, positive, and inclusive, they have capacity to influence constructive early child development. Ujamaa and other Ubuntu values link children with their community that provide a vital outcome of sense of belonging in the natural setting, boosting confidence, inclusion, identity, and help to develop their social life skills.
Moreover, Ujamaa rendered three major influences in early child development 1) the development of relevance of ECD curricular that considered cultural values and ecology, 2) capacitated local communities to provide sustainable and cultural based mechanism for timely addressing early child needs 3) inclusive education through universal education campaigns that targeted even children in marginalized and scattered communities especially pastoralist communities such as Maasai, Tindiga, Barbeig etc. Lastly, its necessary for community members to own the process of ECD through collective and holistic approach and cooperation in sharing of resources such as food, child parenting, and traditional adoption and fostering, also community members render free manpower in school building, teaching, provision of psychosocial care and support etc.

Recommendations
Ujamaa policy should be a relevant case study in strengthening ECD and realization of SDG 4 in the SADC region Ubuntu values are relevant for ECD in Africa thus its call for SADC members to embrace them in ECD protocols and related strategic plans

The Relevance of Indigenous Models For ECD in Africa - A Review of Mama Mkubwa Model in Tanzania Through Ubuntu Lens

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Abstract
This study reviews the relevance of indigenous models for Early Childhood Development (ECD) in Africa, with a focus on the Mama Mkubwa Model (MMM) in Tanzania. Guided by Ubuntu theory, the review highlights the applicability of MMM in addressing the special needs of orphans and vulnerable children. The findings show that MMM represents other African Ubuntu models that prioritize community-based, holistic, and collective child development. The model's voluntary, community-initiated, and owned nature renders a friendly environment for child development. The study concludes that MMM and similar indigenous models hold Ubuntu values necessary for ECD and recommends their integration into child protection and development initiatives in Africa.

Keywords: African Ubuntu, early child development, indigenous model, mama mkubwa

Introduction
Mama Mkubwa Model (MMM) is an indigenous community-based model practiced in Tanzania from pre-colonial era; this model represents other relevant Ubuntu models for Early Child Development in Africa. Mama Mkubwa is a Swahili word that stands for Mother's Elder Sister or trusted elder Woman in the community who is voted to take care of a vulnerable child on behalf of the family and community. MM is person with good integrity, compassion, maturity, tender and passion for children is selected among the extended family members or community to care for a child in voluntary bases. MMM is envisioned to ensure realization of effective child development in Tanzania through integrating local community, cultural values and ecology in addressing the special needs of orphans and vulnerable children. The model is holistic and collective in nature that functions across various ecological intersections in the society including individuals, family, extended family members, groups, clans, local leaders, customary laws and community at large. Despite of being sidelined during colonialism, Tanzania took relevant initiative to restore traditional social welfare systems including MMM in post-colonial Tanzania during Ujamaa Policy.

Main Objective
To highlights the relevance of Indigenous Models for ECD in Africa

Specific Objectives
To review existing literature on the applicability of Mama Mkubwa Model on ECD in Tanzania

Methodology
The review based on desk research method guided by Ujamaa theory.

Results
MMM model represents other African Ubuntu models on child development from the heart of community where a child is not institutionalized rather being hosted in his/her natural setting through the trusted elder woman who comes from the family that strongly embraces Ubuntu values. MMM takes good care of a child on behalf of the parents but the whole community has a close follow up and support for the child's development (socially, psychologically and spiritually). This is a form of community-based alternative that renders effective child development and it has capacity to work with formal systems as it focuses on cultural and ecological strengths to address the special needs of children. Colonial legacy sidelined indigenous knowledge and practices in Tanzania including MMM in Tanzania while post-colonial the government took various deliberate efforts to restore and envision African models relevance for child welfare yet emerging of socio-economic problems hindered the child welfare, yet HIV/AIDS pandemic in 1990s increased child vulnerability that affected the effectiveness of formal systems to address the special needs of OVC and MVC. Also, shortage of child care workforce and social workers contributed to the failure of formal social welfare systems to address the needs of rapid increase of OVC especially in rural areas that necessity the revitalization of indigenous models including MMM in the midst of HIV and AIDS pandemic in the year 2000s.

Conclusion
MMM represents other African models on child protection that form a vital ecological framework for child development from the grass root level whereby a community envisions on collective and holistic practices for child care. Also, since MMM is voluntary nature, community initiated and owned thus it renders a friendly environment for child development in African context and outside.

Recommendations
Child stakeholders need to revisit and learn from MMM that holds Ubuntu values necessary for ECD SADC members should integrate MMM in promoting and maintaining holistic and collective child protection and development in the SADC region.

Realization of Wellbeing and Happiness in Tanzania Through Ujamaa Model - Ubuntu Perspective

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Abstract
Ujamaa Model was a tool that represented African Ubuntu Models relevant for realization of wellbeing, harmony, happiness, equality, human dignity and democracy in African context from pre-colonial time. Ujamaa is among the core values of Ubuntu thus post-colonial Tanzania under the leadership of Julius Nyerere who succeeded to restore the Ujamaa Model that demonstrated truly wellbeing, harmony, equality and democratic in Tanzania and beyond. Arusha declaration of 05 February 1967 became an official Ubuntu tool that facilitated the vison toward achieving collective and holistic welfare, happiness, harmony and democracy in African setting. Nyerere used Arusha declaration to ensure individual human rights, including freedom of expression, the well-being of all citizens, and so as to prevent the exploitation of one person by another and the existence of democracy. Despite of some challenges in implementing Ujamaa model yet it succeeds to unite Tanzanians, collective democracy, social tie, social cohesion, communality, strong mutual support in the community, voluntarism spirit, cooperation, collective community activities and strong cultural values. Also, unlike other post-colonial African states Tanzania was never touched by tribalism, racism and related conflicts due to Ujamaa Model. Tanzania's democratic ideal went beyond boarders with belief that Africa is one and Tanzania couldn't enjoy truly freedom while other African countries were experiencing discrimination, racism and colonial domination thus through Ujamaa Model Tanzania supported liberation of other African states including Zimbabwe, Republic of South Africa, Mozambique etc. Conclusion, basing on Ujamaa's contribution in the Africa's well-being, peace and democratic in 2014 Nyerere was awarded Ubuntu champion by National Heritage Council and it has remained to be a country of high hospitality for refugees, immigrants and those who seek happiness, compassion and peace.

"Traumatic Stress as a Global Causal Factor in Childhood Physical Injuries Transmuting into Cancers via Epigenetic Methylation & Demethylation"

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Abstract
Considering the high global rates (above 60%) of various types of traumatic physical injuries to children, including but not limited to physical injury, natural disaster, bullying, childhood maltreatment, and the numerous parallels and multiple overlaps between normal wound healing and pathological cancerous developments; the research project explores the interconnections between childhood physical injuries and the potential development of cancers in young people.

Complimentary Conceptual & Scientific Methodological Goals consist of:

An examination of various negative triggers that could cause pathological cancerous developments from normal wound healing, including the possible implications of normal and healthy, negative but bearable, and toxic and traumatic stress; and how, in some cases, they are stabilized via stress management via positive mindsets which are constituted by one's assumptions and core beliefs, affecting one's expectations, explanations and motivation and orientation of thinking and acting.

2) These cognitive frames and lenses of perception, on both conscious and subconscious levels, which influence momentary events both within our bodies and in our external environments - will be correlated with a review of the processes of methylation, demethylation, and hyper methylation - whereby genes, via physiological, mutational, or epigenetic developments are either turned on or off, effecting biochemical dynamics playing a critical role in brain function, including neurogenesis, neuronal differentiation, synaptogenesis, learning, and memory.

3) Lastly, the paper will offer ethical reflections on the discrepancies in health outcomes between first, second, and third world interventional procedures and related experiences: Recent stats (2020) indicate that there are more cancers nationally, probably due to the consumption of processed foods, and exposures to social media and advanced industrial wastes, than in second and third world nations; yet, the recovery rate in the latter is less than in the United States, stemming from the extent and quality of health care, generally available.

Management of Dynamic Corporate and Personal Financial Strategy

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Abstract
Comprehending the trajectory and ultimate outcomes of changes in interest rates is important for accomplishing ideal financial and strategic objectives, in both personal and professional spheres. This study looks at the direction, pace, volatility, historical background, and present patterns in interest rate fluctuations and how they affect the financial decisions made by individuals and corporations. The 10-year Treasury rate is currently about 4.5%, which is only 25 basis points higher than the historical long-term rate of 4.25%, despite what the general public believes.
Our research delves into the significance of comprehending the present and potential economic impacts on interest rates and the ensuing policies of the Federal Reserve, encompassing the notion of mean reversion.
The results will give stakeholders useful information to help them manage interest rate changes and make wise financial decisions.

Keywords: interest rates, financial decisions, economic trends, mean reversion, federal reserve policy.

Private Sector Expanded IRA Contributions: Managing Personal Retirement Security In A Fragile Social Security Environment

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Abstract
The feasibility of Social Security benefits beyond the Baby Boomer generation (1946–1964) is investigated in this study. We explore what reasons are leading to the program's anticipated end by conducting a historical analysis of its development, transformation, and plateauing. We analyze the viability of the program considering rising lifespan and falling birthrates, as well as the political discourse surrounding Social Security reform.
In addition, our research explores alternatives that may yield higher financial returns and beta-tested methods that may assist people in mitigating the risk of lower benefits. In the end, our research hopes to provide guidance for business efforts that may effectively handle retirement difficulties related to personal finances and provide a more secure financial future for future generations.

Keywords: Social Security, retirement benefits, financial sustainability, alternative investments, personal finance.

"Is The Federal Reserve Really Independent" Did Presidential Moral Suasion Disrupt The Better Spirits Of Federal Reserve Of Managing Inflation And Interest Rate Stability, Causing A Rapid And Very Volatile Increase In Inflation.

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Abstract
This study looks at the Federal Reserve's autonomy in determining interest rates in the face of real and perceived pressure from the president to keep rates low. We investigate the factors the Fed considers such as inflation, economic growth, employment rates, and unemployment statistics, when adjusting interest rates. The instruments available to the Fed, the length of time needed for effective implementation, and the effects on mortgage rates, property values, and individual and corporate saving and spending patterns are all covered in our analysis. We also examine the effectiveness of corporate America's interest rate forecasting in achieving a balance between the anticipated "goldilocks" economy and the lag effect of policy actions.

Keywords: Federal Reserve, interest rates, monetary policy, Presidential pressure, economic growth, inflation, employment rates, corporate forecasting.

Artificial Intelligence: A Strategic Tool to Promote Critical Thinking

Dr. Kathryn Woodbury Zeno

Abstract
The Use of Artificial Intelligence (AI) continues to increase among consumers as more industries incorporate AI into their products and as the perceived consumer benefit of AI increases. While the perceived consumer benefits of AI increases, there are concerns of overuse and the potential to diminish individual critical thinking and intellectual curiosity/motivation. This is of particular concern in higher education as student use of AI increases. for immediate answers, approaches, and recommendations to address phenomena versus using more traditional and time-consuming methods. AI sources appeal to students given the benefits of high availability, speed obtaining information, and low cost.
Although AI is an efficient tool, academicians need to assess the use of AI in every course and how AI could be used as a tool to aid learning. Developing approaches and methodologies to use AI in support of curriculum and course objectives is essential as AI is becoming ubiquitous. This paper advocates strategic use of AI in the classroom in support of course objectives. A framework and examples of using AI in the classroom are also provided and demonstrate how critical thinking is promoted. Additionally, this paper proffers strategic use of AI in the classroom will broaden student perception and use of AI as an aid to versus replacement for learning. Framework for Artificial Intelligence: A Strategic Tool to Promote Critical Thinking

Note: Highlighted diamonds indicate areas where critical thinking is required and significant.

The Perspective of Tax Practitioners on Taxation as an Incentive to Charity

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Abstract
Researchers continue to ponder what motivates charitable contributions. Since the creation of the income tax in 1909, and the original tax deduction of 1917, the Internal Revenue Service continues to use the income tax system to encourage charitable contributions. This aligns with many developed countries that use the tax system and tax deductions to encourage charity. Despite this, there continues to be ambiguity over whether the tax system motivates charity and enhances the accomplishments of charity. Similarly, the question of why people give to charity within the various social sciences remains an open matter.
The purpose of this paper is to explore the perspective of tax practitioners on the relationship between taxation and charity. We conducted a qualitative study by interviewing tax practitioners about their perspectives, experiences, and understanding on the relationship between taxation and charity. From these interviews, we found that tax practitioners (1) defined charity broadly or as an organization; (2) believed corporate social responsibility was a broader concept that included charity, or did not exist, (3) believed the relationship between charity and taxation is the tax deduction; (4) minimally discussed charitable tax deductions

with their clients; and (5) advocated for greater tax advantages associated with charity, or did not support a change in the tax code.
This paper benefits the fields of taxation, and the motivation of philanthropy. We hope that this study adds to the literature on why people give to charity and reduces the ambiguity over whether the tax system motivates charity.

Keywords: charity, corporate social responsibility, entrepreneurial philanthropy, social entrepreneurship, and taxation.

Gambling, Poverty, and Health Equity: A Short Perspective

Paulette O'Gilvie, PhD & Demere Coker

Abstract
The convergence of gambling disorder, poverty, and health equity are rarely intersected in research literature due to the nature of gambling—it is mostly described by the industry as entertainment, often undetected and unseen, and seldom acknowledged as an addiction. Yet, problem gambling has shown prevalence in marginalized communities, especially in Black and Indigenous People of Color (BIPOC). Used to escape poverty, health inequities, and other socio- economic disparities, gambling can become "solution gambling" mainly due to the inherent restrictions and access to wealth and socioeconomic status, especially for diverse populations such as BIPOC. We examined the health and socio-economic benefits of gambling in casino gambling. We found that socialization, connection, casino perks, and cognitive development were present, but when poverty intersects with anxiety and financial distress from gambling, overall health diminishes. We also found a lack of studies in the scholarship that connects gambling, poverty, and health equity despite the prevalence of gambling, the increase in gambling outlets, and the increase in modes of gambling in our current environment. When compared to other addictive disorders such as substance use disorders (SUDs), gambling treatment is lacking in the health system infrastructure. In contrast, SUDs have evidence-based systems in place to address those addictions. We propose that a wider lens be applied to address the incongruence in health equity for addictions, namely, problem gambling. Implications include revised SUDs addiction curricula to include gambling education including detection, prevention, and treatment; further exploration of the health systems models currently in place for gambling; and gambling stigmas in society.
Keywords: Gambling, poverty, health equity, SUDs

Assessing the Adoption and Impact of Climate-Smart Agriculture Practices in Nigeria

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Abstract
Climate change presents a significant challenge to food security, particularly in developing countries where smallholder farmers are most vulnerable.
This study evaluates the adoption and impact of climate-smart agriculture (CSA) practices among the smallholder farmers across Nigeria's diverse agro-ecological zones. Utilizing data from the Nigeria Generalized Household Survey (GHS) Panel, collected by the National Bureau of Statistics (NBS) during the 2011/2012, 2013/2014, and 2015/2016 periods. The data were analyzed using descriptive statistics and multivariate probit models to understand adoption patterns and impacts. The results indicate that Nigerian farmers adopted all 28 possible CSA combinations, with mixed cropping and improved seeds being the most prevalent. In 2010, 74% of farmers engaged in mixed cropping, which slightly decreased to 67% by 2015. The adoption of improved seeds increased from 79% in 2012, but the adoption of intercropping with legumes, improved seeds, organic fertilizers, and inorganic fertilizers showed a negative significance, indicating that farmers often perceive these practices as either competing alternatives or incompatible with one another. Key factors influencing CSA adoption included gender, age, education, household size, off-farm activities, asset value, and livestock size. Additionally, the study identified complementarity among certain CSA practices, such as mixed cropping and inorganic fertilizers, which positively influenced farm returns. Conversely, some combinations, particularly those involving improved seeds alone, had negative effects on farm productivity. These findings underscore the need for targeted interventions that promote beneficial CSA combinations and address the barriers to CSA adoption, such as farm size constraints and the negative impacts of off-farm activities, while enhancing the effectiveness of subsidy programs and improving digital accessibility for smallholder farmers. By fostering education, enhancing access to resources, and supporting income diversification, policymakers can significantly boost agricultural productivity and income for Nigerian smallholder farmers. Future research should focus on the long-term impacts of CSA adoption and the influence of climate change on these practices.

Keywords: Adoption determinants, agricultural productivity, climate-smart agriculture (CSA), multivariate Probit model, smallholder farmers.

Characterization, Classification and Suitability Evaluation of Hydromorphic Soils in Ibaji area of Kogi State, Nigeria for Garden Egg Cultivation

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Abstract
Hydromorphic soils are soils with high potential for agriculture. This study adopted a free survey method. Two pedons (HIS-P1 and HIS-P2) were selected for the research. One profile pit was dug in each pedon. The soil profile pits were characterized, classified and evaluated for garden egg cultivation. The findings revealed that the soils were predominantly sandy clay loam. The bulk density values ranged from 1.20 to 1.35 g/cm 3 in the surface soils of the pedons. Mottles were observed in the subsurface soils of IHP-P2. The pH of the surface soils ranged from 5.0 to 5.4. The total nitrogen levels were low while the available phosphorus was moderate. The mean values of the cation exchange capacity and base saturation in the surface soils are 10.79 cmol Kg -1 and 88 % respectively.
The findings revealed that the soils have high fertility index due to the percentage saturation which were above 80 percent in both soil units. The two pedons were classified as Inceptisols at the order level of USDA Soil Taxonomy. The evaluation of the soils for garden eggplant revealed that the soils were moderately suitable (S 2) for the cultivation of garden egg. The major limiting factor of IHP-P2 was observed to be poor drainage.

Keywords: Garden egg, Hydomorphic soils, Soil properties, Soil horizon, Soil profile

INTRODUCTION

Hydromorphic soils are generally characterized by the reduction or localized segregation of iron which is due to the temporary or permanent water-logging of the soil pores. Subsequently, this action results in lack of oxygen over a long period. The soil processes in these soils are called gleying and ferrolysis and these are induced by water saturation (Akamigbo, 2009). Consequently, there is formation of gleying and pseudogley horizons, where mottles and concretion of re-oxidized compounds occur. Thus, characterizing hydromorphic soils for agricultural purposes does not only establish relationship between soil properties and the landscape parameters, but also provides preliminary information on the nutrient status, limitations and ensure sound judgment on the behaviour or response of the soil to specific uses (Esu, 2010).
Garden egg *(Solanum melongena L)* has been reported by a Publication on Nigerian Tribune News Paper (2022) to be useful in regulating blood pressure, maintaining and regulating the function of the heart. The report further stated that it controls glucose absorption and reduces

the risk of hypertension which is why when a diabetic person consumes it, it suppresses the sugar level and brings the blood pressure down. The numerous benefits of this plant call attention for optimum productivity. This can be achieved by evaluating the suitability of soils for its cultivation in hydromophic soils, which could as well ensure all-round season through possible irrigation.

Reportedly, hydomorphic soils have distinct advantages for rice production due to their ample water supply (Ukabiala, 2022). Igwe and Okebalama (2005) reported that other advantages observed where most hydromorphic soils occur include low erosion hazard and moderate to high inherent fertility. However, in order to meet the food requirement of mankind (food security), such soils should also be explored for the suitability of other crops since the land areas are often large, making large-scale farming feasible (Ukabiala, 2022). Therefore, the main aim of this research was to characterization, classification and garden egg cultivation-suitability evaluation of hydromorphic soils in Ibaji area of Kogi state, Nigeria.

MATERIALS AND METHODS

Study Area

The study area is Ejule Ojebe in Ibaji Local Government Area of Kogi State, Nigeria. Ejule Ojebe is located between Latitude 06°52'00"N 06°87'00"N. Ibaji is located in the eastern part of Kogi state. It covers a land area of 1, 377 km². It is separated from Edo state to the west by the river Niger, and bordering Delta state in the south. The climate of the study area is humid tropical. There are essentially two major seasons - the rainy and the dry seasons. The former, which lasts from March to October, is characterized by high rainfall with 1523mm – 1625 mm as the range of the annual mean rainfall (Ukabiala, 2022). The distribution is with peaks observed in July and September. The dry season lasts from November to February. The mean annual maximum temperature ranges from 29^0C - 32^0C (Ukabiala, 2022).

The relative humidity in the study area is within the average of 60% throughout the year except during the desiccating period of the Harmattan (Ukabiala *et al*., 2022). Harmattan is a short season (about three weeks) of hazy and very dry weather which usually occurs in December or early January. The vegetation of the area is Guinea savanna with grasses and herbaceous undergrowth. There are only a few stands of remnant forest trees in the area. The main vegetative cover is secondary due to the influence of man through bush burning, clearing and land cultivation. The soils of the area are generally derived from mainly alluvium and Agwu Shale Group. These geological formations usually give rise to sandy and clayey soils respectively. The soils of the lowlands show strong mottling of gray and red color due to periodical water logging (Ukabiala *et al*., 2022).

Field Work

Field reconnaissance was done with the aid of a base map. Sampling points were identified following the observed physiographic units of the wetland. Two profile points were located and denoted as IHS-P1 and HIS-P2. They were dug and described following the standard of the USDA (Schoeneberger, *et al*., (2012). The pits were described immediately after digging because on further delay, the ground-water may fill up the pits making horizon description and sampling difficult or impossible. The field equipment used in the sampling included spade, hand trowel, cutlass, global positioning system (GPS), tape, and munsell soil color chart. The samples taken were placed in appropriately labeled polythene bags for proper handling to a soil science laboratory. Undisturbed soil samples were collected from each identified soil horizon using metal cores. These were used for the laboratory analyses of some soil physical characteristics.

LABORATORY ANALYSES

Laboratory Analyses

The various physical and chemical analyses through specific procedures in the laboratory were carried out. The soil samples collected from the field were air-dried in the laboratory and later sieved with a sieve of 2 mm mesh size.

Soil physical characteristics

The particle size distribution (PSD) < 2 mm was determined using Bouyoucos Hydrometer method Gee and Or (2002). Sodium hydroxide was used as dispersant. The textural classes were read out from the USDA soil textural triangle, while Bulk density was determined by the core and excavation methods described by Landon (1991).

Soil bulk density= oven dry weight of soil/volume of soil.

Soil porosity was calculated with the values of the bulk density using the method outlined in Brady and Weil (2002).

Soil total porosity (%) = 100 - (bulk density/Particle density x 100)

The Soil Saturated Hydraulic Conductivity (K_{sat}) was determined based on Klute and Dirksen (1986) method and calculated by using the transposed Darcy's equation for vertical flows of liquids;

$K_{sat} = (Q/At)/L/DH)$,

where K_{sat} is the saturated hydraulic conductivity (cm h^{-1}), Q is steady-state volume of water outflow from the entire soil column (cm^3), A is the cross-section area (cm^2), t is the time interval (h), L is length of the sample (cm), and DH is the change in the hydraulic head (cm).

Soil chemical characteristics

Soil pH was determined in water and 1N KCl solution using a soil solution ratio of 1:2.5 with the aid of a glass electrode pH meter (McLean, 1982). Organic carbon was determined by wet dichromate acid oxidation method (Nelson and Sommers, 1982). Total nitrogen was estimated by the macro-kjeldahl digestion method (Bremmer and Mulvaney, 1982). Available phosphorus was obtained using Bray II bicarbonate extraction method (Olsen and Sommers, 1982), using 0.03 N ammonium fluoride with 0.1N HCl. The phosphorus in the extract was determined with a photo-electric colorimeter. Exchangeable bases (Ca, Mg, K and Na) were extracted with 1N NH_4OAc (pH 7.0) using 1:10 soil solution ratio. Potassium and sodium in the extract were determined with Flame Photometer while Ca and Mg were determined by atomic absorption spectrophotometry (Thomas, 1982).

Exchangeable sodium percentage (ESP) was calculated using the standard of Soil Survey Staff (1999) formula:

$$ESP = \frac{\text{Exchangeable sodium}}{\text{Cation exchange capacity}} \times \frac{100}{1}$$

The titration method, as outlined in Selected Methods for soil and plant analysis (Thomas, 1982), was used in the determination of the exchangeable acidity. The samples were extracted with 1N KCl solution and the extract titrated with 0.05 NaOH to a permanent pink end point using phenophthalen indicator. Total exchangeable bases (TEB) were obtained by the summation of the exchangeable bases (Na, K, Ca and Mg) (Rhoades, 1982). The cation exchange capacity of the soils was determined with 1N NH_4OAc, pH 7.0 (Rhoades, 1982). The effective cation exchange capacity of the soil samples was estimated by the summation of the exchangeable bases and the exchangeable acidity (Rhoades, 1982).

ECEC = $Ca^{2+} + Mg^{2+} + K^{+} + Na^{+}$ + EA, where EA is the exchangeable acidity.

The percentage base saturation was derived by dividing the total exchangeable bases (Ca, Mg, K and Na) by the CEC obtained and multiplying by 100 (Rhoades, 1982).

$$PBS = \frac{Ca^{2+} + Mg^{2+} + K^{+} + Na^{+}}{CEC} \times \frac{100}{1}$$

Aluminium saturation percentage (ASP) was obtained by multiplying the ratio of aluminium concentration and ECEC with 100 (Soil Survey Staff, 1999);
ASP = Al / ECEC X 100

Statistical Analysis
The data collected were analyzed using descriptive statistics with the help of SPSS software.
Soil classification
The soils were classified in accordance with the USDA Key to Soil Taxonomy (2014) and correlated with FAO/UNESCO and World Reference Base (2015).
Soil Suitability Evaluation
The non-parametric method of soil suitability evaluation as recorded in Ezeaku (2011) was adopted in the evaluation of the soils for the cultivation of garden egg in the soils. The suitability class rating in Table 1 was followed. Table 2 shows the land/crop requirements for rain-fed garden egg cultivation.

Table 1: Class rates of soil suitability classes and agricultural uses

Classes	Suitability classes	Rates	Potential agricultural uses
Class 1 (S_1)	Highly Suitable	85-100	Excellent
Class 2 (S_2)	Moderately Suitable	84-60	Good
Class 3 (S_3)	Marginally Suitable	59-40	Fair
Class4 (N_1)	Currently Not Suitable	39-20	Poor
Class 5 (N_2)	Permanently Not Suitable	<20	Very Poor

Adapted from Ezeaku (2011)

Table 2: Land/Crop requirements for garden egg cultivation

Land qualities	**S_1**	**S_2**	**S_3**	**N_1**	**N_2**
	(100-85)	**(84-60)**	**(59-40)**	**(39-20)**	**(19-0)**
Climate ©:					
Annual rainfall (mm)	1800-2500	1250-1799	1000-1250	500-1000	<500 >2500
Mean annual temp (^oC)	24-33	20-22	>33<20	any	any
Relative humidity (%)	70-75	65-70	50-65	30-50	<30
Topography (t)					
Slope (%)	0-3	4-8	9-16	16-45	>45
Wetness (w):					
Flooding	F0	F1	F2	F3	F4
Drainage	WD	MWD	MD	PD	VPD
Soil physical properties (s):					
Texture	CL,SCL,L	SCL	SCL – LFS	Any	C, Cs,
Structure	blocky	any	any	any	massive, single grain
Depth (cm)	>100	50-100	25-49	20-25	<25
Fertility (f):					
Cation exchange capacity ($cmol_c\ kg^{-1}$)	>10	6-10	<6	any	any

Base saturation (%)	>35	<20	any	any	any
pH (H_2O)	6.5-7.0	5.5-6.0	<5.5;>7.0	<4;>7.0	<4;>7.0
Organic carbon (g kg^{-1}), 0-15cm	>8	< 8	-	-	-
Total nitrogen (g kg^{-1})	>10	<10, >5	2 -5	<2	<2
Available P (mg kg^{-1})	>22	13 - 22	7 -13	3 - 7	<3
Exchangeable K ($cmol_c$ kg^{-1})	>0.5	0.3 -0.5	0.2 – 0.3	0.1 - 0.2	<0.1
Exchangeable Mg ($cmol_c$ kg^{-1})	2-5	1-2	< 1	< 1; > 5	any
Exchangeable Ca ($cmol_c$ kg^{-1})	10-15	5-10	1-5	< 1; > 5	any

F0= no flooding; F1, 1-2 months flooding in >10years; F2, not more than 2-3 months in 5 years out of 10; F3, 2-4 months almost every year; F4, >4 months in almost every year.
CL= clay loam; SCL= sandy clay loam; L=loam; LFS= loamy fine sand; C= clay; CS= clayey sand
WD= Well drained; MWD= Moderately well drained; MD= Moderately drained; PD= Poorly drained; VPD= Very poorly drained
P= Phosphorus; K= Potassium; Ca= Calcium; Mg= Magnesium; N= Nitrogen; CEC= Cation exchange capacity
Source: Author

RESULTS AND DISCUSSION

Morphological Characteristics of the soils

The morphological properties of the studied area are presented in Table I. The morphological features show a dominant hue of 10YR in the two pedons. The surface soils of the two pedons were characterized by brownish black colour. The subsurface soils of the HIS-P1 showed mainly yellowish brown which is at variance with HIS-P2 which showed brown soil colour. The soil colour typifies enrichment of organic matter in the soil which is common on most wetlands or floodplains as reported in Ukabiala (2022). The surface soils were characterized by crumb soil structure while sub-angular blocky structures were seen in the subsurface soils. The soil consistence was slightly sticky and slighty plastic owing to the sandy clay loam textural dominance in the soils. The clear wavy and clear smooth boundary between the surface and the subsurface layers showed the depositional patterns across the seasons of water inundation. Reddish and yellowing mottles were found in the subsurface soils of IHS-P2 which shows redox reactions in the area. On the other hands, this also means that that fluctuation of water occurs in this pedon below 45 cm from the surface.

Physical Characteristics of the soils

The physical characteristics of the soils studied are presented in Table 4. The soils were dominantly characterized by sandy loam texture based on the proportions of the sand, silt and clay. There is slight and irregular increase in the clay content of the two pedons, IHS-P1 and IHS-P2 (Figure 1).

Table 3: Morphological characteristics of Hydromorphic soils in ibaji Local Government Area of Kogi State, Nigeria

Profile/Location/Elevation	Horizon designation	Depth (cm)	Soil colour		Texture	Structure	Consistence	Boundary	Others
			Matrix	Mottles					
IHS-P1 06^0 59' 32.8" N, 06^0 44' 14.6"E Elevation =28.6m	Apg	0-21	10YR4/8 (Brownish black)	-	scl	momcrg	sssp	cw	Common irregular very fine pores, many fine roots
	Bwg1	21-49	10YR 5/8 (yellowish brown)	-	scl	momcrsbk	sssp	dw	Few irregular fine pores, moderate medium coarse roots
	Bwg2	49-84	10YR 5/8 (yellowish brown)	-	scl	momcrsbk	sssp	ds	Few irregular very fine pores, few fine roots
	Bwg3	84-150	10YR 6/8 (Bright yellowish brown)	-	scl	momcrsbk	sssp	ds	Very few irregular very fine pores, few fine, medium
	Cg	150-200	10YR 7/8 (yellow orange)	-	sc	wmsg	sssp		Few irregular very fine pores, very few very fine roots.
IHS-P2 07^0 1' 52.5"N, 06^0 44' 29.8"E Elevation= 25.5m	Apg	0 -26	5YR 3/1 (Brownish black)	-	scl	wmofmcrg	sssp sssp	cs	Many fine pores, many fine roots, few ants.
	Bwg1	26-46	7.5YR 5/6 (Bright brown)	-	scl	sfmcrsbk	sssp	gs	Many irregular fine pores, few fine roots
	Bwg2	46-86	10YR 4/6 (Brown)	2.5YR 4/6 (Reddish brown)	scl	mosmcosbk	sssp	gs	Few irregular very fine pores, very few very fine roots
	Bwg3	86-135	10YR 4/6 (Brown)	2.5YR 4/6	scl	mosmcosbk	sssp	ds	Few irregular very fine pores, very few very fine roots.

			(Reddish brown)				
Cg	135-200	10YR 6/4 (Dull yellow orange)	10YR 7/8 (Yellow orange)	scl	mosmcos bk	sssp	Few irregular very fine pores, few fine roots, few fine medium black Mn concretion

Structure: W=weak, mo=moderate, s=strong, f=fine, m=medium, co= coarse, cr=crumb, g=granular, sbk=sub angular blocky
Consistence: sssp = slightly sticky and slightly plastic
Boundary: c=clear, d=diffuse, g=gradual, s=smooth, w=wavy
Texture:, scl=sandy clay loam, sc = sandy clay

Table 4: Physical characteristics of Hydromorphic soils in ibaji Local Government Area of Kogi State, Nigeria

Profile location	Horizon depth (cm)	Practice Size Distribution (g/kg)			Textural class	Silt/clay ratio	Sand/silt ratio	Bulk density (g/cm^3)	Porosity (%)	Moisture content (%)
		Sand	Silt	Clay						
IHS-P1 $06^0$59'32.8''N, $06^0$44'14.6''E Elevation: 28.6m	0-21	752.4	45.6	202	SCL	0.23	16.50	1.35	49	5
	21-49	698	5.6	296.4	SCL	0.02	124.64	1.42	46	10
	49-84	742.4	5.6	252	SCL	0.02	132.57	1.46	45	6
	84-150	762.4	5.6	232	SCL	0.02	136.14	1.50	43	4
	150-200	808	5.6	186.4	SL	0.03	144.29	1.51	43	2
IHS-P2 $07^0$1'52.5''N, $06^0$44'29.8''E Elevation: 27m	0-26	722.4	65.6	212	SCL	0.31	11.01	1.20	55	2
	26-46	658	45.6	296.4	SCL	0.15	14.43	1.31	51	6
	46-86	658	35.6	306.4	SCL	0.12	18.48	1.44	46	4
	86-135	724	8.4	237.6	SCL	0.03	86.19	1.54	42	5
	135-200	734	8.4	257.6	SCL	0.03	87.38	1.55	42	5

Surface range	722.4-752.4	45.6-65.6	202-212		0.23-0.31	11.01-16.50	1.20-1.35	49-55	2-11
Surface mean	**737.4**	**55.6**	**207**	**SCL**	**0.28**	**11.17**	**1.25**	**53**	**6.0**
Subsurface range	492.4-808	5.6-45.6	186.4-306.4		0.02-0.15	4.26-144.29	1.31-1.55	42-54	2-14
Subsurface mean	**723.1**	**15.05**	**258.1**	**SCL**	**0.09**	**76.38**	**1.44**	**45.8**	**7.6**

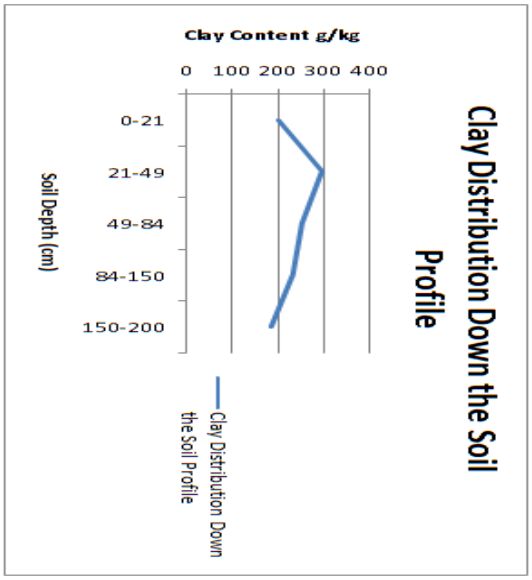

Figure 1. Clay Distribution in HIS-P1

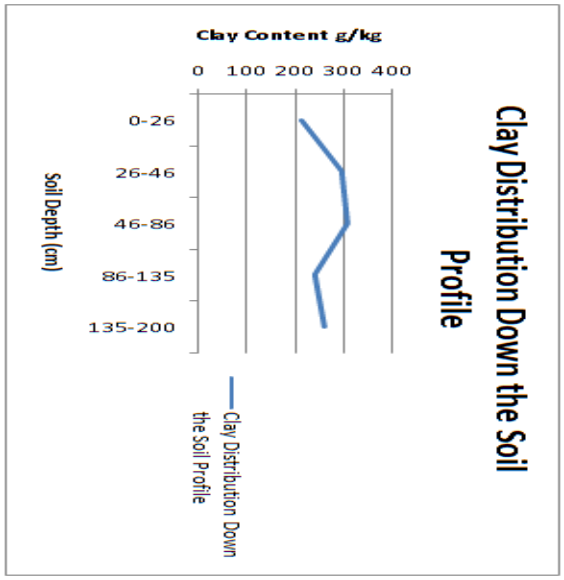

Figure 2. Clay Distribution in HIS-P2

The low silt/clay ration shows the state of soil weathering occurring in the soils. The mean bulk density of the soils is 1.25 and 1.44 g/cm^3 in the surface and subsurface soils, respectively. Figures 3 and 4 show the increase pattern of the soil bulk density down the soil profiles. The lower soil bulk density observed in the surface soil may have been as a result of the higher organic matter contents in the mineral soil surface.

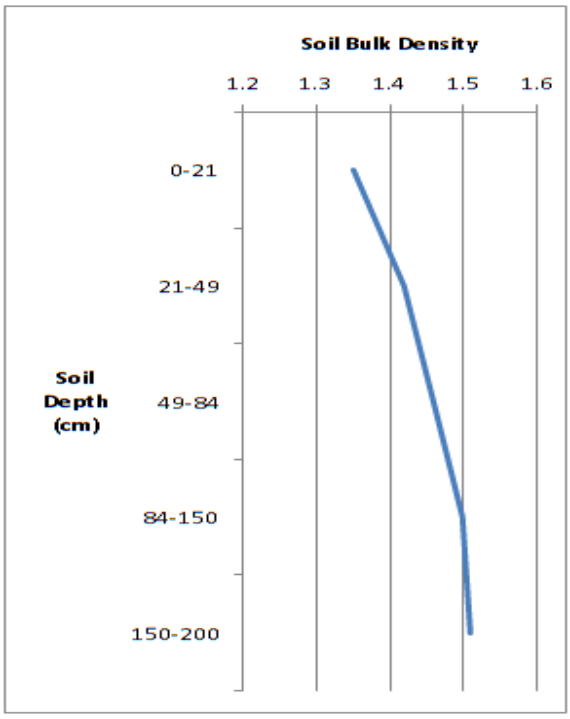

Figure 3. Bulk Density Distribution in HIS-P1

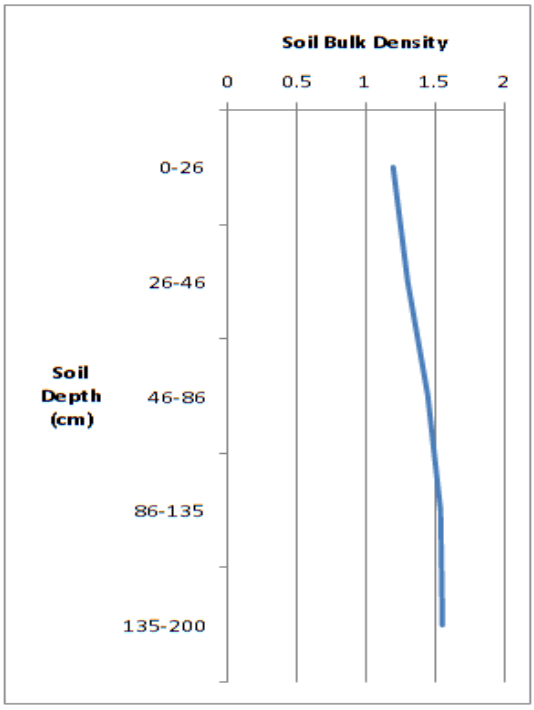

Figure 4. Bulk Density Distribution in HIS-P2

The soil porosity values followed the reverse trend of the bulk density values. The maximum value recorded was 55 % in HIS-P2. However, the values were higher in the surface soils than in the subsurface. This means that there will be averagely higher pore spaces in the surface soils due to the higher accumulation of organic carbon (Ukabiala, 2022). The soil moisture values are low which was due the time of sampling. The sampling was done during the dry season.

Chemical Characteristics of the Soils

The chemical properties of the studied soils are presented in Table 5. The mean value of the soil pH in water was 5.2 in the surface and subsurface soils. According to rating of Soil Survey Staff (1999), the soils are strongly acidic. This is in consonant with the moderate values of the exchangeable calcium, magnesium, potassium and sodium (Respective surface means: 4.78, 2.96, 2.50 and 0.58 cmol kg^{-1}). The mean values of organic carbon for the surface and subsurface soils are 16.3 and 4.9, respectively. The high content of organic matter in the surface soils could represent the surface accumulation of litter and subsequent accumulation of organic matter. The materials left on soil surface by the seasonal flooding have been reported to be rich in organic matter (Ukabiala, 2022). The distribution of organic matter agrees with the values obtained for soil organic carbon. The values of the total nitrogen are higher in the surface with mean value of 0.8 g/kg than in the subsurface (mean: 0.2). It was observed the total nitrogen irregularly decrease with depth in the two pedons studied. The low values of total nitrogen obtained signifies the loss of nitrogen from the soils through leaching and other un-identified sources.

The values obtained for available phosphorus were low to moderate (surface mean: 13.28 mg/kg; subsurface mean: 9.78 mg/kg). Low phosphorus values of the soils may be associated with the pH, as phosphorus tends to be tied up with sesquioxides and becomes unavailable in acid soils (Egboka *et al*. (2021). The values of the electrical conductivity in all the horizons was less than 0.1 dS/m, suggesting less likeliness of salinity. The values of the cation exchange capacity were low. The means value of the surface soils is 10.79 cmol kg^{-1}, while the subsurface is 8.81 cmol kg^{-1}. The low clay contents of the soils may have resulted to low concentrations of charges attracting cations. The range of values obtained for the exchangeable acidity reflects the nature of the soil pH. The high levels of base saturation (Mean: 88.0 -83.0%) is highly suitable for crop production.

Table 5: Chemical Characteristics of Hydromorphic Soils of Ibaji Local Government Areas of Kogi State, Nigeria

Profile location	Horizon depth (cm)	pH			Org. C (g/kg)	Org. M (g/kg)	Total N (g/kg)	C: N Ratio	EC (dS/m)	Avail P (mg/kg)
		KCl	H_2O	ΔpH						
IHS-P1 $06^0 59' 32.8'' N$, $06^0 44' 14.6'' E$ Elevation: 28.6m	0-21	3.9	5.4	-1.5	13.5	23.3	0.7	19	0.02	12.28
	21-49	4.6	5.1	-0.5	5.9	10.2	0.3	20	0.01	11.45
	49-84	4.5	5.2	-0.7	4.3	7.4	0.2	22	0.01	11.03
	84-150	4.2	4.8	-0.6	3.8	6.6	0.2	19	0.01	10.95
	150-200	4.6	5.1	-0.5	4.3	7.4	0.2	22	0.02	8.37
IHS-P2 $07^0 1' 52' 5'' N$, $06^0 44' 29.8'' E$ Elevation: 27m	0-26	4.4	5.0	-0.6	18.0	31.0	0.9	20	0.01	14.42
	26-46	4.4	5.0	-0.6	7.9	13.6	0.4	20	0.01	11.93
	46-86	4.5	4.9	-0.4	5.4	9.3	0.3	18	0.01	9.84
	86-135	4.9	5.5	-0.6	6.1	0.5	0.3	20	0.01	8.22
	135-200	4.4	5.0	-0.6	3.8	6.6	0.2	19	0.01	7.76
Surface range		**3.8-4.4**	**5.0-5.4**	**-0.6- -1.5**	**13.5-18.0**	**23.3-31.0**	**0.7-0.9**	**19-20**	**0.01-0.22**	**12.28-14.42**
Surface mean		**4.0**	**5.2**	**-0.9**	**16.3**	**28.0**	**0.8**	**19**	**0.08**	**13.28**
Subsurface range		**3.6-7.3**	**4.2-7.9**	**-0.4- -0.7**	**0.9-8.5**	**1.6-14.7**	**0.05-0.4**	**18-23**	**0.01-0.29**	**7.14-0.03**
Subsurface mean		**4.6**	**5.2**	**-0.6**	**4.9**	**8.5**	**0.2**	**20**	**0.05**	**9.78**

Org.. C = Organic carbon, Org. M = Organic Matter. Total N= Total Nitrogen, EC = Electrical Conductivity, Avail P = Available Phosphorus

Table 5 continued

Profile location	Horizon depth (cm)	Exchangeable bases cmol(+)kg^{-1}				Exchangeable acidity cmolkg^{-1}	CEC cmolkg^{-1}	ECEC cmolkg^{-1}	PBS %
		Ca	Mg	K	Na	($H^+ + Al^{3+}$)			
IHS-P1 06^{0}59'32.8"N, 06^{0}44'14.6"E Elevation: 28.6m	0-21	4.39	2.77	2.31	0.76	1.43	10.23	11.66	88.0
	21-49	4.07	2.38	2.01	0.58	1.55	9.04	10.59	85.0
	49-84	3.84	2.23	1.80	0.64	1.68	8.51	10.19	84.0
	84-150	3.51	1.96	1.54	0.57	1.76	7.58	9.34	81.0
	150-200	3.64	1.87	1.56	0.69	1.84	7.76	9.60	80.0
IHS-P2 07^{0}1'52.5"N, 06^{0}44'29.8"E Elevation: 27m	0-26	4.77	3.26	2.81	0.54	1.62	11.38	13.00	88.0
	26-46	4.48	2.88	2.46	0.82	1.74	10.64	12.38	86.0
	46-86	4.17	2.54	2.06	0.79	1.86	9.56	11.42	84.0
	86-135	4.20	2.63	2.19	0.52	1.89	9.54	11.43	83.0
	135-200	3.94	2.35	1.81	0.45	1.94	8.55	10.49	82.0
Surface range		**4.39-4.11**	**2.77-3.26**	**2.31-2.81**	**0.45-0.76**	**1.33-1.62**	**10.23-11.38**	**11.66-13.00**	**88.0-89.0**
Surface mean		**4.78**	**2.96**	**2.50**	**0.58**	**1.46**	**10.79**	**12.26**	**88.0**
Subsurface range		**3.51-4.48**	**1.87-2.88**	**1.54-2.46**	**0.45-0.87**	**1.55-1.94**	**7.58-10.64**	**9.34-12.38**	**80.0-86.0**
Subsurface mean		**3.98**	**2.29**	**1.87**	**0.67**	**1.77**	**8.81**	**10.58**	**83.0**

Ca = Calcium, Mg = Magnesium, K = Potassium, Na = Sodium, CEC = Cation Exchange Capacity, ECEC = Effective Cation Exchange Capacity, PBS = Percentage Base Saturation, H = Hydrogen, Al = Aluminium

Classification of Hydromorphic Soils in Ibaji area of Kogi State

The soils are slightly developed. They have available water for plants in more than three months during the warm period. The soils occur in humid region with minimal development. Thus, these soils, HIS-P1 and HIS-P2 are broadly classified as *Inceptisols* at the order level of USDA, having also minimal developed ochric epipedon.

HIS-P1 had no recognized sign of redox depletions. This means that they are freely drained, having the texture of sandy clay loam. However, since they are put to use by the native for crop production, they are classified as as *Udepts* at the Suborder level of USDA Soil Taxonomy. Following the free draining nature of IHP-P1, with high base status (> 60 %) in horizons at depth between 25 and 75 cm from the mineral soil surface, they are placed as *Eutrudepts* at the Great Group level, having also no fragipan or duripan with its upper boundary within 100 cm of the mineral soil surface. At the Subgroup level of USDA Soil Taxonomy, this pedon qualified as *Dystric Eutrudepts* considering the low soil pH that will not guarantee more than 40 % free carbonates.

The HIS-P2 pedon has natural poor drainage, with brownish black soil surface horizon and reddish brown (2.5YR 4/6) redox concentrations that was observed from 46 cm (Table 3) from the mineral soil surface. This is an indication or evidence of ground water fluctuations This pedon is therefore also classified as *Inceptisols* at the order level of the USDA. Due to the groundwater fluctuations, this pedon is placed as *Aquepts* at the suborder level. This pedon had no horizon within 100 cm of the mineral soil surface in which plinthite or any other cemented or indurated diagnostic horizon formed. Therefore, it is taken to the great group of *Endoaquepts*. This pedon is classified as *Dystric Endoaquepts* due to low pH within 100 cm soil depth. The FAO-WRB equivalence of this pedon is *Dystric Gleysols*.

Table 6: Summary of the classification of Hydromorphic Soils in Ibaji area of Kogi State

Soil unit	Oder	Suborder	Great group	Subgroup	FAO/UNESCO Equivalent
IHP-P1	*Inceptisols*	*Ustrepts*	*Eutrudepts*	*Dystric Eutrudepts*	*Eutric fluvisols*
IHP-P2	*Inceptisols*	*Aquepts*	*Endoaquepts*	*Dystric Endoaquepts*	*Dystric Gleysols*

Suitability Evaluation of Hydromorphic Soils in Ibaji area of Kogi State

The rating of the land qualities and the average suitability scores of IHP-P1 and IHP-P2 are presented in Table 7. The result revealed that both IHP-P1 and IHP-P2 are moderately suitable for garden egg production. IHP-P1 scored average of 73 while IHP-P2 had average score of 67. The lower average score for IHP-P2 was caused by a major limiting factor (fluctuation of water table to a shallow depth). This was manifested by the appearance of mottles (Table 3) at around 40 cm depth to the mineral soil surface. The implication of this is that poor drainage can negatively affect the development and the activities of the roots of the plants, which will result to poor yield or low yield. Other limiting factors in the soils include soil pH and total nitrogen. Soil pH was lower in IHP-P2. The roots of the crop will not thrive in acidic soil. Most times, the farmers in the area involve in bush

burning. This can lead to volatility and loss of nitrogen from the soil. The low nitrogen may also be attributed to leaching due to high rainfall in the area, and removal by fallow plants.

Table 7: Suitability Evaluation of Hydromorphic Soils in Ibaji area of Kogi State

Land qualities/units	IHP-P1	IHP-P2
Climate (c):		
Annual rainfall (mm)	90	90
Mean annual temperature (°C)	95	95
Relative humidity (%)	80	80
Topography (t)		
Slope (%)	70	70
Wetness (w):		
Drainage	80	30
Soil physical properties (s):		
Texture	80	70
Depth (cm)	100	30
Fertility (f):		
CEC ($cmol_c\ kg^{-1}$)	80	80
Base saturation (%)	70	90
Organic carbon ($g\ kg^{-1}$)	60	80
pH (H_20)	60	30
Total N ($g\ kg^{-1}$)	50	60
Available P ($mg\ kg^{-1}$)	70	70
Exchangeable Ca ($cmol_c\ kg^{-1}$)	60	70
Exchangeable Mg ($cmol_c\ kg^{-1}$)	60	60
Exchangeable K ($cmol_c\ kg^{-1}$)	60	60
AGGREGATE SUITABILITY	**73(S_2)**	**67(S_2)**

Conclusion

The hydromophic soils of Ibaji area of kogi state was characterized, classified and evaluated for garden egg production. Hydromorphic soils are soils with high potential for agriculture. This study revealed that the soils have high fertility index due to the percentage saturation which recorded above 80 percent in both soils. The soils are Inceptisols because of evidences that they are beginning to develop. The IHP-P1 and IHP-P2 are moderately suitable for the successful growing of rain-fed garden egg.

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Harnessing Python, R, and MATLAB for Advanced Business Data Analytics and Machine Learning

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Abstract
Strategic business decisions in highly successful companies are increasingly driven by robust data analysis. The ability to extract meaningful insights from data is a sought-after skill across all industries, making data analytics one of today's fastest-growing professions. Data analytics goes beyond basic reports and statistical analysis; it requires a blend of technical proficiency and analytical acumen to derive actionable business solutions. Data analytics involves scrutinizing data to gain insights, draw conclusions, and inform decisions. In the realm of big data—characterized by its vast volume, rapid velocity, and diverse variety—this field becomes even more critical. Descriptive analytics aims to interpret data, providing insights and understanding. Predictive analytics focuses on forecasting future trends from existing data, while prescriptive analytics offers decision-making guidance based on these predictions. Data mining, a predictive analytical approach, involves examining data from multiple perspectives to convert it into actionable information, thereby enhancing productivity, increasing revenue, and reducing costs. This paper aims to highlight the importance and growing need for using Python, R, and MATLAB in Business Intelligence applications. It also explores selected.

Artificial Intelligence (AI) and machine learning algorithms, reviewing widely used methods in supervised and unsupervised machine learning. Additionally, it addresses key issues students may encounter and offers solutions to optimize the accuracy and validity of the train and test methodology.

Data mining leverages machine learning and statistical methods to discover patterns in large datasets, aiding decision-making. Machine learning, a subset of AI, enables computers to learn from data without explicit programming. Unlike classical statistics, machine learning relies on extensive iterative computation, though it incorporates statistical models and tools.

Developing a data warehouse necessitates a clear understanding of business needs and functions, determining the necessary data (internal and external) without excess. This requires careful planning. AI demonstrates machine intelligence, while machine learning equips computers with the capability to learn and make human-like decisions. Data science involves exploring and quantitatively analyzing structured and unstructured data to extract knowledge and develop actionable insights.
Time series analysis is essential for non-stationary data—data that fluctuates over time, such as in finance, retail, and economics. It is particularly useful in stock market analysis and weather forecasting, helping predict everything from daily weather to long-term climate change.

The machine learning process comprises three main steps: data cleansing, feature extraction and optimization, and train/test system modeling. Model evaluation is based on error statistics in predicted values. Evaluating models can be challenging due to the absence of labeled testing data. In Python, Principal Component Analysis (PCA) is used to evaluate clustering methods. Scikit-learn, a Python library, facilitates the implementation of various machine learning algorithms, including classification, regression, clustering, and decision trees. With Scikit-learn, machine learning implementation becomes straightforward by simply providing the appropriate data to train the model.

This paper underscores the significance of integrating data analytics, machine learning, and AI into business intelligence, advocating for the proficient use of Python, R, and MATLAB to achieve optimal business outcomes.

Background

The past decade has brought tremendous advances in an exciting dimension of business analytics, AI, deep learning and machine learning. This technique for taking data inputs and turning them into predictions has enabled technology (tech) giants such as Amazon, Apple, Facebook, and Google to dramatically improve their products. It has also spurred start-ups to launch new products and platforms, sometimes even in competition with Big Tech (Mishra, 2019).
Data mining is the process of discovering patterns in large data sets using methods from machine learning and statistics to inform decision-making. For example, a credit card company's software examines one million fraudulent charges and detects the common pattern of small charges at gas stations. The use of data mining in business has grown rapidly due to the proliferation of data produced by email, customer transaction and web browsing logs, smartphones, and electronic sensors, coupled with the increases in affordability and availability of storage and computing power to store and analyze these data.
The paper will start with an introduction, followed with justifications of different methodologies such as Matlab and R. Iris flower dataset or Fischer’s Iris Data set among the other data sets will be used for demonstrations. The data set consists of 50 samples from each of three species of Iris (Iris setosa, Iris virginica, Iris versicolor). Four features are measured from each sample: the length and the width of the sepals and petals, in centimeters. This data sets consists of 3 different types of irises’ petal and sepal length, stored in a 150 x 4 numpy.ndarray. The rows being the samples and the columns being: Sepal Length, Sepal Width, Petal Length and Petal Width.
There are a number of software products that are add-ins to Matlab Machine Learning Toolbox that let you perform supervised machine learning. These are explained as well in Appendix A.

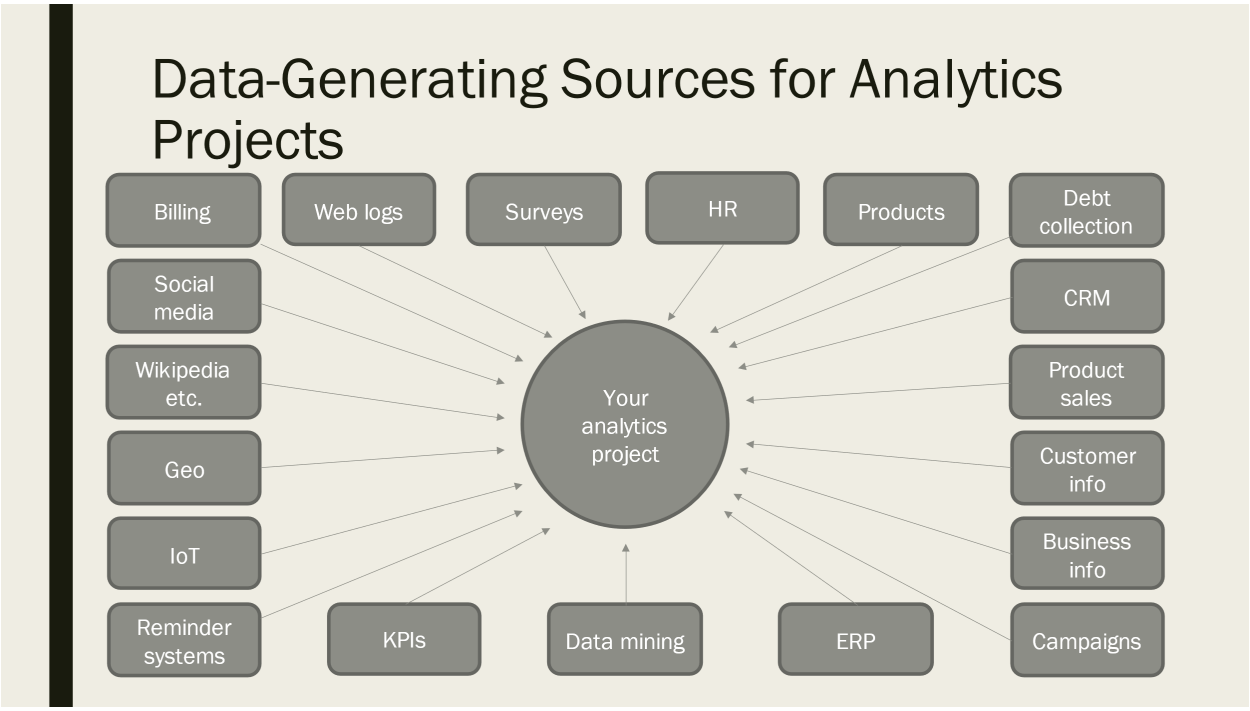

Figure 1. Data Generating Sources for Analytics Projects

Introduction

Data mining is the process of using software tools and models to summarize large amounts of data in a way that supports decision making. There are two classes of data mining methods that are used to summarize the available data. The two classes are grouping methods and predictive modeling methods. Grouping methods are used to group products and services. One of the common grouping methods is known as association rules. These rules come from machine learning and examine the co-occurrence of different objects, such as tuna and beer on the same shopping trip, and then from there they are formed into a set of rules that describe the relationships among objects in a database. Another type of grouping method used to group customers is known as cluster analysis. This analysis was developed in statistics. The most common of these is known as k-means, which finds the best division of the data in k partitions, and the number of k partitions is decided by the analyst. There are several different methods used in predictive modeling for data mining. One of these is known as linear and logistic regression. Both of these methods use a weighted sum of an analyst-specified set of predictor variables to come up with a predicted value. The advantage to using this model is that the implied customer behavior underlying a model can be more easily seen, so it is easier for a manager to interpret and learn. Decision tree is the other model that can be used in predictive modeling. Every scenario used in this model is based on if-then rules that lead to a set of final values for the predicted variable. Artificial neural networks are based on the brain's neurological structures. Neural networks are less dependent on the skill of the analyst to develop a good model. Secondly, they are flexible based on the relationships that they can mimic. Thirdly, neural networks are very hard to interpret. Finally, the goal is to predict a variable of interest.

Business Intelligence (BI) uses technologies and practices to collect, integrate, analyze, and present business information, aiding decision-making. The key functions are as follows:

Pattern Recognition: Identifies trends and predicts future occurrences.

Classification: Assigns items to categories (e.g., customer segmentation).

Association: Finds relationships between variables (e.g., products bought together).

Clustering: Groups similar data items (e.g., customer behavior).

Anomaly Detection: Identifies outliers (e.g., fraud detection).

Regression: Predicts numeric values (e.g., sales forecasting).

Sequential Patterns: Finds common sequences of events.

Salient Business Intelligence Applications are listed as follows:

CRM: Understands customer behavior and tailors marketing.

Sales and Marketing: Identifies opportunities and optimizes strategies.
Risk Management: Detects fraud and assesses risks.
Operations and Supply Chain: Optimizes inventory and predicts equipment failures.
Financial Analysis: Forecasts trends and manages investments.
Healthcare: Predicts disease outbreaks and optimizes treatment plans.
Machine learning is an outgrowth of data mining with computers doing the data processing that facilitates learning information from data. Sometimes a computer will identify a relationship or trend that a person may not have considered, thus machine learning can help improve business strategy and results. Machine learning can facilitate artificial intelligence that can be used in just about any industry or business.
how you define a problem depends on the application. For different people with their peculiar background, Java, Matlab, R, and Python may end up being 'best' for that application (Shakib & Muqri, 2010).
The key to good decision making is to understand data and interpret what the data means. When we chart data, we can see trends as well as outliers. By visually looking at a data set, we can determine the meaning of data and apply it to a decision-making process. An additional benefit is that a chart is effective in communicating what data looks like visually. This is especially important for managers and other users who may not have a full understanding of how analytics work. Charts help translate the data into information that is readable, reusable, and reliable. They can help lead to good decision-making activities as long as the data is cleansed, of course.
Some experts have reported that the premise of Matlab is numerical computing. Depending on the application, say, if one just wants to numerically compute eigenvalues, inverses, or numerically solve differential equations then probably Python is the way to go, because one can easily learn Python and make use of libraries like Numpy, SciPy, and Scikit rich numerical computing tools and abundant community support and best of all it is free (Muqri & Chang, 2015).
Machine learning (ML) process may be divided into three main steps: data cleansing, feature extraction and optimization, and train/test system modeling. Models are evaluated based on statistics about the errors, or residuals, in the predicted values. Evaluating models is challenging since there is no testing data with labels to determine the correctness. In Python, Principal Component Analysis (PCA) is used to evaluate clustering methods. Scikit-learn is a Python library that implements the various types of machine learning algorithms, such as classification, regression, clustering, decision tree, and more. Using Scikit-learn, implementing machine learning is now simply a matter of supplying the appropriate data to a function so that you can fit and train the model. The steps in machine learning are depicted below in Figure 2.

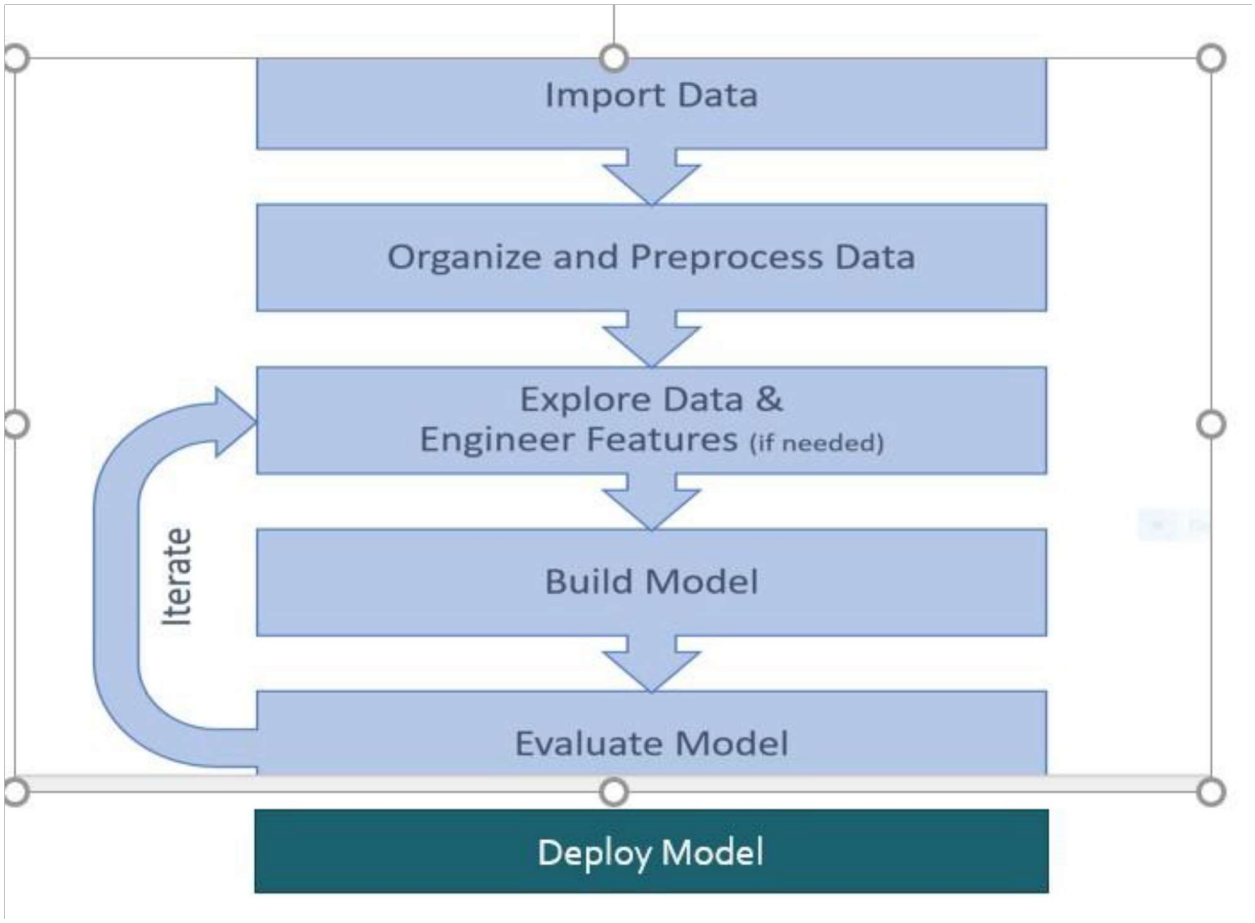

Figure 2. Machine Learning Workflow

Machine Learning Algorithms help computer system learn without being explicitly programmed. These algorithms are categorized into supervised or unsupervised. Let us now see a few selected algorithms:

Unsupervised machine learning algorithms:
The unsupervised leaning problems can be divided into the following two kinds of problems: Clustering and Dimensionality reduction.
Clustering: Take a collection of 1,000,000 different genes and find a way to automatically group these genes into groups that are somehow similar or related by different variables, such as lifespan, location, roles, and so on (UCI, Center for Machine Learning and Intelligent Systems, 2022).

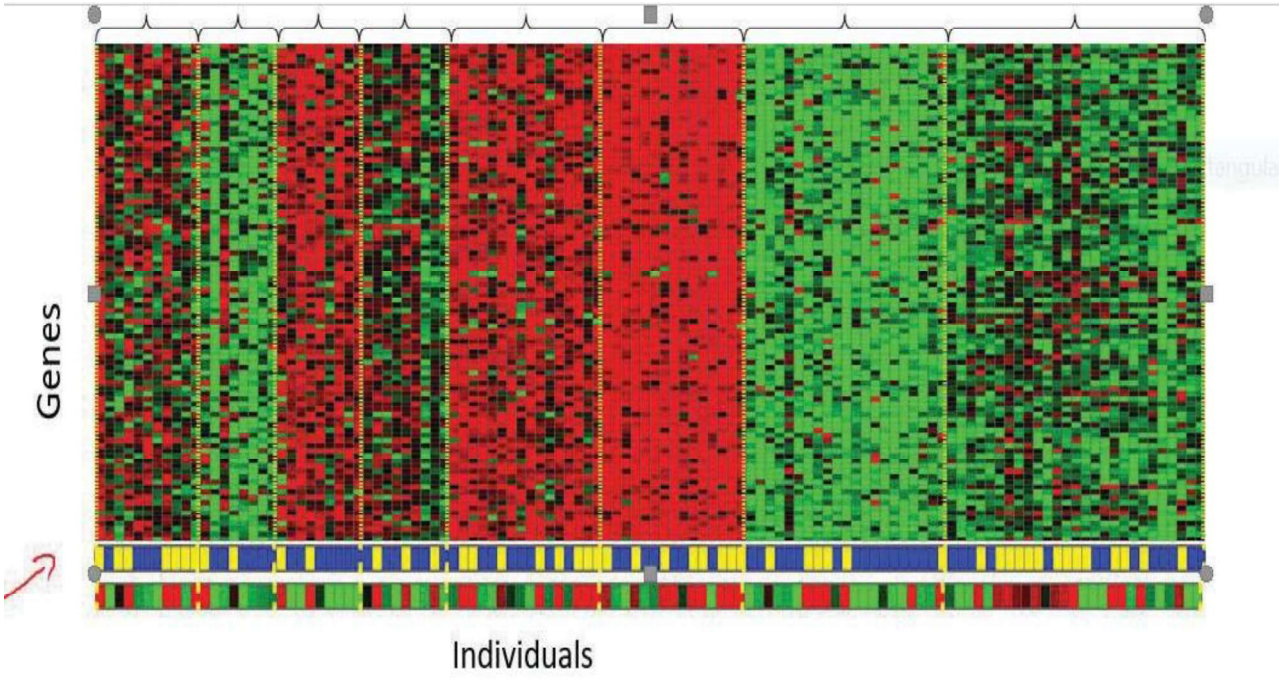

Figure 3. Unsupervised Machine learning, Gene analysis

Dimensionality Reduction:

Dimensionality reduction in unsupervised machine learning refers to the process of reducing the number of input variables or features in a dataset while preserving important information. It aims to simplify the data by transforming high-dimensional data into a lower-dimensional space. Techniques like Principal Component Analysis (PCA), t-distributed Stochastic Neighbor Embedding (t-SNE), and Autoencoders are commonly used for dimensionality reduction. This process helps in visualizing data, speeding up computation, and improving the performance of machine learning algorithms by reducing noise and redundancy in the data.

The paper will conclude by providing students with five different lab experiments to practice on using R, Python and Matlab. The paper ends by providing student feedback. The paper includes an appendix demonstrating various Machine Learning Algorithms.

Moving Average Forecasting

Let us begin with moving average forecasting, a popular technique in stock market analysis where historical price data is averaged over a specified time period to identify trends. It smooths out short-term fluctuations and helps analysts discern underlying patterns in stock prices. By calculating moving averages of different durations (e.g., 50-day, 200-day), analysts can determine potential buy or sell signals based on the relationship between short-term and long-term averages.

In the context of stock market analysis via moving averages, the smoothing parameter alpha typically refers to the weighting factor used in exponential moving averages (EMA). In the programs which follows, Time represents the time periods (e.g., days, months). We will use three sets of forecasts (f.es1, f.es2, f.es3) initialized for three different smoothing parameters (alpha = 0.1, 0.2, 0.3). For each alpha, the forecast for the next period is calculated as a weighted average of the previous actual value and the previous forecasted value. Three error metrics will be reported:

MAE: Mean Absolute Error (the average of absolute errors),

MSE: Mean Squared Error (the average of squared errors),

MAPE: Mean Absolute Percentage Error (the average of absolute percentage errors).

The actual stock prices are plotted, and the forecasted values for each alpha are added to the plot with different colors.

The following section will include different R, and Python activities for students to explore and investigate Machine Learning libraries (Wei-Ming, 2019). The equivalent Matlab versions will also be presented for comparison purposes.

Student Activity I

Using R Language.

Given below is a R language program to perform moving average forecasting for stock market analysis. The program will simulate stock prices and use exponential smoothing for forecasting, which is a common technique in time series analysis and automated trading algorithms.

```
# Simulate stock prices (Period and Expense renamed to Time and StockPrice for clarity)
Time <- 1:10
StockPrice <- c(516, 288, 406, 463, 332, 401, 436, 319, 365, 505)
n <- length(StockPrice)

# Exponential Smoothing with alpha = 0.1
f.es1 <- vector()
alpha <- 0.1
f.es1[2] <- StockPrice[1]
for (i in 3:n) f.es1[i] <- alpha * StockPrice[i-1] + (1 - alpha) * f.es1[i-1]
e.es1 <- StockPrice - f.es1

# Calculate Mean Absolute Error (MAE)
mae1 <- mean(abs(e.es1), na.rm = TRUE)
cat("MAE with alpha = 0.1: ", mae1, "\n")

# Calculate Mean Squared Error (MSE)
mse1 <- mean(e.es1^2, na.rm = TRUE)
cat("MSE with alpha = 0.1: ", mse1, "\n")

# Calculate Mean Absolute Percentage Error (MAPE)
mape1 <- mean(abs(100 * e.es1 / StockPrice), na.rm = TRUE)
cat("MAPE with alpha = 0.1: ", mape1, "\n")

# Exponential Smoothing with alpha = 0.2
f.es2 <- vector()
alpha <- 0.2
f.es2[2] <- StockPrice[1]
for (i in 3:n) f.es2[i] <- alpha * StockPrice[i-1] + (1 - alpha) * f.es2[i-1]
e.es2 <- StockPrice - f.es2

# Calculate MAE, MSE, MAPE for alpha = 0.2
mae2 <- mean(abs(e.es2), na.rm = TRUE)
cat("MAE with alpha = 0.2: ", mae2, "\n")

mse2 <- mean(e.es2^2, na.rm = TRUE)
cat("MSE with alpha = 0.2: ", mse2, "\n")

mape2 <- mean(abs(100 * e.es2 / StockPrice), na.rm = TRUE)
cat("MAPE with alpha = 0.2: ", mape2, "\n")

# Exponential Smoothing with alpha = 0.3
f.es3 <- vector()
alpha <- 0.3
f.es3[2] <- StockPrice[1]
for (i in 3:n) f.es3[i] <- alpha * StockPrice[i-1] + (1 - alpha) * f.es3[i-1]
e.es3 <- StockPrice - f.es3

# Calculate MAE, MSE, MAPE for alpha = 0.3
```

```
mae3 <- mean(abs(e.es3), na.rm = TRUE)
cat("MAE with alpha = 0.3: ", mae3, "\n")

mse3 <- mean(e.es3^2, na.rm = TRUE)
cat("MSE with alpha = 0.3: ", mse3, "\n")

mape3 <- mean(abs(100 * e.es3 / StockPrice), na.rm = TRUE)
cat("MAPE with alpha = 0.3: ", mape3, "\n")

# Plotting the stock prices and the forecasted values
plot(Time, StockPrice, ylim = c(200, max(StockPrice)), type = "o", pch = 16,
     ylab = "Stock Price", xlab = "Time", main = "Stock Price Forecasting")
lines(Time, f.es1, type = "o", pch = 16, col = "blue", lty = 2)
lines(Time, f.es2, type = "o", pch = 16, col = "green", lty = 2)
lines(Time, f.es3, type = "o", pch = 16, col = "red", lty = 2)
legend("topright", legend = c("Actual", "Forecast (alpha = 0.1)", "Forecast (alpha = 0.2)", "Forecast
(alpha = 0.3)"),
       col = c("black", "blue", "green", "red"), pch = 16, lty = 2)
```

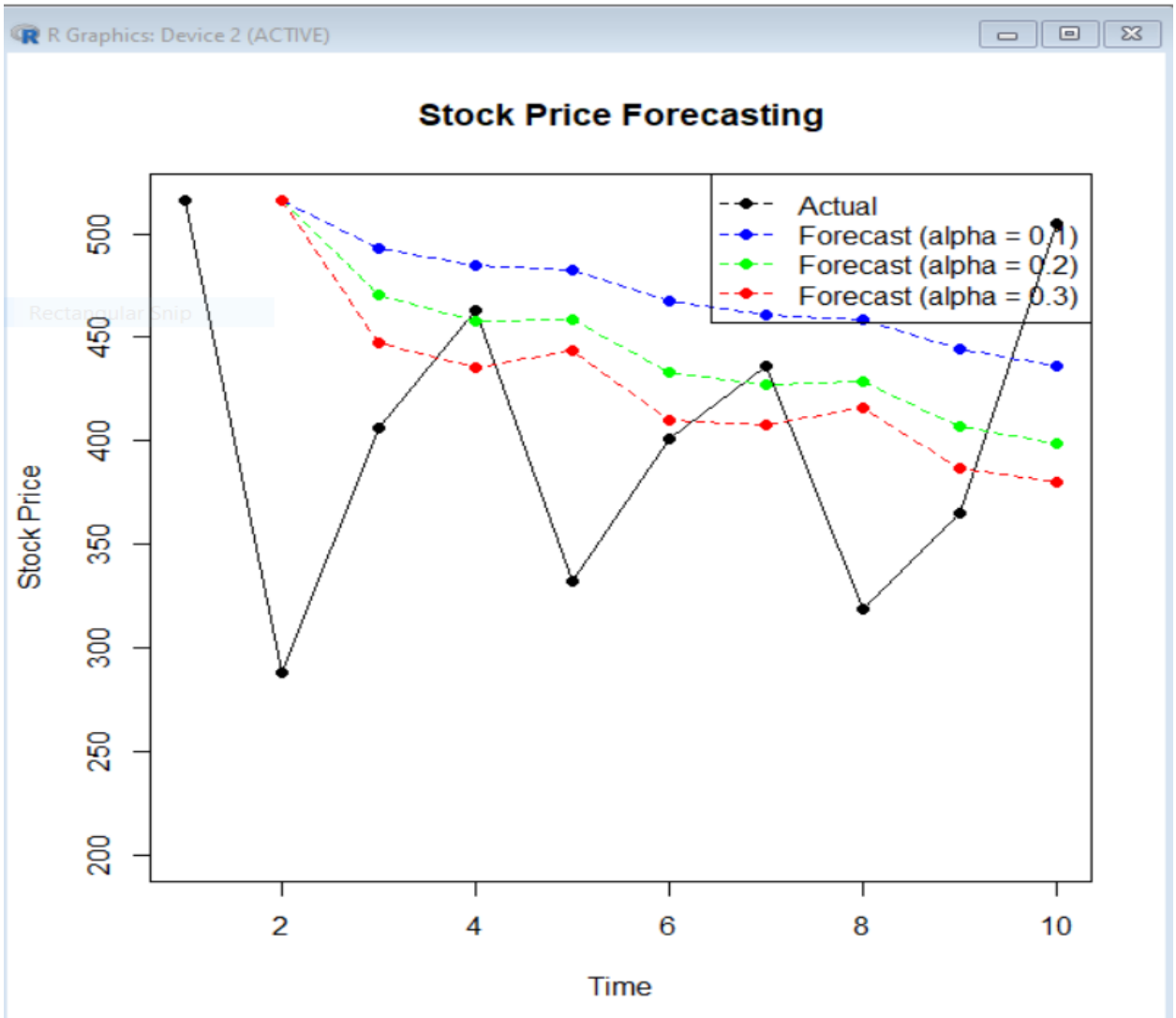

Figure 4. Stock Price Forecasting Output with Exponential Smoothing model using R

Using Python

Let us explore the Python code that uses Exponential Smoothing to forecast stock prices and evaluate the accuracy of different smoothing parameters.
The code performs the following steps:
Simulates stock prices over time.
Converts the data into a pandas DataFrame.
Applies Exponential Smoothing with three different smoothing levels (alpha = 0.1, 0.2, and 0.3).
Calculates and prints Mean Absolute Error (MAE), Mean Squared Error (MSE), and Mean Absolute Percentage Error (MAPE) for each smoothing level.

Type the following Python code and then click the **Run** button to explore Time series forecasting in Python, providing a basis for analyzing and predicting stock prices using automated trading algorithms.

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.holtwinters import ExponentialSmoothing

# Simulate stock prices (Time and StockPrice)
Time = np.arange(1, 11)
StockPrice = np.array([516, 288, 406, 463, 332, 401, 436, 319, 365, 505])

# Convert to a pandas DataFrame
data = pd.DataFrame({'Time': Time, 'StockPrice': StockPrice})

# Exponential Smoothing with alpha = 0.1
model1 = ExponentialSmoothing(data['StockPrice'], trend=None, seasonal=None,
initialization_method='estimated')
fit1 = model1.fit(smoothing_level=0.1)
f_es1 = fit1.fittedvalues
e_es1 = data['StockPrice'] - f_es1

# Calculate MAE
mae1 = np.mean(np.abs(e_es1))
print("MAE with alpha = 0.1: ", mae1)

# Calculate MSE
mse1 = np.mean(e_es1**2)
print("MSE with alpha = 0.1: ", mse1)

# Calculate MAPE
mape1 = np.mean(np.abs(100 * e_es1 / data['StockPrice']))
print("MAPE with alpha = 0.1: ", mape1)

# Exponential Smoothing with alpha = 0.2
model2 = ExponentialSmoothing(data['StockPrice'], trend=None, seasonal=None,
initialization_method='estimated')
fit2 = model2.fit(smoothing_level=0.2)
f_es2 = fit2.fittedvalues
e_es2 = data['StockPrice'] - f_es2

# Calculate MAE, MSE, MAPE for alpha = 0.2
mae2 = np.mean(np.abs(e_es2))
```

```
print("MAE with alpha = 0.2: ", mae2)

mse2 = np.mean(e_es2**2)
print("MSE with alpha = 0.2: ", mse2)

mape2 = np.mean(np.abs(100 * e_es2 / data['StockPrice']))
print("MAPE with alpha = 0.2: ", mape2)

# Exponential Smoothing with alpha = 0.3
model3 = ExponentialSmoothing(data['StockPrice'], trend=None, seasonal=None,
initialization_method='estimated')
fit3 = model3.fit(smoothing_level=0.3)
f_es3 = fit3.fittedvalues
e_es3 = data['StockPrice'] - f_es3

# Calculate MAE, MSE, MAPE for alpha = 0.3
mae3 = np.mean(np.abs(e_es3))
print("MAE with alpha = 0.3: ", mae3)

mse3 = np.mean(e_es3**2)
print("MSE with alpha = 0.3: ", mse3)

mape3 = np.mean(np.abs(100 * e_es3 / data['StockPrice']))
print("MAPE with alpha = 0.3: ", mape3)

# Plotting the stock prices and the forecasted values
plt.plot(data['Time'], data['StockPrice'], marker='o', label='Actual Stock Price')
plt.plot(data['Time'], f_es1, marker='o', linestyle='--', label='Forecast (alpha=0.1)')
plt.plot(data['Time'], f_es2, marker='o', linestyle='--', label='Forecast (alpha=0.2)')
plt.plot(data['Time'], f_es3, marker='o', linestyle='--', label='Forecast (alpha=0.3)')
plt.xlabel('Time')
plt.ylabel('Stock Price')
plt.title('Stock Price Forecasting')
plt.legend()
plt.show()
```

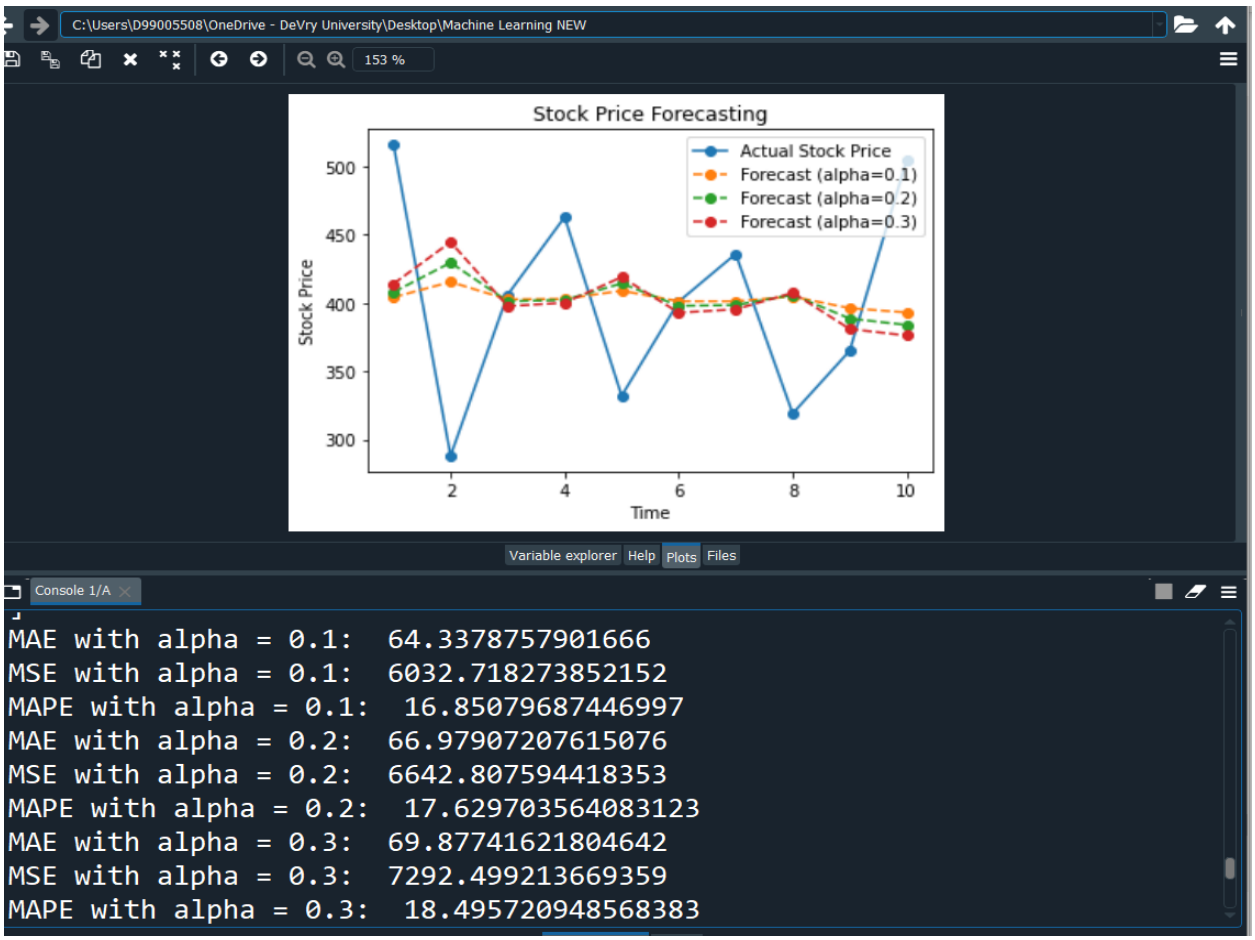

Figure 5. Stock Price Forecasting Output with Exponential Smoothing model (statsmodels) using Python.

Using Matlab

This Matlab code provides a straightforward comparison of exponential smoothing with different alpha values for stock price forecasting.

```
% Simulate stock prices (Time and StockPrice)
Time = 1:10;
StockPrice = [516, 288, 406, 463, 332, 401, 436, 319, 365, 505];

% Exponential Smoothing with alpha = 0.1
alpha1 = 0.1;
f_es1 = zeros(size(StockPrice));
f_es1(1) = StockPrice(1); % Initial value
for i = 2:length(StockPrice)
    f_es1(i) = alpha1 * StockPrice(i-1) + (1 - alpha1) * f_es1(i-1);
end
e_es1 = StockPrice - f_es1;

% Calculate MAE
mae1 = mean(abs(e_es1));
fprintf('MAE with alpha = 0.1: %.2f\n', mae1);

% Calculate MSE
mse1 = mean(e_es1.^2);
fprintf('MSE with alpha = 0.1: %.2f\n', mse1);

% Calculate MAPE
```

```
mape1 = mean(abs(100 * e_es1 ./ StockPrice));
fprintf('MAPE with alpha = 0.1: %.2f\n', mape1);

% Exponential Smoothing with alpha = 0.2
alpha2 = 0.2;
f_es2 = zeros(size(StockPrice));
f_es2(1) = StockPrice(1); % Initial value
for i = 2:length(StockPrice)
    f_es2(i) = alpha2 * StockPrice(i-1) + (1 - alpha2) * f_es2(i-1);
end
e_es2 = StockPrice - f_es2;

% Calculate MAE, MSE, MAPE for alpha = 0.2
mae2 = mean(abs(e_es2));
fprintf('MAE with alpha = 0.2: %.2f\n', mae2);

mse2 = mean(e_es2.^2);
fprintf('MSE with alpha = 0.2: %.2f\n', mse2);

mape2 = mean(abs(100 * e_es2 ./ StockPrice));
fprintf('MAPE with alpha = 0.2: %.2f\n', mape2);

% Exponential Smoothing with alpha = 0.3
alpha3 = 0.3;
f_es3 = zeros(size(StockPrice));
f_es3(1) = StockPrice(1); % Initial value
for i = 2:length(StockPrice)
    f_es3(i) = alpha3 * StockPrice(i-1) + (1 - alpha3) * f_es3(i-1);
end
e_es3 = StockPrice - f_es3;

% Calculate MAE, MSE, MAPE for alpha = 0.3
mae3 = mean(abs(e_es3));
fprintf('MAE with alpha = 0.3: %.2f\n', mae3);

mse3 = mean(e_es3.^2);
fprintf('MSE with alpha = 0.3: %.2f\n', mse3);

mape3 = mean(abs(100 * e_es3 ./ StockPrice));
fprintf('MAPE with alpha = 0.3: %.2f\n', mape3);

% Plotting the stock prices and the forecasted values
figure;
plot(Time, StockPrice, 'o-', 'DisplayName', 'Actual Stock Price');
hold on;
plot(Time, f_es1, 'o--', 'DisplayName', 'Forecast (alpha=0.1)');
plot(Time, f_es2, 'o--', 'DisplayName', 'Forecast (alpha=0.2)');
plot(Time, f_es3, 'o--', 'DisplayName', 'Forecast (alpha=0.3)');
xlabel('Time');
ylabel('Stock Price');
title('Stock Price Forecasting');
legend('show');
```

```
grid on;
hold off;
```

```
MAE with alpha = 0.1: 81.11
MSE with alpha = 0.1: 10299.30
MAPE with alpha = 0.1: 22.14
MAE with alpha = 0.2: 79.63
MSE with alpha = 0.2: 10308.12
MAPE with alpha = 0.2: 22.13
MAE with alpha = 0.3: 78.67
MSE with alpha = 0.3: 10290.63
MAPE with alpha = 0.3: 22.00
```

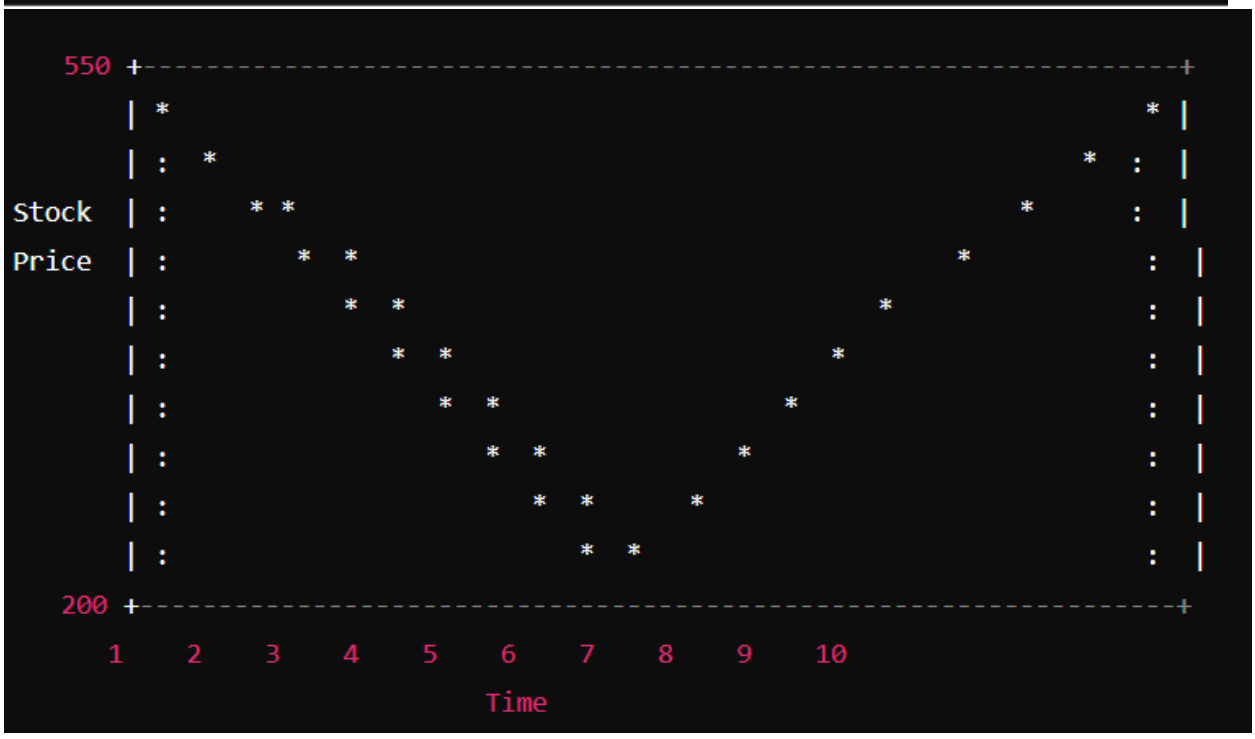

Figure 6. Command window output with MatLab Stock Prices Forecasting Program

Decision Trees Algorithms

Decision trees are powerful algorithms for data mining and machine learning that recursively split data into subsets based on the most significant attributes. In R and Python's Scikit-learn library, decision trees are implemented with functions that facilitate model training, evaluation, and visualization. They are versatile for both classification and regression tasks, leveraging tree structures to hierarchically partition data until reaching leaf nodes, which provide predictions or classifications. Decision trees are interpretable, intuitive, and capable of handling both numerical and categorical data, making them essential tools for understanding and analyzing complex datasets in various industries.

Student Activity II:

Exploring the Python Scikit-learn Dataset for Decision Tree aspect of Data mining.

Using Python

Type the following code and then click the **Run** button to explore the Iris DataSet.

Code run

```
# Import necessary libraries
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier, plot_tree
from sklearn.metrics import accuracy_score
import matplotlib.pyplot as plt

# Load the Iris dataset
iris = load_iris()
X = iris.data
y = iris.target

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Create a Decision Tree classifier
clf = DecisionTreeClassifier()

# Train the classifier on the training set
clf.fit(X_train, y_train)

# Make predictions on the test set
y_pred = clf.predict(X_test)

# Calculate accuracy
accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy * 100:.2f}%")

# Plot the decision tree
plt.figure(figsize=(20,10))
plot_tree(clf, filled=True, feature_names=iris.feature_names, class_names=iris.target_names)
plt.show()
```

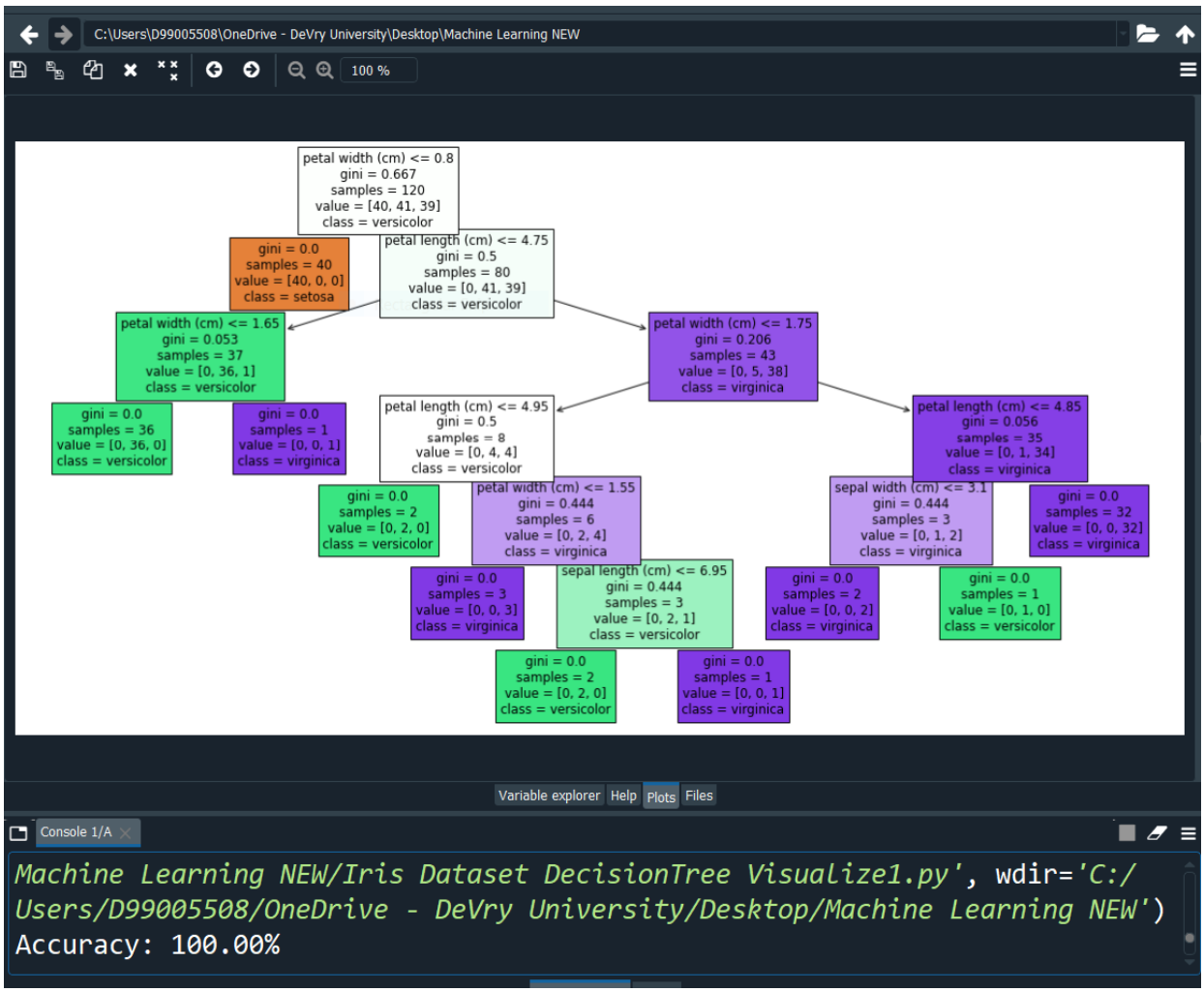

Figure 7. Decision Tree Output of Python program's display of Iris Data Set Attributes

Student Activity II(cont.): Exploring the R-Studio for Iris Data Set Attributes

Using the R Language

Type the following R code and then click the **Run** button to explore the Iris DataSet For Decision Tree aspect of Datamining.

```
# Install necessary packages if not already installed
if (!requireNamespace("rpart.plot", quietly = TRUE)) {
  install.packages("rpart.plot")
}

if (!requireNamespace("caret", quietly = TRUE)) {
  install.packages("caret")
}

# Load necessary libraries
library(rpart)
library(rpart.plot)
library(caret)

# Load the Iris dataset
data(iris)

# Split the dataset into training and testing sets
set.seed(42)
```

```
trainIndex <- createDataPartition(iris$Species, p = .8,
                                  list = FALSE,
                                  times = 1)
irisTrain <- iris[ trainIndex,]
irisTest  <- iris[-trainIndex,]

# Create a Decision Tree classifier
clf <- rpart(Species ~ ., data = irisTrain, method = "class")

# Make predictions on the test set
pred <- predict(clf, irisTest, type = "class")

# Calculate accuracy
accuracy <- sum(pred == irisTest$Species) / nrow(irisTest)
cat(sprintf("Accuracy: %.2f%%\n", accuracy * 100))

# Plot the decision tree
rpart.plot(clf, type = 4, extra = 104)
```

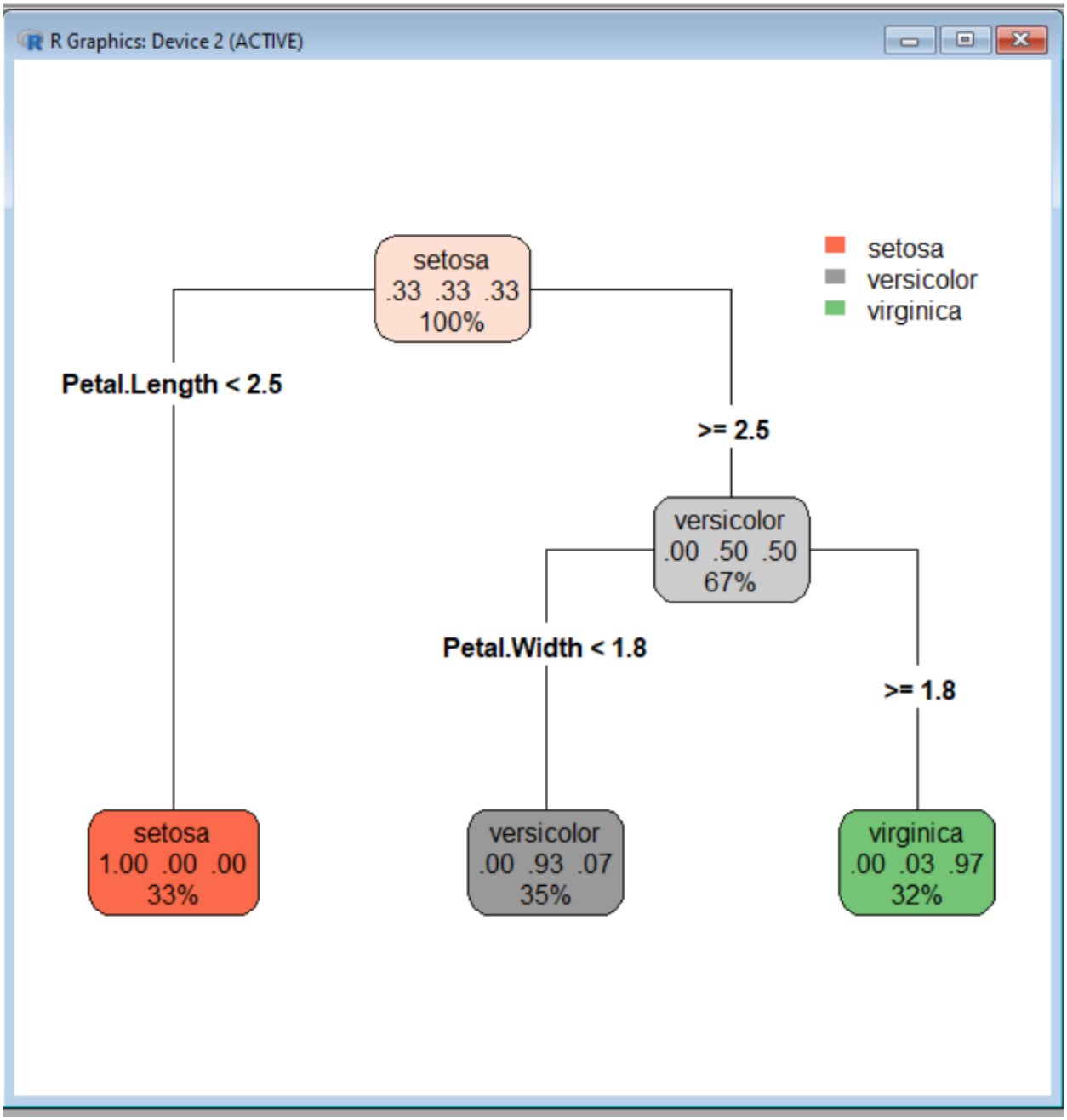

Figure 8. Decision Tree Output of R program's displaying Iris Data Set Attributes

Using Matlab

Below is the MATLAB equivalent of the provided R program, which involves loading the Iris dataset, splitting it into training and testing sets, creating a decision tree classifier, making predictions, calculating accuracy, and plotting the decision tree.

Matlab Script:

```
% Load the necessary toolbox
if ~exist('fitctree', 'file')
    error('Statistics and Machine Learning Toolbox is required.');
end

% Load the Iris dataset
load fisheriris

% Split the dataset into training and testing sets
rng(42); % For reproducibility
cv = cvpartition(species, 'HoldOut', 0.2);
```

```
irisTrain = meas(training(cv), :);
irisTrainLabels = species(training(cv));
irisTest = meas(test(cv), :);
irisTestLabels = species(test(cv));

% Create a Decision Tree classifier
clf = fitctree(irisTrain, irisTrainLabels);

% Make predictions on the test set
pred = predict(clf, irisTest);

% Calculate accuracy
accuracy = sum(strcmp(pred, irisTestLabels)) / numel(irisTestLabels);
fprintf('Accuracy: %.2f%%\n', accuracy * 100);

% Plot the decision tree
view(clf, 'Mode', 'graph');
```

The above MATLAB script performs the same steps as the R script and should provide similar results. Make sure the student has the Statistics and Machine Learning Toolbox installed in the MATLAB environment.

Here's a simple representation of what the decision tree plot looks like using above Matlab program.

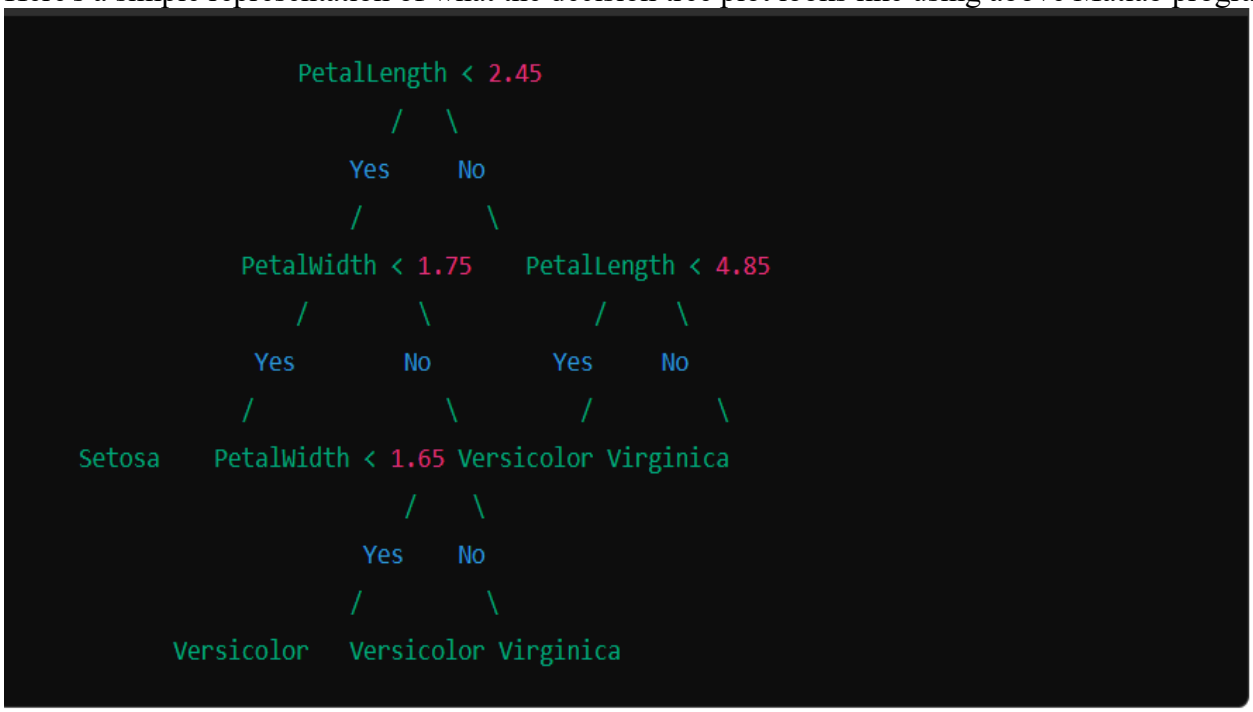

Figure 9. Decision Tree Program Output display of Iris Data Set Attributes using Matlab

Multiple Regression

Multiple regression in machine learning is a statistical technique used to predict a continuous target variable based on multiple predictor variables. It extends simple linear regression by incorporating multiple independent variables to model more complex relationships in the data. The goal is to find coefficients for each predictor variable that best fit the observed data and minimize prediction errors. Multiple regression is widely used in various domains, such as finance, economics, and social sciences, where multiple factors influence an outcome, allowing for more nuanced and accurate predictions compared to single-variable models.

Student Activity III:

Using Python

Python code for multiple regression using scikit-learn for the modeling and matplotlib for the visualization to explore the Electric Utility Bill's seasonal variation.

```
import numpy as np
import pandas as pd
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
# Data
Period = np.arange(1, 14)
Expense = np.array([149, 80, 79, 168, 155, 81, 80, 178, 160, 81, 80, 170, 150])
Season = np.array(["spring", "summer", "fall", "winter", "spring", "summer", "fall", "winter",
                   "spring", "summer", "fall", "winter", "spring"])
# Create dummy variables for seasons
Spring = (Season == "spring").astype(int)
Summer = (Season == "summer").astype(int)
Fall = (Season == "fall").astype(int)
# Create a DataFrame
df = pd.DataFrame({
    'Expense': Expense,
    'Spring': Spring,
    'Summer': Summer,
    'Fall': Fall
})
# Define the independent variables and the dependent variable
X = df[['Spring', 'Summer', 'Fall']]
y = df['Expense']
# Create and train the model
model = LinearRegression()
model.fit(X, y)
# Display the model's coefficients and intercept
print(f"Intercept: {model.intercept_}")
print(f"Coefficients: {model.coef_}")
# Make predictions
new_data = pd.DataFrame({
    'Spring': [0, 0],
    'Summer': [1, 0],
    'Fall': [0, 0]
})
predictions = model.predict(new_data)
print(f"Predicted Expense for Summer: {predictions[0]}")
print(f"Predicted Expense for Winter (Baseline): {predictions[1]}")
# Visualization
plt.figure(figsize=(10, 6))
plt.plot(Period, Expense, marker='o', linestyle='-', label='Actual Expenses')
# Adding season markers
season_markers = {'spring': 's', 'summer': '^', 'fall': 'D', 'winter': 'o'}
for i, season in enumerate(Season):
    plt.scatter(Period[i], Expense[i], marker=season_markers[season], s=100, label=season if i == 0
else "")
plt.ylim(0, max(Expense) + 20)
plt.xlabel('Period')
plt.ylabel('Heating Gas Bill ($)')
plt.legend()
```

```
plt.title('Heating Gas Bill Over Time')
plt.grid(True)
plt.show()
```

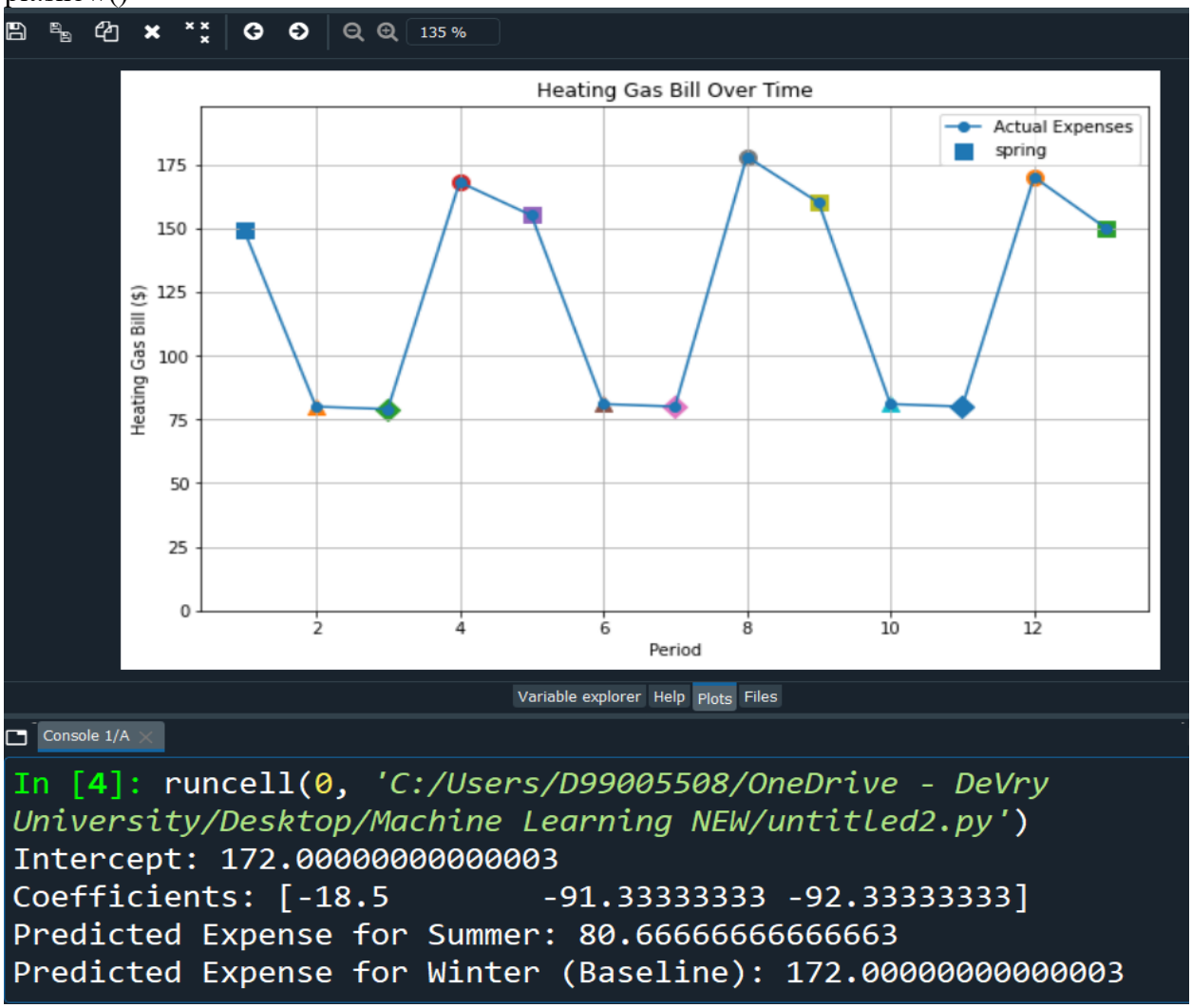

Figure 10. Multiple Regression output for Electric utility Bill's seasonal variation using Python

Using R Language:

Using R Studio, the R code given below performs multiple linear regression to analyze Electric Utility Bills seasonal expense data. It defines a Period and corresponding Expense vector and converts seasons into dummy variables (Spring, Summer, Fall). A linear model (lm) is created to predict Expense based on these seasonal dummy variables. The summary of the model shows estimates and significance for each season. Predictions are made for specific seasons using the model. Finally, the data is plotted with season-specific markers.

```
Period <- 1:13
Expense <- c(149, 80, 79, 168, 155, 81, 80, 178, 160, 81, 80, 170, 150)
Season <- factor(c("spring", "summer", "fall", "winter", "spring", "summer", "fall", "winter",
"spring",
                   "summer", "fall", "winter", "spring"))
Spring <- ifelse(Season=="spring", 1, 0)
Summer <- ifelse(Season=="summer", 1, 0)
Fall <- ifelse(Season=="fall", 1, 0)
model <- lm(Expense ~ Spring + Summer + Fall)
summary(model)
#             Estimate Std. Error t value Pr(>|t|)
# (Intercept)  183.667      8.197  22.405 3.33e-09 ***
# Spring       -25.167     10.844  -2.321   0.0454 *
```

```
# Summer      -114.000     11.593  -9.834 4.11e-06 ***
# Fall         -97.667     11.593  -8.425 1.46e-05 ***
# ---
# Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#
# Residual standard error: 14.2 on 9 degrees of freedom
# Multiple R-squared:  0.9402,  Adjusted R-squared:  0.9202
# F-statistic: 47.14 on 3 and 9 DF,  p-value: 7.912e-06
predict(model, newdata=data.frame(Spring=0, Summer=1, Fall=0))
# 69.66667
predict(model, newdata=data.frame(Spring=0, Summer=0, Fall=0))
# 183.6667
plot(Period, Expense, ylim=c(0, max(Expense)), type="b", pch=as.numeric(Season),
    ylab="Heating gas bill ($)")
legend("bottomright", legend=c("Spring", "Summer", "Fall", "Winter"),
       pch=c(2, 3, 1, 4), cex=0.9, inset=0.02)
```

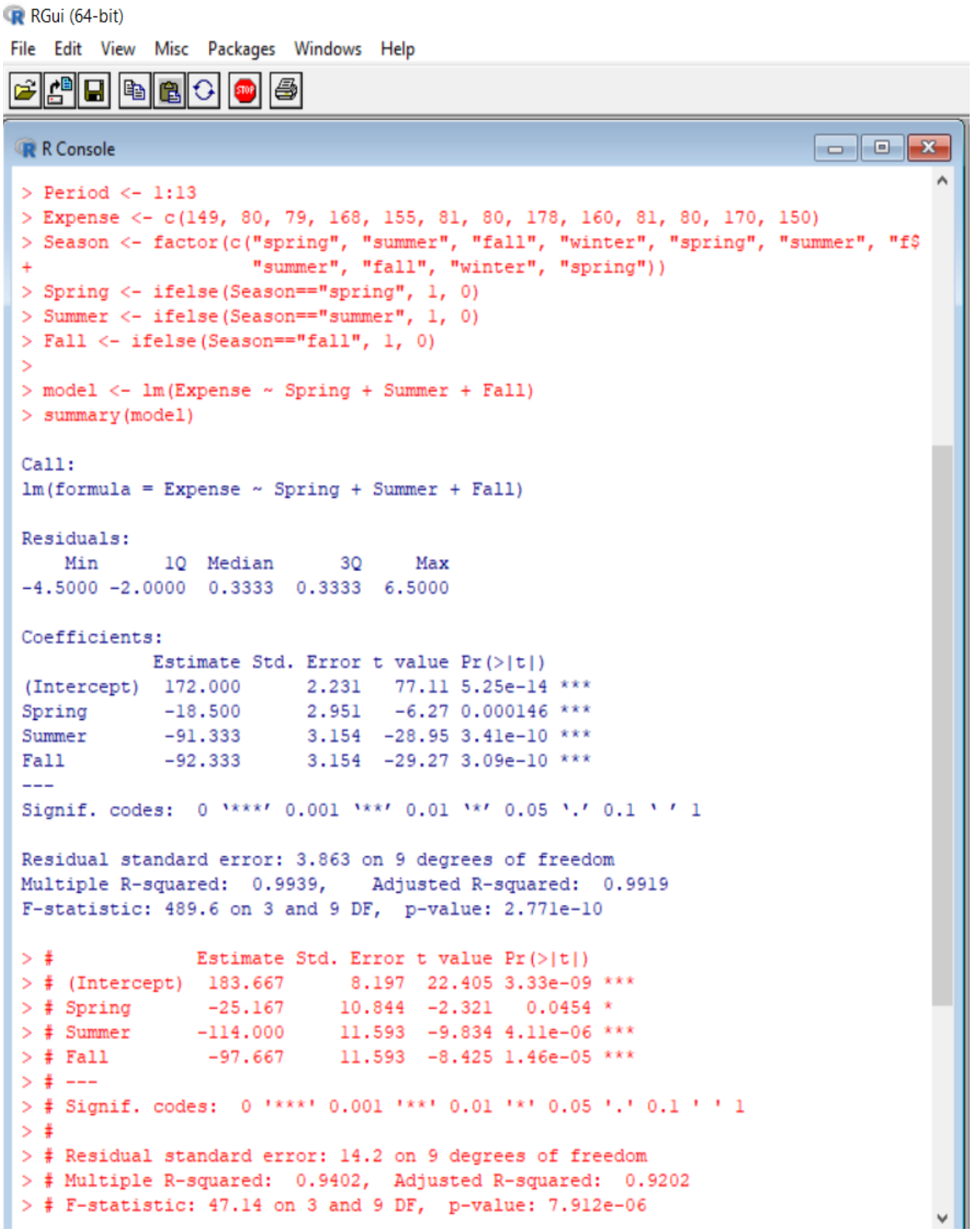

Figure 11. Multiple Regression output for Electric utility Bill's seasonal variation using R

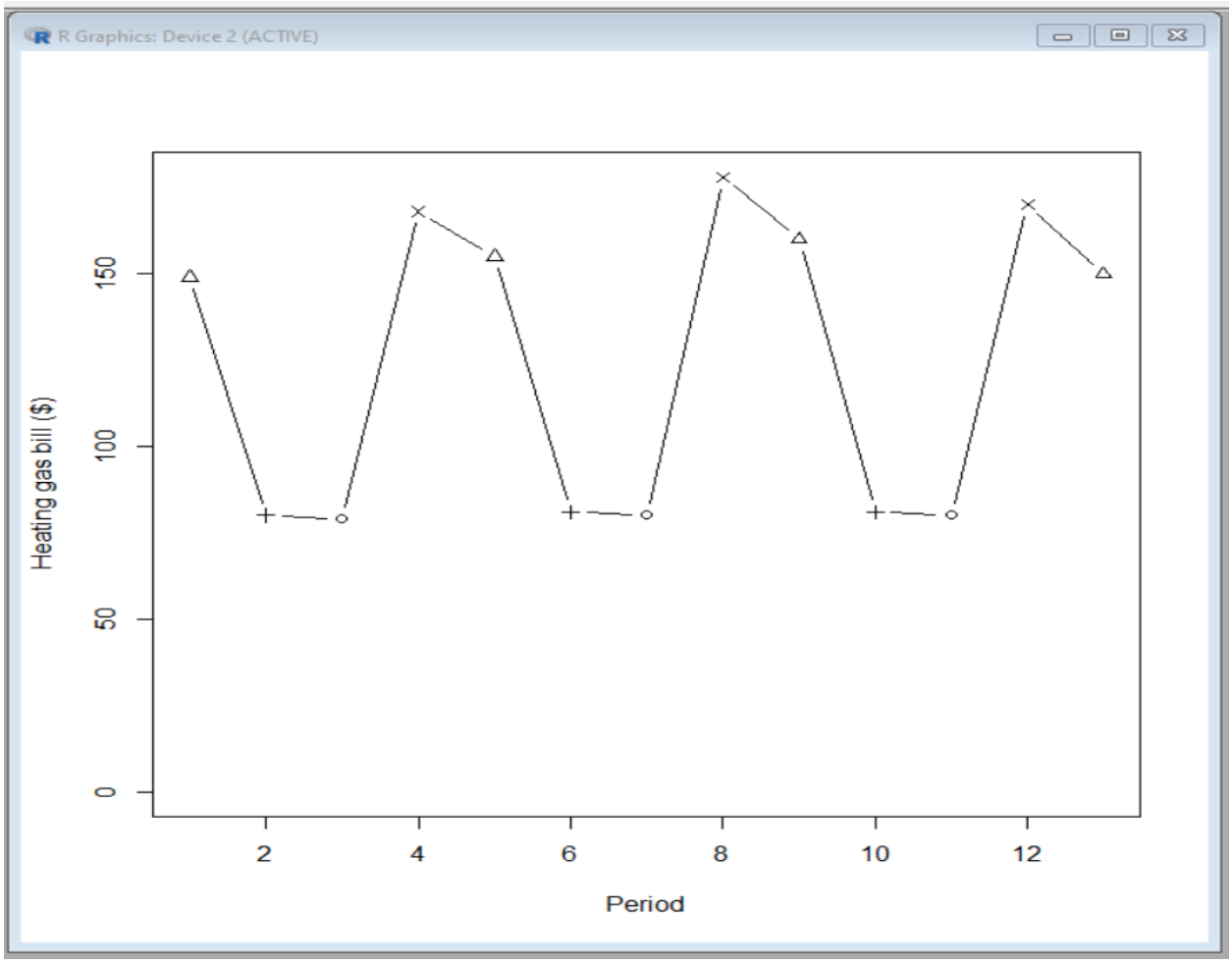

_Figure 12. Multiple Regression R program output Plots for Electric utility Bill's seasonal variation

Summary Chart comparing Python, R, and MATLAB for data analytics and machine learning:

Feature	Python	R	MATLAB
Ease of Learning	Moderate	Moderate	Moderate
Community and Support	Large, active	Large, active	Moderate, strong in academia and industry
Libraries and Packages	Extensive (NumPy, pandas, scikit-learn, TensorFlow, Keras, etc.)	Extensive (dplyr, ggplot2, caret, randomForest, etc.)	Good (Statistics and Machine Learning Toolbox, Deep Learning Toolbox, etc.)
Data Manipulation	Excellent (pandas)	Excellent (dplyr, data.table)	Good
Data Visualization	Excellent (matplotlib, seaborn, plotly)	Excellent (ggplot2, plotly)	Good (built-in plotting functions)
Statistical Analysis	Good	Excellent (built-in statistical functions)	Good

Feature	Python	R	MATLAB
Machine Learning	Excellent (scikit-learn, TensorFlow, Keras)	Good (caret, randomForest, xgboost)	Good (Statistics and Machine Learning Toolbox)
Deep Learning	Excellent (TensorFlow, PyTorch, Keras)	Moderate (TensorFlow, Keras)	Good (Deep Learning Toolbox)
Integration with Big Data Tools	Excellent (Spark, Hadoop)	Good (SparkR)	Limited
Integration with Other Languages	Excellent (C, C++, Java)	Good (C, C++, Java)	Moderate (C, C++)
Speed and Performance	Good, but can be improved with libraries like NumPy	Moderate	Excellent
IDE and Development Environment	Excellent (PyCharm, Jupyter, Spyder)	Good (RStudio)	Excellent (MATLAB IDE)
Cost	Free and open-source	Free and open-source	Commercial, with a cost for licenses
Usage in Academia	Widespread	Widespread	Very widespread
Usage in Industry	Very widespread (tech, finance, healthcare)	Moderate (academia, research)	Widespread (engineering, academia, research)
Typical Use Cases	General-purpose programming, web development, data science, machine learning, AI	Statistical analysis, data visualization, data science	Engineering simulations, numerical analysis, data visualization

Conclusion

Python: Known for its versatility, Python is widely used in both academia and industry. It has a rich set of libraries for data manipulation, visualization, machine learning, and deep learning. Python is often the go-to language for data science due to its ease of integration with other languages and big data tools.

R: Primarily used for statistical analysis and data visualization, R excels in these areas with a comprehensive set of built-in functions and libraries. It is popular in academia and research but is also used in industry for specialized tasks.

MATLAB: MATLAB is strong in numerical analysis, engineering simulations, and data visualization. It is heavily used in academia and engineering fields. While it has good capabilities for data analytics and machine learning, it comes with a commercial license cost, which might be a limiting factor for some users.
Each tool has its strengths and is chosen based on the specific needs of the project, the background of the user, and the environment in which it will be used. For instance, ML-powered systems hold promise for delivering faster and more-consistent cancer diagnoses. The lack of a gold standard in cancer diagnosis is a well-known problem as such technology has important limitations. The reliability of ML algorithms depends on the validity of the data on which they are trained. In the diagnosis of cancer, this means a reliance on data that are correctly labeled with the ground truth about what is and what is not cancer.

Researchers and physicians eager to make machine learning driven cancer diagnosis a clinical reality are concerned that the technology's reliance on pathologists as an external standard could lead to an increase in over diagnosis. This is an observed fact that has been observed in other cancer types as well. Machine learning ascertains the diagnosis of disease that meets the pathologic definition of cancer but never would have caused morbidity or mortality in a patient's lifetime. Like any other technology, ML needs to be adequately vetted before it is widely adopted, given the potential for unintended harms such as over diagnosis in oncological applications.

Student Feedback

We administered an anonymous questionnaire to obtain feedback from the students in relation to the choice of using R, python and Matlab for Data Analytics and Machine Learning. We have provided some selected questions from the questionnaire and their respective responses that apply particularly to the choice of programming language and lessons learned by early exposure to this module. Note that all the students 'comments were encouraging and positive; there were few negative responses obtained from students with no background in statistics and linear algebra using Matlab tools for machine learning.

Do you feel that learning Data Analytics and ML module reinforced class material in a good, bad, or indifferent way?

Sample Responses:

✓ Excellent. The python programs have greatly enhanced the overall class information.

✓ In an indifferent way. I like the computing with R and Matlab but it was quite cumbersome, may be because I am more comfortable with python's scikit library.

Machine tool kit. ab's Classification Learner was daunting at the onset, but it let me choose from

✓ Why python, why not Octave or Matlab ? I was able to retrofit them using Matlab's

✓ Matlab several classification types including decision trees, SVM and k-nearest neighbors.

✓These equivalent Python and Matlab programming lab modules were really helpful and set the pace for the class and enhance the rich experience.

Has the teaching module been straight forward and easy to understand? Do you have suggestions for improvement?

Sample Responses:

✓ Wonderful. The R Studio is open source and seems to be more friendly than python and mat lab.

✓ For Data Analytics EXCEL is not bad. I like the computing with EXCEL and the new embedded EXCEL tools are pretty straight forward because I am more comfortable with EXCEL and learning python is kind of a drag.

Why not Perl or Octave? I was able to retrofit them using Octave.

Learning R was daunting at the onset, but it let me choose from

✓ several classification types including time series analysis, decision trees, Regression analysis, what if Analysis and much more.

✓The equivalent R programming lab modules were really interesting and helpful and stimulated the class progress and provided comparison with python an Matlab.

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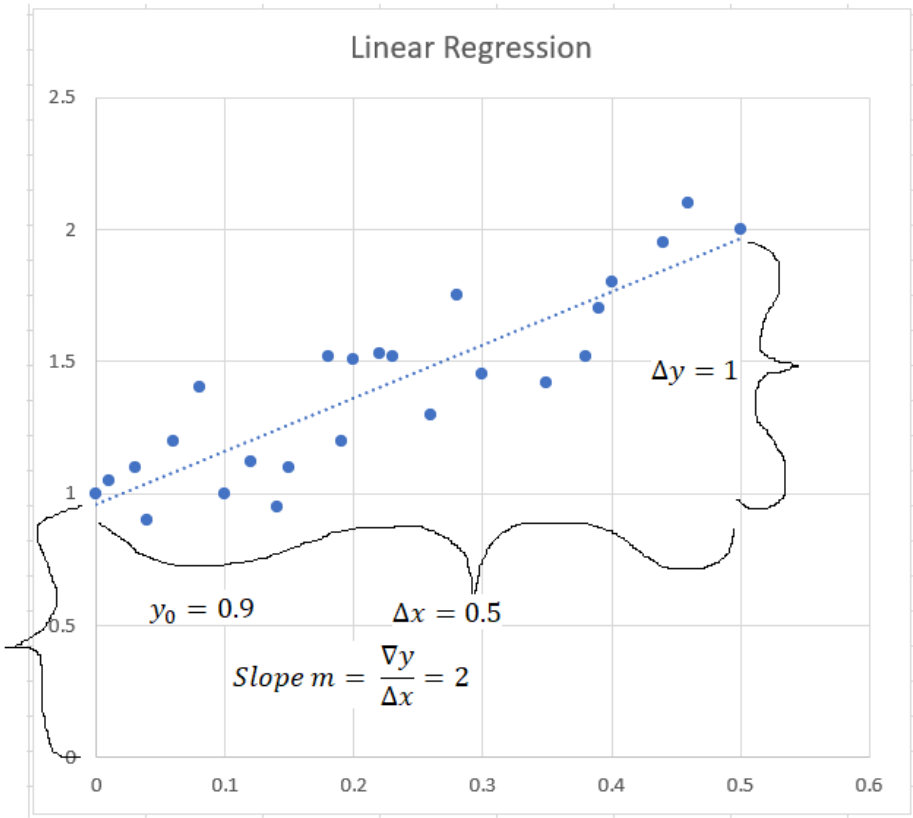
Appendix A: **Methods for Business Analytics** and Selected Machine Learning Algorithms

Methods for business analytics encompass a variety of techniques that utilize data to extract insights and support decision-making processes within organizations. These methods include descriptive analytics, which summarize historical data to provide a snapshot of past performance, predictive analytics, which use statistical models and machine learning algorithms to forecast future trends and outcomes, and prescriptive analytics, which recommend actions based on predictive models to optimize decisions. Selected machine learning algorithms commonly used in business analytics include linear regression for predicting continuous outcomes, logistic regression for binary classification tasks, decision trees and random forests for handling complex decision-making processes, and clustering algorithms like k-means for grouping similar data points. These methods are crucial for leveraging data-driven insights to improve operational efficiency, understand customer behavior, optimize marketing strategies, and drive innovation in business settings.

Linear Regression

Used in data science and machine learning to make prediction, linear regression algorithm, as its name implies, determine a linear relationship between an input variable "x" and an output "y". The data consists of a known set of input X (the data or the independent variable) with corresponding known output set Y (the data label, or data annotation, or the dependent variable). That is to say, linear regression is a supervised machine-learning algorithm. Determining the linear relationship $y = mx + y_0$ ("m" is the slope, and "y_0" is the y intercept) among the elements of those 2 sets lead to predicting the output "y" for any value of input "x".



Appendix: Figure 1. Best Fit Line Obtained Using Linear Regression

Depending on the number of independent set of data, one or multiple, and the number of dependent variables, one or multiple, we have the following terminology.

	One dependent variable	***Multiple dependent variables***
One independent variable	*Simple and Univariate Linear Regression* $y = mx + y_0$	*Simple and Multivariate Linear Regression* $y_j = m_j x + y_{0j}$ $j = 1, 2, \ldots, N$

Multiple independent variables	*Multiple and Univariate Linear Regression* $y = m_1x_1 + m_2x_2 + \cdots + m_nx_n + y_0$	*Multiple and Multivariate Linear Regression.* $y_j = m_{1j}x_1 + m_{2j}x_2 + \cdots + m_{nj}x_n + y_{0j}$ $j = 1, 2, \ldots, N$

Cost Function.
For linear regression the Mean Square Error (MSE) can be used. It is the average of the square of the difference between the predicted values $\tilde{y}_i$ and the actual values y_i.

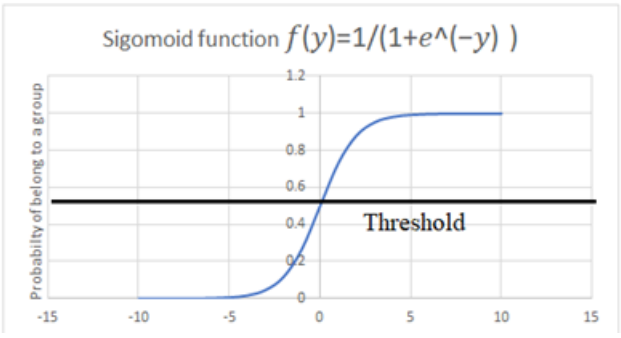
$$MSE = \frac{\sum_{i=1}^{i=n}(\tilde{y}_i - y_i)^2}{n}$$

Training of a Linear Regression Model.
During the training of a linear regression model, the parameters must be adjusted iteratively until the slope m and the y-intercept y_0 of the best fit line is obtained within a certain margin of acceptable errors. The gradient descent optimization algorithm can be used to find the minimum of the MSE at $mminimum$ and $y_0minimum$.

Logistic Regression
logistic regression algorithm is used in data science and machine learning to predict the probability that an input belongs in a group or in another group. Consequently, it is a supervised machine learning algorithm that performs classification.
In the logistic regression, the output of the linear regression algorithm is applied to a sigmoid function

$$f(y) = \frac{1}{1 + e^{-y}}$$

that converts any real number y (that comes from the linear regression prediction) from $-\infty$ to $+\infty$ to a range of probability from 0 to 1. Then a threshold is applied to determine whether the input belongs in one group or in the other group. For instance, if the threshold is set to 0.5, the logistic regression algorithm is saying that above if an input has a probability above that threshold, it belongs in group A. It belongs in group B otherwise.



Appendix: Figure 2. Output of Linear Regression Prediction

Decision Tree
A *decision tree* is a flowchart that asks a sequence of questions and classifies an observation based on the answers.
A decision tree contains *nodes*, *branches*, and *leaves*.
A *node* determines whether a condition is satisfied and contains splits of a feature. Decision trees often have more than one node. The topmost node is called the root node.
A *branch* indicates that a condition is satisfied and contains one set of values after splitting a node.
A *leaf* represents a decision and contains segments of observations containing features that satisfy the conditions of the preceding nodes.
Random Forest: A ***random forest*** is a collection of many decision trees. For a training set of size N with M attributes, each tree is grown by selecting N cases at random with replacement. This process is known as bagging. At each node, m<M attributes are considered for the split, and the best option is chosen. Thus, the decision trees have low correlation. When the model is used for

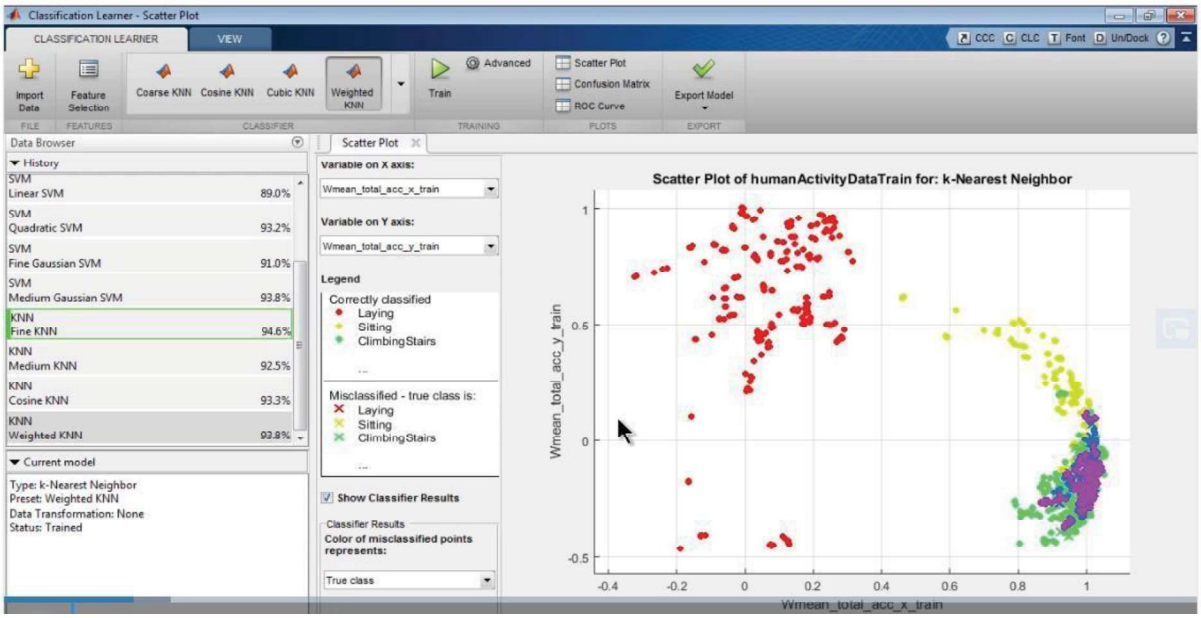
classification, each new object is sent down all the trees, and the majority result is taken as the correct outcome.

k-means Clustering Algorithms

Whereas, linear regression and logistic regression machine learning algorithms use supervised machine learning algorithms, k-means clustering algorithm is an unsupervised machine learning algorithm. Using unlabeled data, it places inputs in a number of predermined clusters (k clusters with k = 2, 3, 4, ,,,,) according to some forms of relations (or no relations) between them.

Matlab Machine Learning Tools:

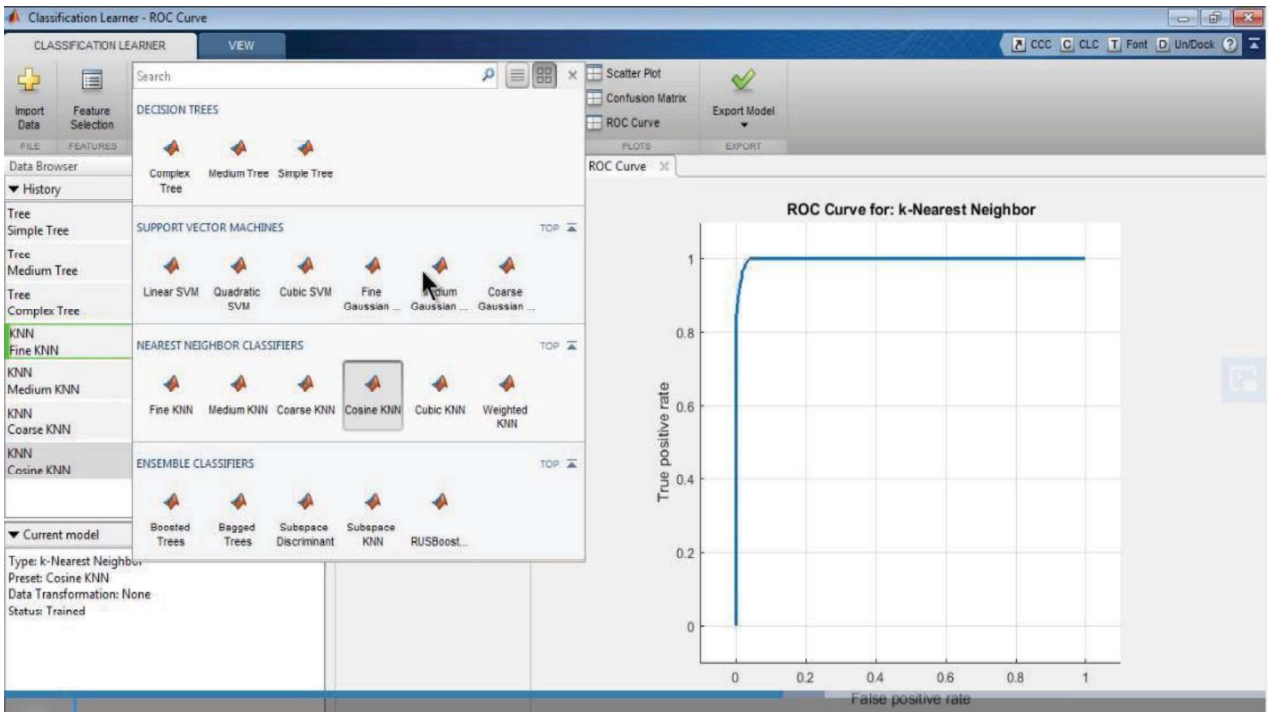
The Classification Learner app lets you train models to classify data using supervised machine learning. Using classification learner, one can perform machine learning tasks such as interactively exploring your data, selecting features, specifying validation schemes, training models and assessing results.



Appendix: Figure 3. Classification Learner

One can choose from several classification types including decision trees, support vector machines (SVM), and k-nearest neighbors, and select from ensemble methods such as bagging, boosting and random subspaces just to name a few.

Classification learner helps one choose the best model for the data by letting one perform model assessment and model comparisons using confusion matrices and ROC curves as shown in figure below.



Appendix: Figure 4. An ROC curve for k-Nearest Neighbor

The confusion matrix displays the total number of observations in each cell. The rows of the confusion matrix correspond to the true class, and the columns.

An example of confusion matrix using Matlab is also shown below:

Cat	42	6	9
Dog	5	31	9
Penguin	7	1	41
	Cat	Dog	Penguin

True Class

Predicted Class

Appendix: Figure 5. Depiction of typical Confusion Matrix

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Challenges of Corpus Linguistics in Africa

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Abstract
Language research has become of pre-eminent importance now than it was decades ago when the relevance of language to society was less discernible. There are many societal problems whose origin bother on language whether directly or indirectly. Corpus linguistics seems to be solving a great part of this problem by presenting itself as an alternative method of linguistic investigation; offering new perspectives on language related issues, new ways of engagements and producing significant results. This is why the corpus method has continued to hold sway in the language academy in most parts of the global North where it originated. In those places, there are many established corpora which are relatively easily accessible, many software exist that are fairly commonly known and used by linguists across universities, and a great number of published outcomes of corpus research are found to be in application in many contexts, whether directly in the classrooms or applied in the real world. This is not the case in the global South, especially in many parts of Africa, where corpus linguistics remains largely unknown and the knowledge it provides even more largely untapped. The state of corpus linguistics in Africa is therefore, the prime interest of this address. Through ethnographic surveys of corpus linguistics studies across the countries of: Nigeria and Ghana in West Africa; Tanzania, Uganda, and Kenya in East Africa; Zimbabwe and South Africa in Southern Africa; and Cameroon in Central Africa, this paper provides some insights into the state of corpus research in Africa and reveals the challenges facing it.

Ethical Implications of the Emergence of AI in Society

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Abstract
This paper discusses the ethical implications of the emergence of AI in society. Ethics, by general definition, is a set of theoretical fundamental principles of conduct that determines what is right, and guides individuals, and society in decision-making. New discoveries often bring unknown impacts to society and can sometimes lead to unintended consequences that need to be monitored and addressed. This phenomenon is evident across various fields, including art, science, technology, biological medicine, and law. With the emergence of AI, society faces ethical dilemma regarding its integration into various business fields.

The concept of AI is implemented through computer programming. This is not without ethical implications. An important task of AI is to mimic human behavior and perform tasks that experts do with accuracy and speed. This includes descriptive, predictive, prescriptive, diagnostic, and generative tasks. Historically, technological innovations carry doubts and debates in society. Ethical policy is the force that set a clear pathway that aligns new creation with societal norms and expectations.

Cross Road – AI and Quantum Computing

Adnan Turkey
DeVry University

Abstract
As we navigate through the dynamic landscape of the 21st century, rapid advancements in Artificial Intelligence (AI) and Machine Learning (ML) have emerged as game-changers in various industries. Yet, we need to pay attention to the enormous impact of Quantum Computing that could change the current computing speed, capability, data processing, and storage to tremendously higher levels of precision and accuracy. These technologies drive significant innovations, push businesses toward their goals faster, and redefine the boundaries of what is possible. This paper explores and introduces new undiscovered venues about blending AI and Quantum Computing in the most advanced and complicated problems that even the current Super Computers fail to solve or need very long time to execute.

Keywords: Artificial Intelligence, Machine Learning, Quantum Computing, Future of Computing.

Economics Analysis of Cassava (Manihot esculenta Crantz) Based Cropping Systems in Okigwe, Southeastern Nigeria

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Abstract
Cassava is a major staple crop in Nigeria, often cultivated alongside other crops, especially in rural and peri-urban areas. However, the economic benefits of these component crops are frequently overlooked. This study, conducted at the Umuowa-Ibu1via National Horticultural Research Institute, Mbato Okigwe substation in 2021 and 2022, aimed to assess the production costs and economic returns of cassava-based intercropping systems. A randomized complete block design with three replications were used. All farm operation costs and inputs were meticulously recorded, and economic analyses were performed using partial budgeting methods. The results revealed significant differences in weed infestation and storage root yields across the cropping systems. Sole cassava stands produced the highest storage root yields, at 31.45 and 31.98 t/ha in 2021 and 2022, respectively. This was closely followed by the cassava + akidi treatment, with yields of 31.01 and 30.91 t/ha. The lowest yields were observed in the cassava + fluted pumpkin + okra system, with 26.66 and 26.31 t/ha. Net returns varied significantly, with the cassava + akidi + okra system achieving the highest net returns: N1,633,770 in 2021 and N1,829,887 in 2022. The sole cassava system recorded the lowest net returns: N1,103,590 and N1,353,610 for the respective years. Cost-benefit analysis showed that the cassava + akidi + okra and cassava + egusi-melon + okra systems had an average cost-benefit ratio of 1.44, indicating a marginal profit of N1.44 for every N1 spent. In contrast, the sole cassava system had a cost-benefit ratio of 0.77. These findings highlight the economic advantages of intercropping cassava with compatible crops, promoting sustainable agricultural practices and improving farmer livelihoods.

Keywords: Cassava intercropping, Economic analysis, Crop yields, Weed management, Smallholder

profitability.

Introduction

Cassava (*Manihot esculenta Crantz*) is a vital crop in Nigeria, serving as a primary source of carbohydrates and playing a crucial role in the nation's agriculture and economy (Apeh et al., 2023). As one of the world's largest producers of cassava, Nigeria relies heavily on this crop for food security, employment, and income generation (Food and Agriculture Organization (FAO), 2013). Cassava's adaptability to diverse soil types and its resistance to drought make it a reliable staple, particularly in Southeastern Nigeria, where it supports the livelihoods of numerous smallholder farmers.

Intercropping, the practice of growing two or more crops simultaneously on the same piece of land, is widely practiced in Southeastern Nigeria. This agricultural system offers several benefits over sole cropping, including enhanced land utilization, improved soil fertility, and reduced pest and disease incidences (Ikeh et al, 2023; Mohammed et al., 2018; Ofori & Stern, 1987). According to Vaghela et al. (2019), intercropping is biologically dynamic, making it more resilient to weather fluctuations and more reliable in providing returns compared to sole cropping. Gangadhar (2022) also notes that intercropping is more profitable and sustainable than sole cropping, offering higher remuneration to farmers. Cassava is often intercropped with legumes, cereals, and vegetables, which enhances ecosystem services such as pest control, nutrient cycling, and yield per land unit. However, many Nigerian farmers primarily focus on the main crop, overlooking the potential additional income from component crops. In southeastern Nigeria, subsistence farmers aim to meet family nutritional needs and generate income from surplus sales. The primary goal of intercropping is to achieve higher economic returns per land unit compared to sole cropping. Farmers often select crop combinations that increase their income without systematically assessing the most profitable combinations (Bowman & Zilberman, 2013).

Intercropping diversifies crop production, serving as insurance against crop failure. Different crops have varying life cycles and resource demands, enhancing biodiversity and ecosystem stability. For instance, vegetables may mature within three to five months, while tuber crops like cassava may take seven to twelve months. This diversification can lead to better financial outcomes by reducing risks associated with pests, diseases, environmental hazards, and market fluctuations (Beillouin et al., 2018; Rosa-Schleich et al., 2019). Selecting crop combinations with uncorrelated production stages can further lower risks (Iheke et al., 2023). Common intercropping combinations involve cassava and various vegetables, which can optimize the use of available resources and increase overall productivity (Amanze et al., 2011).

Despite the benefits, smallholder farmers in Okigwe and other parts of Southeastern Nigeria face challenges related to land scarcity and the need for improved profitability. Efficient land use is essential to maximize yields and incomes, particularly in regions where agricultural land is limited. There is a pressing need to identify and promote economically viable intercropping systems that can enhance the livelihoods of these farmers.

This study aims to analyze the economic viability of cassava intercropping with vegetables in Okigwe, Southeastern Nigeria. Specifically, the study will focus on intercropping combinations involving cassava and three vegetables: okra (*Abelmoschus esculentus*), fluted pumpkin (*Telfaria occidentalis* Hook), pumpkin (*Cucurbita pepo*), akidi (*Vigna unguiculata - sesquipedalis*), and egusi-melon (*Colocynthis citrullus*). The objectives are to compare the costs, yields, revenues, and profitability of these intercropping systems to determine the most economically advantageous combination for smallholder farmers.

Materials and Methods

Site Location

A field experiment was conducted during 2020 and 2021 at the Farm Settlement of Umuowa Ibu1, affiliated with the National Horticultural Research Institute (NIHORT) Okigwe sub-station, Okigwe, Imo State, Nigeria. Okigwe is geographically positioned between latitudes 5°49'45"N and longitudes 7°21'2"E. The region experiences a mean annual rainfall range of 80 to 375 mm, an average relative humidity of 79%, and mean temperatures ranging from 22.7°C to 34°C. Situated within Nigeria's humid tropical rainforest zone, Okigwe features two distinct seasons: the wet season, lasting from March or April to October with a brief interruption known as the "August Break," and the dry season, which spans from November to late March (Nigeria Meteorological Agency (NIMET), 2019).

Soil Sample Collection and Analysis

Composite soil samples were collected from the surface soil at two depths, 0-15 cm and 15-30 cm. These samples were air-dried and processed for mechanical and chemical analysis to determine the soil's properties and suitability for the experimental crops (Gee & Or, 2002).

Experimental Design and Treatments

The experiment was arranged in a randomized complete block design (RCBD) with three replications. The treatments included nine cropping systems: sole cassava, cassava + fluted pumpkin, cassava + okra, and cassava + fluted pumpkin, among others. This design was chosen to minimize variability and ensure reliable comparisons between treatments (Gomez & Gomez, 1984).

Agronomic Practices

The site had been under fallow for two years following maize and egusi-melon cultivation. Land preparation involved manual clearing with machetes, spades, and Indian hoes, followed by ridge construction. Ridges were 5 meters long and spaced 1 meter apart. Planting occurred in the first week of April in both 2020 and 2021. All intercrops were sown at a row spacing of 30 cm x 10 cm. The experimental area measured 90 m x 20 m (1800 m²), with each plot measuring 5 m x 5 m (25 m²). There were 10 plots per replicate, totaling 30 plots. Spacing of 1.5 meters and 2 meters was maintained between plots and replicates, respectively.

Land Preparation and Planting

The experimental site was manually cleared and prepared into ridges using machetes and spades. Cassava was planted on the ridges using 25 cm stem cuttings placed in an inclined position (45°) at a spacing of 1.0 m x 1.0 m. Compound fertilizer, NPK Mg (12:12:17:2), was applied two months after planting using the ring method. Manual weeding was carried out with a native weeding hoe at one and two months after planting. Cassava storage roots were harvested 12 months after planting (MAP).

Data Collection

Growth data were collected from ten randomly tagged plants within each plot. Measurements included:

Plant Height (cm): Cassava plant height was measured from the soil surface to the terminal point of the plant at 2, 4, and 6 MAP.

Number of Branches per Plant: The number of branches per plant was counted at 2, 4, and 6 MAP.

Storage Root Yield (t/ha): The weight of harvested cassava storage roots from each net plot was measured using a top-load weighing balance and converted to tones per hectare.

Weed Density (m²): The number of weeds per plot was counted using a 1m x 1m quadrat thrown randomly twice in each cassava plot.

Dry Weed Biomass (g/m²): Collected weeds were oven-dried at a constant temperature of 75°C for 5 hours, and the final dry biomass weight was measured using an electronic weighing balance.

Results

Cassava Plant Height

Table 1 show that cassava height varied significantly among cropping systems at 4 and 6 months after planting (MAP). The tallest plants were recorded in the sole cassava stands, with heights of 228.54 cm and 233.44 cm in 2021 and 2022, respectively. As the number of intercrops increased, the cassava height generally decreased. Specifically, the cassava + akidi and cassava + egusi melon intercrops showed less competition, resulting in plant heights of 227.81 cm and 231.67 cm for cassava + akidi, and 225.94 cm and 229.81 cm for cassava + egusi melon in 2021 and 2022, respectively. The shortest plants were observed in the cassava + pumpkin + okra intercrop, with heights of 178.11 cm and 188.60 cm in 2021 and 2022, respectively.

Table 1: Cassava Height (cm) as Influenced by Cropping Systems

Cropping systems	**2021**			**2022**		
	Months after planting			**Months after planting**		
	2	**4**	**6**	**2**	**6**	**8**
Sole Cassava	63.93	176.33	228.54	69.72	189.01	233.44
Cassava + Fluted pumpkin	63.44	168.41	207.33	67.01	181.61	228.14
Cassava + Akidi	62.40	175.05	227.81	68.13	188.56	231.67
Cassava+ Okra	60.33	166.77	199.03	67.15	171.55	215.77
Cassava +Pumpkin	60.90	161.09	201.35	65.40	168.18	211.65
Cassava + Egusi-melon	61.91	174.66	225.94	68.11	187.65	229.81
Cassava +Pumpkin +Okra	62..81	155.91	178.11	61.66	163.55	188.60
Cassava + Fluted pumpkin +Okra	61.44	157.72	190.67	62.39	161.52	195.78
Cassava +Akidi +Okra	62.18	160.22	188.33	67.11	164.16	198.72
Cassava + Egusi-melon +Okra	61.59	154.44	191.42	65.39	157.81	201.39
LSD(p<0.05)	**NS**	**4.36**	**9.23**	**NS**	**6.19**	**10.12**

Source, field survey, 2021

Weed Density

Table 2 show that weed density varied significantly among the different cropping systems. The highest weed density was recorded in the sole cassava stands, with values of 102.11, 234.10, and 229.01 per m² in 2021. In the second year, the weed density at 3, 6, and 9 weeks after planting (WAP) was 118.22, 230.16, and 340.66 per m², respectively. There was a significant reduction in weed density as the number of component crops increased. The cassava + egusi melon + okra cropping system showed the most significant reduction in weed density at 3, 6, and 9 WAP, followed by the cassava + akidi + okra cropping system.

Table 2: Weed Density (M^2) of Cassava farm as Influenced by Cropping Systems

Cropping systems	2021			2022		
	Weeks after planting			Weeks after planting		
	3	6	9	3	6	9
Sole Cassava	102.11	234.10	229.01	118.22	230.16	240.66
Cassava + Fluted pumpkin	78.23	145.01	100.38	91.30	171.11	101.37
Cassava + Akidi	61.33	81.20	2.81	77.71	70.70	4.66
Cassava+ Okra	99.55	155.40	101.04	102.11	166.81	111.89
Cassava +Pumpkin	55.45	135.30	158.22	60.37	127.01	146.13
Cassava + Egusi-melon	45.23	20.41	9.39	54.01	21.17	6.45
Cassava +Pumpkin +Okra	23.37	23.00	15.12	29.55	20.09	12.18
Cassava + Fluted pumpkin +Okra	41.11	31.55	10.73	59.31	33.60	11.50
Cassava +Akidi +Okra	22.92	19.77	1.90	29.50	25.31	5.81
Cassava + Egusi-melon +Okra	19.11	11.42	1.58	23.00	9.45	2.93
LSD($p<0.05$)	**3.67**	**8.82**	**7.64**	**4.91**	**9.13**	**8.33**

Source, field survey, 2021

Weed Biomass

Table 3 indicates that weed biomass also varied significantly across the cropping systems at 3, 6, and 9 WAP. The highest weed biomass was recorded in the sole cassava stands, with values of 133.51, 180.11, and 168.51 g/m² in the first cropping year, and 129.03, 179.44, and 150.14 g/m² in the second cropping year. There was a significant reduction in weed biomass with an increase in the number of component crops. At 9 WAP, the cassava + egusi melon intercrop had 0.85 and 1.19 g/m², whereas the cassava + egusi melon + okra treatment had 0.11 and 1.84 g/m² in 2021 and 2022, respectively. The percentage difference in weed biomass ranged from 45-99% and 53-98% when comparing sole cassava stands to other cropping systems in 2021 and 2022.

Table 3: Weed Biomass (g/M^2) of Cassava farm as Influenced by Cropping Systems

Cropping systems	2021			2022		
	Weeks after planting			Weeks after planting		
	3	6	9	3	6	9
Sole Cassava	133.51	180.11	168.51	129.03	179.44	150.14
Cassava + Fluted pumpkin	91.33	99.70	82.12	86.34	84.61	99.10
Cassava + Akidi	55.02	76.56	49.66	60.01	78.45	32.40
Cassava+ Okra	89.16	71.81	68.33	97.11	78.16	70.40
Cassava +Pumpkin	35.11	48.12	77.81	40.05	55.60	81.02
Cassava + Egusi-melon	28.77	14.06	0.85	35.12	17.20	1.19
Cassava +Pumpkin +Okra	26.91	20.12	1.39	30.11	23.50	2.43
Cassava + Fluted pumpkin +Okra	31.80	20.60	2.77	40.03	19.12	3.36
Cassava +Akidi +Okra	22.43	11.69	2.01	27.23	9.15	6.19
Cassava + Egusi-melon +Okra	13.44	2.13	0.11	10.91	3.01	1.84
LSD($p<0.05$)	**5.11**	**11.45**	**7.55**	**4.99**	**10.71**	**8.68**

Source, field survey, 2021

Yields

Table 6 show that cassava root yield differed significantly among the cropping systems in both years. The highest tuber yield was observed in the sole cassava stands, with 31.45 t/ha and 31.98 t/ha in 2021 and 2022, respectively. This was followed by the cassava + akidi treatment, with yields of 31.01 t/ha and 30.91 t/ha. The cassava + egusi melon treatment produced yields of 30.81 t/ha and 30.77 t/ha. The lowest yield was recorded in the cassava + fluted pumpkin + okra intercrop, with 26.66 t/ha and 26.31 t/ha in 2021 and 2022, respectively.

Number of Stem Bundles per Plant

Table 6 equally show that the number of stem bundles per plant varied significantly among the different cropping systems. In the 2021 cropping season, the number of stem bundles ranged from 299.75 in the cassava + fluted pumpkin + okra system to 319.67 in the sole cassava system. In 2022, the range was from 300.86 to 322.70 bundles per plant.

Yield of Component Crops

The yields from the component crops in the cassava-based cropping systems showed in Table 4 showed significant variation. Intercropping cassava with a single crop resulted in higher yields compared to intercropping with two crops. The yields of fluted pumpkin and okra were significantly higher when intercropped with cassava alone than when another crop was introduced. However, the yields of akidi, egusi melon, and pumpkin were not significantly different when another crop was introduced to create a three-crop intercrop.

Table 4: Yield of Component Crops

	2021					**2022**				
	F	**A**	**O**	**P**	**M**	**F**	**A**	**O**	**P**	**M**
Cropping systems										
Sole Cassava										
Cassava + Fluted pumpkin	28.5					28.9				
Cassava + Akidi		8.5					8.4			
Cassava+ Okra			12.7					12.8		
Cassava +Pumpkin				20.4					21.1	
Cassava + Egusi-melon					6.9					6.8
Cassava +Pumpkin +Okra			10.8	18.6				10.9	19.2	
Cassava + Fluted pumpkin +Okra	21.1		8.4			22.2		8.5		
Cassava +Akidi +Okra		7.5	7.6				7.9	7.6		
Cassava + Egusi-melon +Okra			7.1		5.8			7.2		5.8
LSD(p<0.05)	**3.1**	**NS**	**2.6**	**NS**	**NS**	**2.9**	**NS**	**1.7**	**NS**	**NS**

Source, field survey, 2021; **Note:** NS=Not Significant; F = Fluted Pumpkin, A = Akidi, O = Okra, P = Pumpkin, M = Melon Seed

Cost of Production

The cost of producing cassava showed in Table 5 varied across the different cropping systems. The highest cost of production, N 660,000 and N 670,000 per hectare, was recorded in the sole cassava stands due to high weed density. The cost of production was lower in systems with low-growing crops like egusi melon, akidi, and fluted pumpkin, which helped smother weeds. Differences in costs also arose from the varying costs of planting materials and the extra cost of planting.

Table 5: Cost of Production of Cassava in Okigwe during 2021 and 2022 Cropping Seasons

Intercropping with cassava	**S/N**	**Farm Operations**	**2021**	**2022**
			Amount (₦)	**Amount (₦)**
Sole Cassava	i)	Land Preparation	205,000	221,000
	ii)	Soil Analysis	45,000	50,000
	iii)	Planting Material (Stem bundles)	180,000	185,000
	iv)	Planting	90,000	100,000
	v)	Fertilizer/Application	195,000	198,000
	vi)	Weeding (three times)	660,000	670,000
	vii)	Harvesting	105,000	105,500
	viii)	Miscellaneous	100,000	100,000
Total Cost of Production			1,580,000	1,629,500
Cassava + Fluted pumpkin		Planting materials	1,403,5000	1,405,000
Cassava + Akidi		Planting materials and two times weeding	1,200,000	1,205,000
Cassava+ Okra		Planting materials and two times weeding	1,540,000	1,559,900
Cassava +Pumpkin		Planting materials and two times weeding	1,400,000	1,405,000
Cassava + Egusi-melon		Planting materials and two times weeding	1,200,000	1,205,000
Cassava +Pumpkin +Okra		Planting materials and two times weeding	1,450,000	1,475,000
Cassava + Fluted pumpkin +Okra		Planting materials and two times weeding	1,470,000	1,485,300
Cassava +Akidi +Okra		Planting materials and two times weeding	1,200,000	1,20,000
Cassava + melon +Okra		Planting materials and two times weeding	1,200,000	1,203,000

Source, field survey, 2021

Gross Revenue from Cassava Stem and Storage Root Yields

The gross revenue from cassava showed in Table 6 differed significantly among the cropping systems. In 2021, the highest gross revenue was recorded in the sole cassava stands, with N 2,683,590, followed by the cassava + akidi treatment with N 2,654,310. In 2022, the highest gross revenue was N 2,983,110 for sole cassava and N 2,898,159 for cassava + akidi. The lowest gross revenue was recorded in the cassava + fluted pumpkin + okra system, with N 2,332,400 and N 2,462,300 in 2021 and 2022, respectively.

Table 6: Gross Revenue from Cassava Stem and Storage Root Yields in Different Cropping Systems

Cropping systems	2021	2022	2021	2022	2021	2022
	Tuber Yield (t/ha)	**Tuber Yield (t/ha)**	**Number of Stem Bundles/ha**	**Number of Stem Bundles/ha**	**Gross Revenue (₦)**	**Gross Revenue (₦)**
Sole Cassava	31.45	31.98	319.67	323.70	2,683,590	2,983,110
Cassava + Fluted pumpkin	28.47	28.55	303.48	305.55	2,457,510	2,701,265
Cassava + Akidi	31.01	30.91	319.33	318.90	2,654,310	2,898,159
Cassava+ Okra	29.88	29.41	312.18	310.04	2,566,560	2,771,792
Cassava + Pumpkin	29.13	29.67	310.15	309.20	2,513,750	2,788,060
Cassava + Egusi-melon	30.81	30.77	320.34	322.01	2,643,530	2,740,673
Cassava + Pumpkin + Okra	27.45	27.18	300.68	302.81	2,385,610	2,463,163
Cassava + Fluted pumpkin + Okra	26.66	26.31	299.75	300.86	2,332,400	2,462,300
Cassava + Akidi + Okra	30.47	30.62	310.76	311.88	2,602,070	2,770,000
Cassava + melon + Okra	29.74	29.33	312.43	315.10	2,557,960	2,687,525
LSD(p<0.05)	**3.17**	**3.26**	**7.33**	**7.91**		

Source, field survey, 2021; **Note:** Cost of a tone of cassava storage root was N65, 000 and N70, 000 based on prevailing market price at farm gate in 2021 and 2022 cropping seasons, respectively. The cost of a stem bundle was N2, 000 and N2, 300 in2021 and 2022, respectively.

Total Gross Revenue

Table 7 showed that the total gross revenue from cassava and component crops was higher in two and three crop intercropping systems compared to the sole crop. The highest total gross revenue in 2021 was N 2,860,890 for the cassava + okra system, while in 2022, the highest total gross revenue was N 3,305,140 for the cassava + pumpkin + okra system. The cassava + fluted pumpkin + okra system recorded total gross revenues of N 2,656,468 and N 2,812,350 in 2021 and 2022, respectively.

Table 7: Total Gross Revenue from Cassava and Component Crops

Cropping systems	2021	2022	2021	2022	2021	2022
	Gross Revenue from Cassava (₦)	Gross Revenue from Cassava (₦)	Gross Revenue from Component Crops (₦)	Gross Revenue from Component Crops (₦)	Total Gross Revenue (₦)	Total Gross Revenue (₦)
Sole Cassava	2,683,590	2,983,110	-	-	2,683,590	2,983,110
Cassava + Fluted pumpkin	2,457,510	2,701,265	272,640	288,800	2,730,150	2,990,065
Cassava + Akidi	2,654,310	2,898,159	137,862	136,728	2,792,172	3,034,887
Cassava+ Okra	2,566,560	2,771,792	184,295	192,000	2,860,890	3,176,484
Cassava +Pumpkin	2,513,750	2,788,060	347,140	388,424	2,795,990	2,904,593
Cassava + Egusi-melon	2,643,530	2,740,673	152,460	163,920	2,750,855	2,963,793
Cassava +Pumpkin +Okra	2,385,610	2,463,163	472,775	517,080	2,858,385	3,305,140
Cassava + Fluted pumpkin +Okra	2,332,400	2,462,300	324,068	350,050	2,656,468	2,812,350
Cassava +Akidi +Okra	2,602,070	2,770,000	231,700	241,230	2,833,770	3,011,230
Cassava + Egusi-melon +Okra	2,557,960	2,687,525	230,035	271,170	2,787,625	2,958,695

Source, field survey, 2021; **Note:** A ton of fluted pumpkin pods was N9, 600 in 2021 and N 10,000.00 in 2022. A ton of vegetable cowpea (Akidi) is 16,200 in both cropping seasons. A ton of okra in 2021 and 2022 were 14,500 and 15,500, respectively. Price of pumpkin was N17,000 and N18,400 in both cropping years while a ton of egusi melon seed were N22,000 and 24, 000 in both cropping seasons.

Net Returns and Cost/Benefit Ratios

Table 8 show that the net returns varied among the different cropping systems. The highest net returns were recorded in the cassava + akidi + okra system, with N 1,633,770 in 2021 and N 1,829,887 in 2022. The least net returns were recorded in the sole cassava system, with N 1,103,590 and N 1,353,610 in 2021 and 2022, respectively. The cost/benefit ratios showed that the cassava + akidi + okra and cassava + egusi melon + okra systems had an average ratio of 1.44, indicating that for every N1 spent, a farmer could expect to achieve N1.44. The sole cassava system had the lowest average cost/benefit ratio of 0.77.

Table 8: Net Returns and Cost/Benefit Ratios

Cropping Systems	Cost of Production		Net Returns		Cost/Benefit Ratio		Mean
	2021	2022	2021	2022	2021	2022	
Sole Cassava	2,683,590	2,983,110	1,103,590	1,353,610	0.70	0.83	0.77
Cassava + Fluted pumpkin	2,730,150	2,990,065	1,326,650	1,585,065	0.95	1.13	1.04
Cassava + Akidi	2,792,172	3,034,887	1,530,150	1,829,887	1.28	1.52	1.40
Cassava+ Okra	2,860,890	3,176,484	1,320,890	1,616,584	0.86	1.04	0.95
Cassava + Pumpkin	2,795,990	2,904,593	1,395,990	1,499,593	1.00	1.07	1.04
Cassava + Egusi-melon	2,750,855	2,963,793	1,550,855	1,763,793	1.29	1.47	1.38
Cassava + Pumpkin +Okra	2,858,385	3,305,140	1,408,385	1,830,140	0.97	1.24	1.11
Cassava + Fluted pumpkin + Okra	2,656,468	2,812,350	1,186,468	1,327,350	0.81	0.89	0.85
Cassava + Akidi + Okra	2,833,770	3,011,230	1,633,770	1,811,230	1.36	1.51	1.44
Cassava + Egusi-melon + Okra	2,787,625	2,958,695	1,587,625	1,755,695	1.32	1.46	1.44

Discussions

The variation in cassava height among the cropping systems can be attributed to the differing levels of competition for soil nutrients, space, and light. The significantly taller plants in the sole cassava treatment are likely due to the absence of competition from intercrops, allowing cassava to maximize its growth potential. In contrast, the intercropped systems, particularly those involving three crops, experienced more severe competition for these resources, resulting in shorter cassava plants. This observation is consistent with the findings of Adeniyan et al. (2014), who reported that intercropping cassava with other crops is productive and compatible, mainly because the component crops are typically short-season varieties, while cassava is a long-duration crop.

The significant differences in weed densities across the cropping systems highlight the influence of intercropping on weed suppression. The higher weed density observed in the sole cassava treatments can be attributed to the lack of competitive ground cover that intercrops provide. Conversely, the intercrops, particularly those with low-growing crops like akidi and egusi-melon, effectively smothered weeds, leading to lower weed densities and biomass. This aligns with the observations of Nwokoro et al. (2022), who noted the beneficial effects of intercropping on the growth and yield of cassava by reducing weed competition.

Regarding crop yields, the sole cassava cropping system recorded significantly higher storage root yields. This can be explained by the reduced competition for plant nutrients and space in the sole crop system. However, the yield difference between sole cassava and the cassava + akidi or cassava

+ egusi-melon systems was not statistically significant. This may be due to the ability of egusi melon and akidi to suppress weed growth, thereby reducing competition for resources. Additionally, akidi, being a leguminous crop, could have enhanced soil fertility by fixing nitrogen and adding organic matter, which benefited the cassava plants. These findings are supported by the work of Onwueme and Sinha (1991), who highlighted the positive impact of leguminous intercrops on soil fertility and subsequent crop yields.

The cost of production varied across the different cropping systems, primarily due to differences in the costs of planting materials, planting operations, and weeding. The higher costs associated with sole cassava were due to the increased need for weed management, as there were no intercrops to suppress weed growth. On the other hand, the intercropped systems, especially those involving low-growing crops like akidi and egusi-melon, had lower weed management costs due to their effective weed suppression.

The results also showed higher total gross and net returns to management in the intercropping systems, particularly the cassava + akidi + okra and cassava + akidi combinations. These systems not only provided effective weed control, reducing the cost of production, but also improved soil fertility and overall crop yields. This led to higher gross revenues and net returns compared to the sole cassava system, demonstrating the economic viability and benefits of intercropping in cassava production. These findings are in line with the economic analysis conducted by Adeniyan et al., (2014), which highlighted the profitability of intercropping systems involving cassava and other crops in Nigeria.

Conclusion

This study aimed to analyze the economic profitability and yield efficiency of different cassava-based cropping systems in Okigwe, southeastern Nigeria. The findings demonstrate the significant impact of intercropping on cassava growth, yield, weed management, and economic returns. Sole cassava stands yielded the tallest plants and the highest root storage yields due to reduced competition for nutrients and space. However, these systems also incurred higher weed management costs, reducing their overall economic efficiency.

Intercropping systems, particularly those involving cassava + akidi and cassava + egusi-melon, provided substantial benefits. These systems effectively suppressed weed growth, reducing weed density and biomass, which in turn lowered the cost of production. Moreover, the presence of leguminous crops like akidi improved soil fertility, enhancing cassava yields. As a result, intercropped systems recorded higher total gross and net returns, highlighting their economic viability.

The study underscores the importance of adopting diverse cropping strategies to achieve sustainable crop yields and income for farmers. By integrating suitable intercrops with cassava, farmers can improve resource use efficiency, reduce production costs, and increase profitability. These findings provide valuable insights for promoting diversification in agricultural practices, contributing to the economic stability and resilience of smallholder farmers in southeastern Nigeria.

Overall, the study advocates for the implementation of cassava-based intercropping systems as a strategic approach to enhance agricultural productivity and profitability, ensuring sustainable livelihoods for farmers in the region.

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