



THOMAS ADEWUMI  
UNIVERSITY,  
OKO, KWARA STATE  
Science | Technology | Medicine

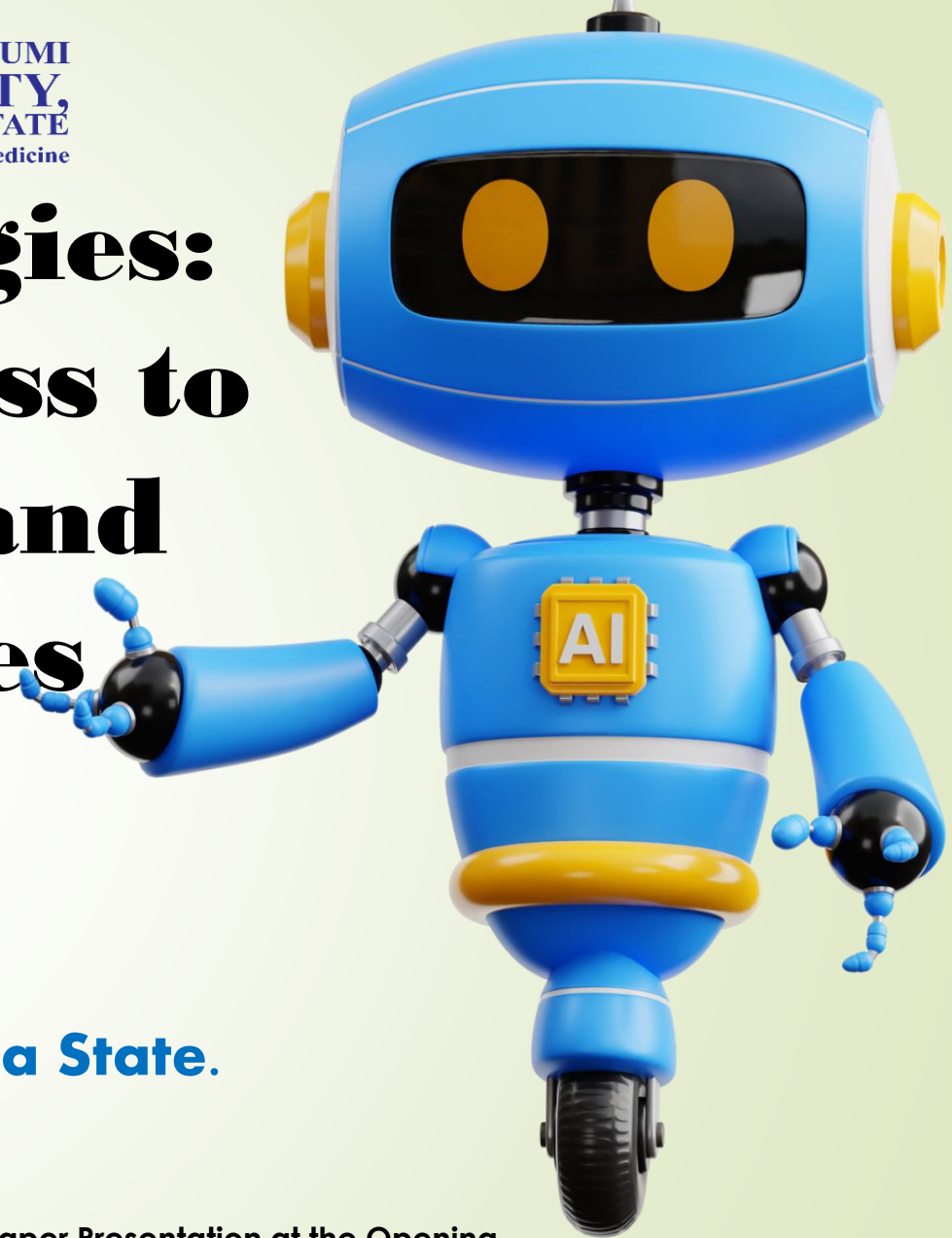
# AI-Driven Technologies: Revolutionizing Access to Quality Education and Healthcare Services

by:

**Professor Francisca O. Oladipo**

**Vice-Chancellor,**

**Thomas Adewumi University, Oko, Kwara State.**



Lead Paper Presentation at the Opening  
Ceremony of the Faculty of Communication & Information  
Sciences, Unilorin, 3<sup>rd</sup> International Conference on ICT for National  
Development and Its Sustainability (ICT4NDS2024), University of Ilorin,  
Ilorin.

*21<sup>st</sup> May, 2024.*

# Outline

- Introduction
- Sustainable Development Goals
- Artificial Intelligence (AI) for Sustainable Development Goals (SDGs)
- Conclusion and Recommendation.

# Introduction

- In an increasingly digitalized world, the intersection of technology and sustainability has become a focal point for global progress.
- Among the technological advancement tools, Artificial Intelligence (AI) and Big data stands out as a powerful tool driving sustainability efforts in the digital age.
- AI and Big Data are transforming society, economy and the environment.
- Their strategic implementation can drive sustainable development by solving complicated issues through innovative solutions.

# SUSTAINABLE DEVELOPMENT GOALS

- The United Nations Assembly set up SUSTAINABLE development Goals in the year 2015 which are intended to be achieved by the year 2030 by all the countries.
- These sustainable goals help in building sustainable communities, promoting better use of resources, eliminating hunger and inequality, and in ensuring social and environmental sustainability.





# SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



5/22/2024

# .....Urgency of Sustainable Development

- Humanity faces intertwined sustainability challenges
- Urgent action is needed to transition towards sustainable future.
- Sustainable development is crucial for meeting present needs without compromising the future.
- Harnessing the potential of artificial intelligence (AI) technologies offers a promising avenue to facilitate system-level changes and promote sustainable development.

# AI for Sustainability

- ❖ AI is a promising and powerful technology for sustainability.
- ❖ **Sustainability** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
- ❖ AI enables new technologies that improve efficiency and productivity.

Three main pillars of Sustainable Development:





# AI for Sustainability

- ❖ AI and big data has revolutionized various industries; Education and Healthcare are no exception.
- ❖ In healthcare systems: issues of accessibility, affordability, and disparities in service delivery, particularly in underserved communities.
- ❖ The integration of AI and big data presents a unique opportunity to tackle these challenges to optimize, resource allocation, personalize learning and treatment approaches, and improve overall system efficiency.



# Applications of AI in promoting SDG 3

3 GOOD HEALTH  
AND WELL-BEING



- ▶ Revolutionizing healthcare delivery through improved diagnostic tools and predictive analytics in healthcare: early disease detection, optimized treatment plans, and improved patient outcomes.
- ▶ Integration of AI drives transformative shift in healthcare: through innovative solutions for personalized care and learning experiences.
- ▶ AI's role in clinical practice is increasingly crucial; equipping healthcare providers with the necessary tools for disease diagnosis, treatment recommendations, and patient engagement.
- ▶ Use of big data analytics to inform population health management, disease surveillance, and the development of precision medicine approaches, ultimately leading to improved quality of care and better health outcomes.

# AI in Precision Oncology

- Tools leveraging AI and big data analytics has changed the field of oncology.
- Recent advancements in clinical oncology have been driven by the application of AI-based novel molecular strategies.
- Next-generation sequencing (NGS). NGS is a high-throughput platform that generates large amounts of data, making it ideal for studying cancer at the molecular level
- Utilizing NGS data for early-stage cancer detection, precise diagnosis, identification of target sites, and high-resolution medical imaging, using machine learning (ML) (Horak et al., 2016).

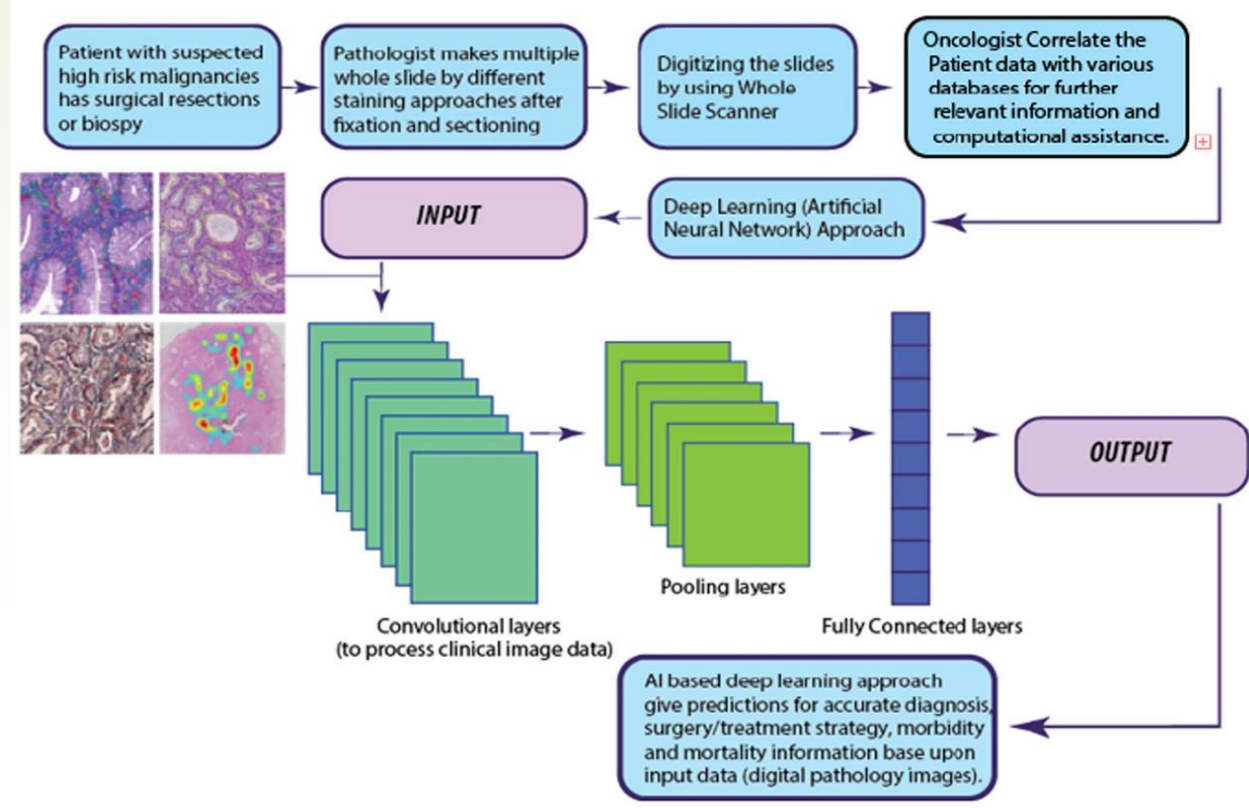


Fig 1: A typical AI workflow for AI in precision oncology

# AI in Surgery

- AI assistance has made a significant impact by reducing the occurrence of breast conserving surgeries (mastectomies) by 30.6% (Juwara et al., 2020).
- However, accurate prediction of high-risk cancer lesions through ML models using image-guided needle biopsies and pathological updates has become crucial in clinical practice.
- Research groups have developed random forest ML models to predict cancer survival and long-term cognitive outcomes.
- In a clinical study involving 335 high-risk cancer patients, the random forest ML model prevented nearly one third of unnecessary surgeries (Bahl et al., 2018).
- Given that breast cancer is the most prevalent cancer among women worldwide, several supportive ML studies have recently reported significant progress in detecting visual cancer signatures and determining novel prognostic factors using neural networks (Crosby et al., 2022; Topol, 2019).



# AI in Infant Care

- Infant care has always demanded precision and expertise, with healthcare professionals working tirelessly to ensure the well-being of newborns.
- AI tools for diagnostic of birth asphyxia and translations of infant cry (Gorin et al., 2023); AI algorithms can analyze the acoustic features of infant cries, such as pitch, intensity, and duration, to determine different types of cries associated with specific needs.
- By training on large datasets of cry recordings and correlating them with various factors like hunger, discomfort, pain, and fatigue,
- <https://www.ubenwa.ai>



Fig 2: Ubenwa landing page

# AI in Medical Speech Transcription

- Intron Health is a company at the forefront of this innovative technology. The company leverages AI and big data to revolutionize the health care sector (Onu et al., 2017; Gorin et al., 2023).
- It is time-saving.
- Enables doctors to be more focused while examining patients rather than manual data entry.
- Improves efficiency.
- Enhances the doctor-patient interaction; as doctors can maintain eye contact and engage more fully with their patients.

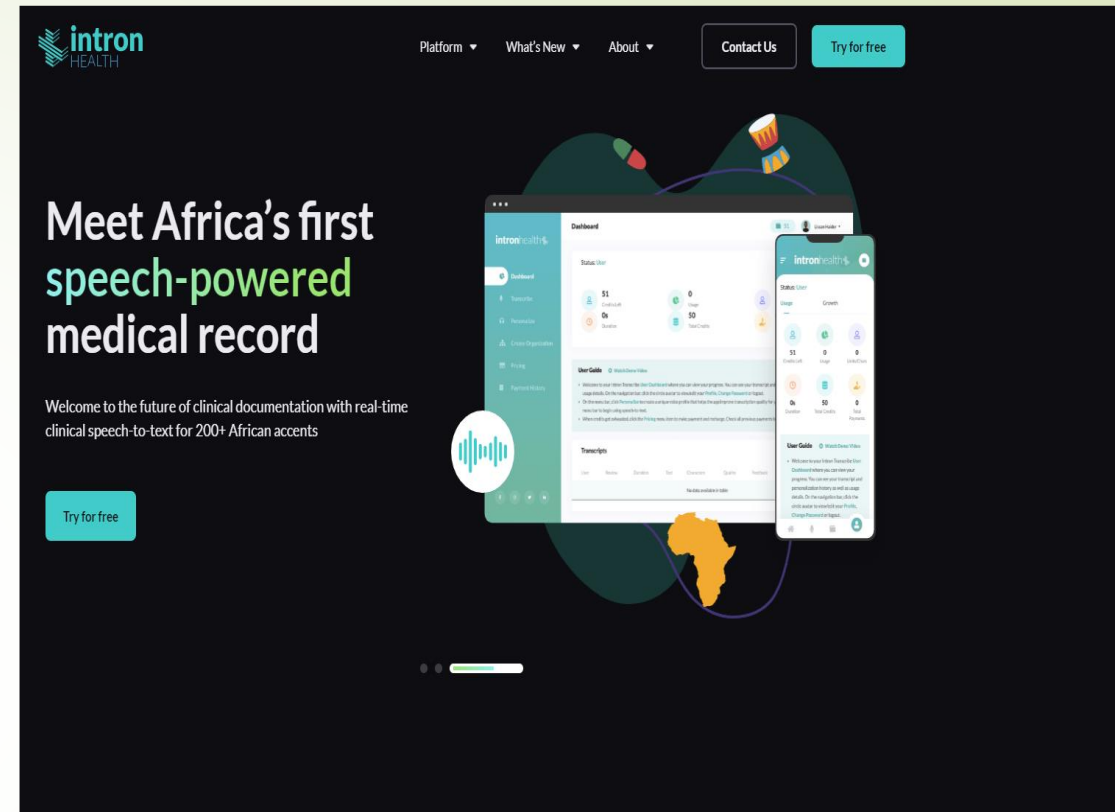


Fig 3: Intron Health landing page

# Applications of AI in promoting SDG 4

4 QUALITY EDUCATION



- Addressing the role of digital infrastructure, technology, and innovation for the achievement of SDG 4.
- The analysis of large-scale datasets can yield insights into student performance trends, learning outcomes, and educational efficacy, thereby enabling evidence based decision-making and policy formulation.
- AI systems have the potential to revolutionize education by tailoring learning experiences to individual students.
- Quality education at all levels through innovative instructional approaches, enabling a learner-centered outline that supports innovative, action oriented, and transformative learning for a sustainable future for all.
- Making a digital transition happen and at the same time achieve the SDGs.



# AI in Personalized Learning Experiences

- AI-driven personalized learning systems are changing the traditional one-size-fits-all approach to education.
- These systems analyze big data, including student performance metrics, learning styles, and engagement levels, to tailor educational experiences to individual needs
- Shoaib et al. (2024) proposed an AI student success predictor developed for forecasting retention or possible dropouts, automatic grading, and predicting student risk.
- The convolution neural network (CNN) and the ensemble models yielded 93% for both student grade prediction and risk assessment and 92% accuracy in predicting retention and dropout outcomes.

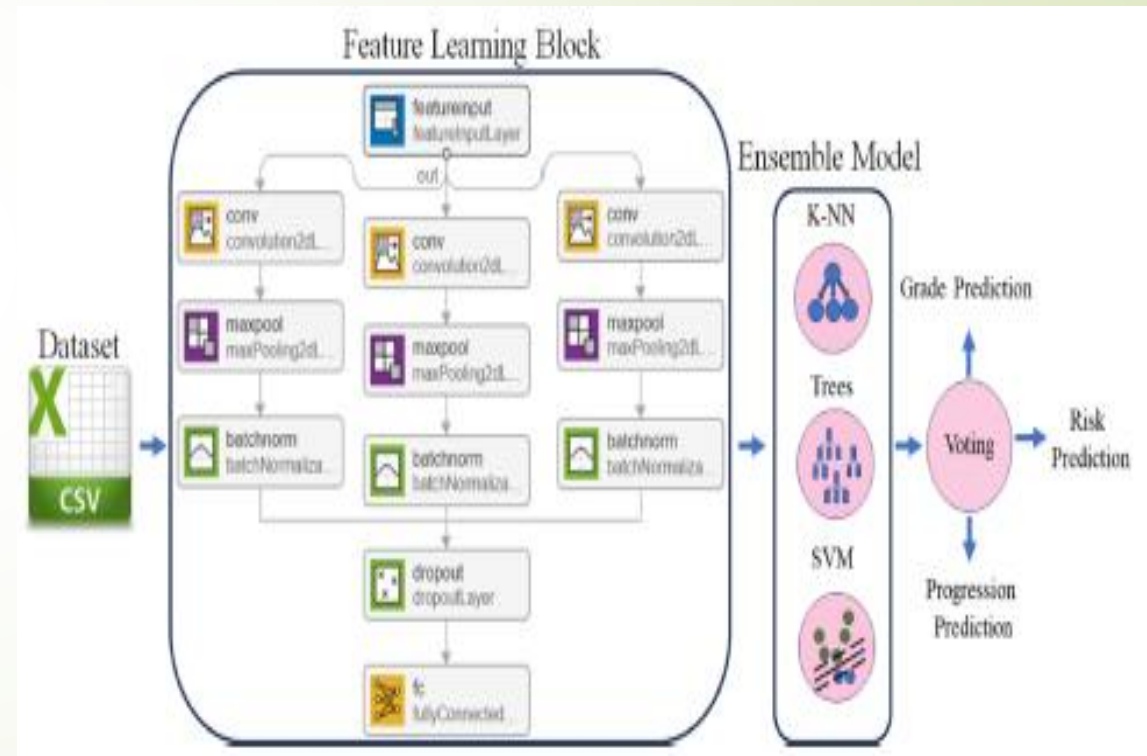


Fig 4: AI student success predictor

# Course Content Creation

AI and big data is a powerful tool that can catalyze significant sustainable development, particularly in developing educational tools such as course content creation tools.

Elbanna et al. (2024) investigated the penetration of AI tools for educational purposes.

AI algorithms have the capability to analyze large volumes of data to identify patterns, trends, and user preferences. When integrated with big data analytics.

AI can process and interpret vast amounts of structured and unstructured data, including user behavior, demographic information, and social trends.

Content generation using AI can play a pivotal role in promoting sustainable development initiatives.

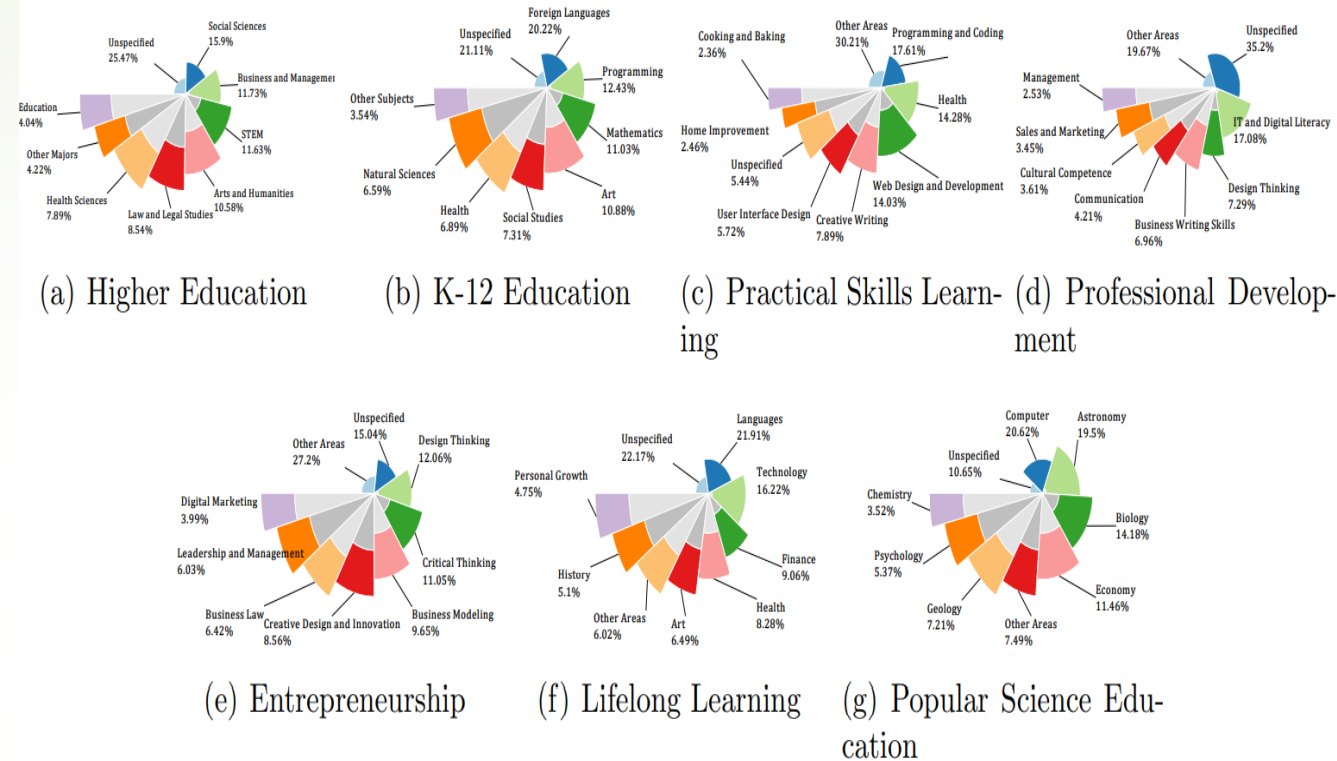


Fig 5: High adaptation of ChatGPT for content creation in diverse field

# Speech Recognition and Pronunciation Assistance

- AI driven speech recognition can enhance efficiency in education.
- Pivotal role AI played in breaking down language barriers and enabling seamless communication.
- Leveraging AI and big data for these purposes has the potential to greatly impact sustainable development by facilitating effective communication and learning opportunities for individuals across diverse linguistic backgrounds.
- Tran et al. (2023) developed a speech recognition algorithm running on the edge.

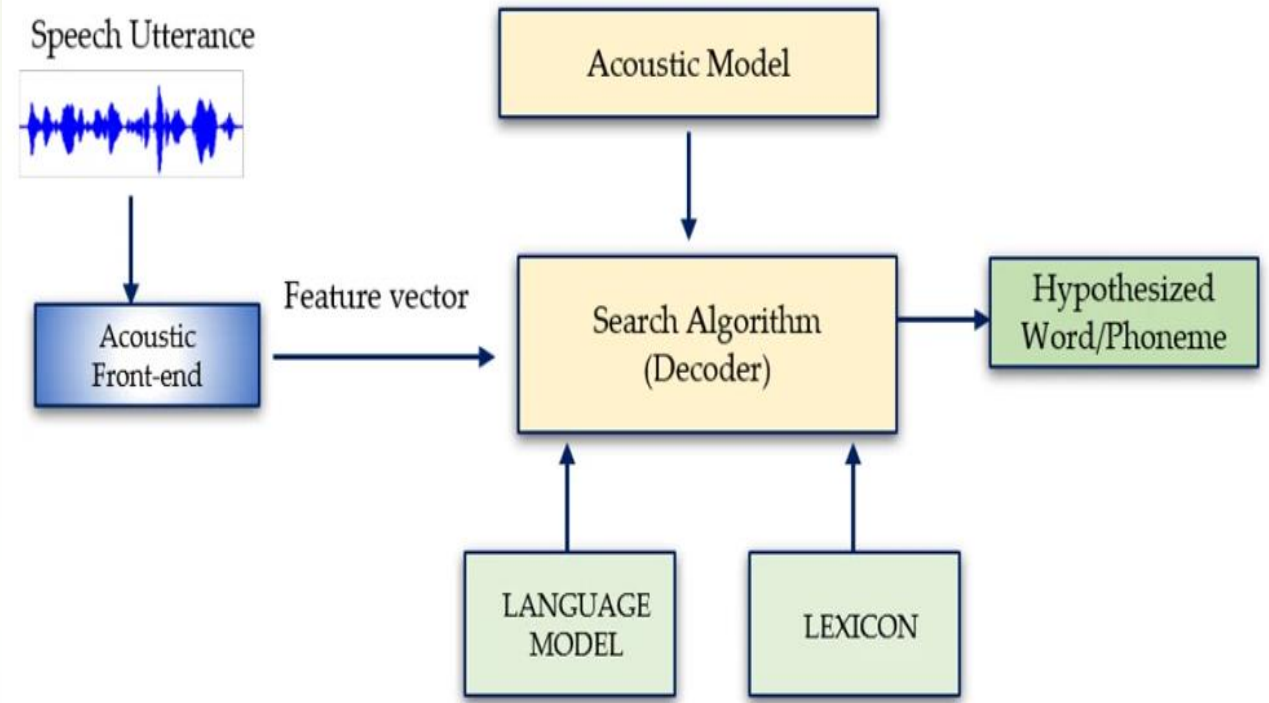


Fig 6: Edge deployment framework for automatic speech recognition in a number of languages.



# Gamification and Immersive Learning

- Gamification, powered by AI and big data, offers a dynamic and interactive approach to learning that transcends traditional educational methods.
- Enhances learner engagement
- Promotes the development of critical thinking, problem solving, and collaborative skills essential for sustainable development initiatives.
- Cruz Torquato et al. (2023) investigated the use of virtual reality in teaching anatomy to medical students. The findings from the students allude that virtual reality did not lead to a significant improvement in scores when assessed in the short-, medium-, and long-term.
- However, participants agreed in the motivation questionnaire that virtual reality offers a superior three-dimensional perspective of the human body, suggesting it has the potential to be a valuable supplementary tool for learning anatomy.



Fig 7: Mobile Robot aiding in STEM education



Fig 8: Virtual reality and AI in teaching

# Selected Solutions in Education Leveraging AI

## ➤ SmartCall: A Real-time, Sign Language Medical Emergency Communicator

- The research addresses the difficulty individuals with speech impairments face in conveying their thoughts, especially during medical emergencies.
- The paper proposes a low-cost embedded device using a 1D-convolution neural network (CNN) to classify American Sign Language (ASL) words related to medical emergencies, based on data from an inertial measurement unit.
- The device achieved an offline accuracy of 91.2% and an online accuracy of 92% for the optimized model, demonstrating its potential to aid speech-impaired individuals during emergencies.

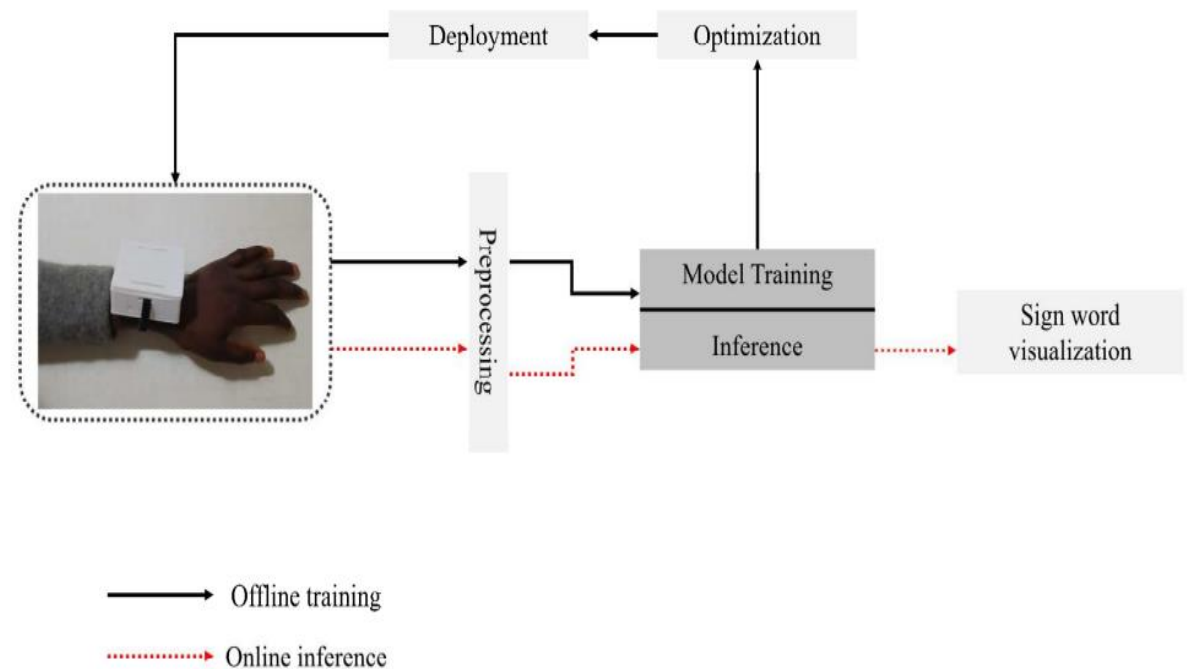


Fig. 9: Proposed device for sign language communication (Dere et al., 2022)



## ■ An end-to-end Framework for Translation of American sign language to Low-Resource Languages in Nigeria

- The paper introduces a novel framework for translating American Sign Language (ASL) to low-resource languages (LRL) in Nigeria, focusing on Hausa, Ibo, and Yoruba.
- The study utilizes a Transformer-based model for ASL-to-Text generation and a translation model for English to LRL conversion; the ASL-to-Text model's performance is measured using BLEU scores, indicating moderate translation accuracy.
- The study highlights the framework's potential to improve socio cultural interactions and educational access for the Deaf and Hard of Hearing (DHH) community in low-resource settings.
- The study is a step towards enabling persons with speech impairment access to work in the education sector without prejudice.

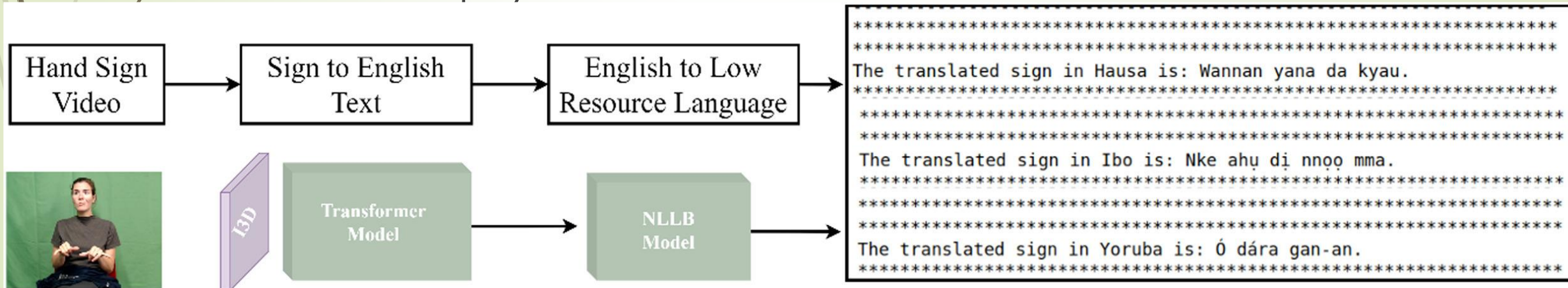
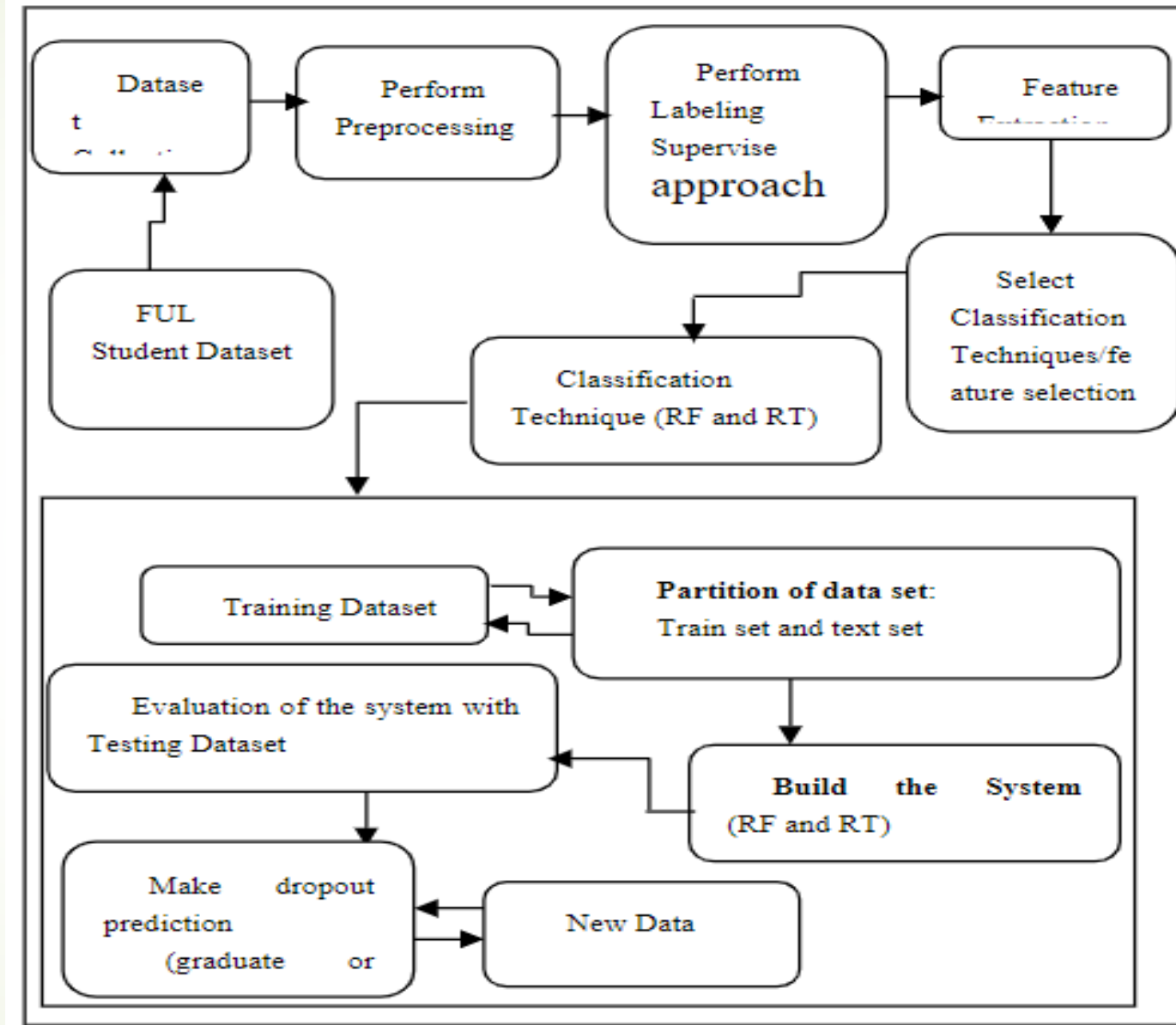


Fig. 10: Proposed framework for translation of American sign language to Yoruba, Ibo and Hausa (Sani et al., 2023)



## • Development of a Predictive Model of Student Attrition Rate

- The study aims to develop a predictive model that can accurately forecast the attrition rate of students in educational institutions.
- The study adopts classical machine learning techniques to analyze historical data and identify patterns related to student dropouts.
- Help institutions understand and mitigate factors leading to attrition, improving student retention.
- Moreover, the proposed solution can be used for policy-making, curriculum design, and targeted interventions to support at-risk students.



5/22/2024

Fig. 11: Proposed solution for predicting student attrition (Sani et al., 2023)

# Event-Driven Edge Deep Learning Decoder for Real-Time Gesture Classification and Neuro-Inspired Rehabilitation Device Control

- The study introduces an event-driven deep neural network (DNN) for real-time gesture classification from biosignals, aimed at controlling neuro-inspired rehabilitation devices. A hybrid-modal biosignal approach, combining electromyography (EMG) and electroencephalography (EEG), showed improved performance over single-modal EEG in gesture classification.
- The study outlined the significance of EMGEEG signals fusion. The fused data and proposed DNN in the study are aimed at building rehabilitation and prosthetic devices for stroke, spinal cord injury and amyotrophic lateral sclerosis patients (Dere et al., 2023).

- **Design of a FAIR digital data health infrastructure in Africa for COVID-19 reporting and research**

- The paper discusses the design of a digital data health infrastructure in Africa for COVID-19 reporting and research.
- It emphasizes the need for a FAIR (Findable, Accessible, Interoperable, Reusable) data architecture to address concerns about data ownership and the limited use of health data for quality treatment at the point of care.
- The architecture proposed as VODAN enables clinical and research data to be accessed across continents in real-time, enhancing the availability of African health data.

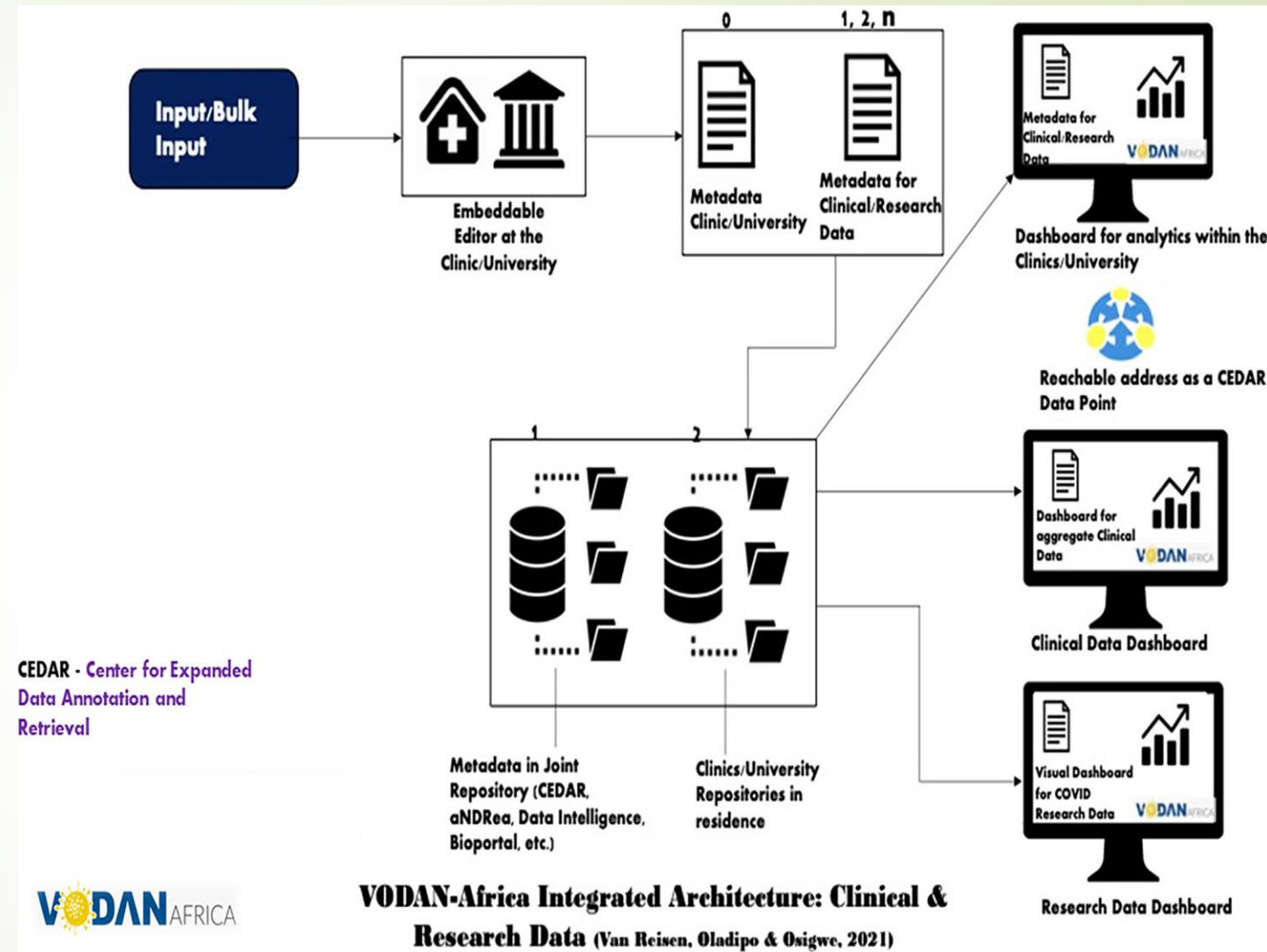


Fig. 12: The framework for big data acquisition



# Sentimental Analysis Model for Twitter on COVID-19 Vaccine

- The paper presents a sentiment analysis model to categorize tweets related to COVID-19 vaccines into positive, negative, or neutral sentiments.
- The authors indicated that Americans showed slightly more positive sentiment towards COVID-19 vaccines compared to Indians, with a difference of 3.26%.
- The overall sentiment in both countries was positive, suggesting support for the vaccination efforts. The study highlights the potential of using big data and AI for far-reaching effects in sustainable development (Oladipo et al., 2022).

# Conclusion and Recommendation

- AI and Big Data have the potential to drive sustainable development by integrating into environmental, economic, and social initiatives.
- In this paper, we have critically examined an array of recent literature, comprehensively exploring the potential of AI and big data in fostering sustainable development, particularly in education and healthcare sectors.
- The impact of AI on driving sustainability in the digital age is profound and multifaceted, by harnessing the power of AI technologies, we can address pressing environmental challenges and pave way for a more sustainable future.
- However, realizing the full potential of AI for sustainability requires collaborative efforts from Governments, industries and communities.
- Through innovation, collaboration and a shared commitment to sustainability, we can harness the transformative power of AI to create a sustainable FUTURE. 5/22/2024



**THANK YOU.**