WINEST/Tech. Rangers Research Group : Its involvement in ITU-T

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Overview

- Introduction of Next Generation Technologies AI/ML in Communication Network
- Opportunities in Embracing Next Generation Technologies
- Challenges in Africa
- The Journey so far with our WINEST Research Group
- List of awards and Certificate

Introduction

- WINEST/Tech. Rangers Research Group : Its involvement in ITU-T: The WINEST/Tech Rangers Research group experience
- Provide an overview of the journey so far in Nigeria West Africa

WINEST & Tech Rangers

- WINEST means “Wireless Network and Embedded System Technology Research Group”

- This is are student centred research group aimed at attending to various problem statements from use cases in ITU-T

Our Journey so far at Advancing AI/ML in communication Networks

The WINEST Experience

WINEST was set up as a research group with the following objectives:

- Create a platform where young University student will come together and attend to problem statement for particular use case.
- Students are sub-divided into groups and are assigned various task
- The groups are assigned various problem statements to attend to.
- We host weekly meetups to bolster quality submissions from the country and internationally.

Research team Training and Learning Process

- At first the student are made to go through orientation programme from the mentors.
- Meetings are held ones every week to attend to some of the problems highlighted
- Students in the research group are assigned task to evolve techniques for solving the problem.

Implementation

- Simulations and models are developed using various software and Cloud-based tools tools to implement and find solutions to the problem.

Exhibition and Presentation

This solutions are usually exhibited and showcased at the ITU-T workshops to get questions and feedbacks from industry and academia experts.

Benefit of Build a Thorn Competition

- The next is the Build a Thorn Competition
- The competition attract various research group around the world
- The platform afford the research group the opportunity compete and also benchmark their work with other contemporaries around the world.

AI/ML in Communication Networks

- Artificial Intelligence (AI) and Machine Learning (ML) approaches, have establish itself in the field of Communication networks.

- Communication Networks can be clustered into AI/ML techniques for network monitoring and management.

- AI/ML techniques help in network management, operations & automation and also address the design and application of AI/ML techniques to improve the way we address networking today.

- Recently, networking has become the focus of a huge transformation enabled by new models resulting from virtualization and cloud computing.

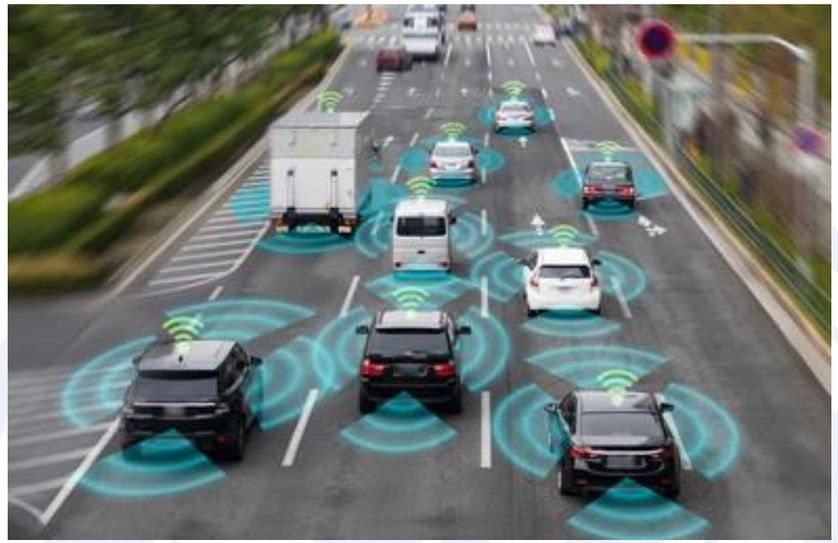
Apply AI/ML To reduce the cost of faults in the network

- Study use cases for applications in 6G
- Create models from around the world
- Fine tune with local data
- Monitor with human feedback

When you are in a developing region, Leap-frog to technology

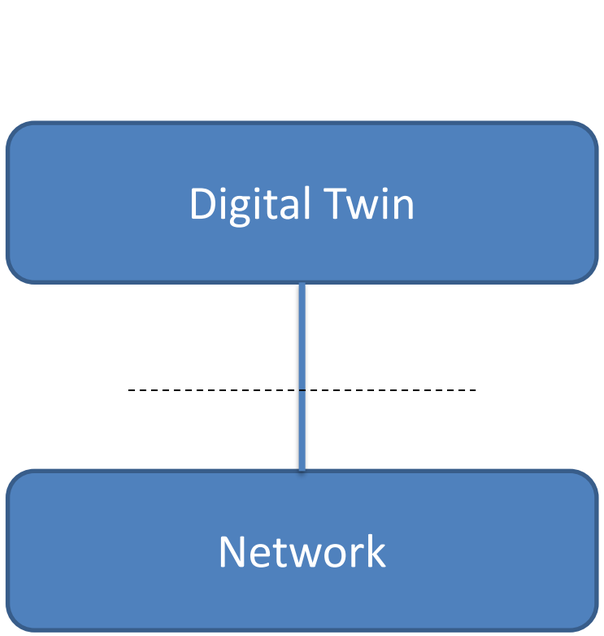
To reduce the cost of faults in the network.

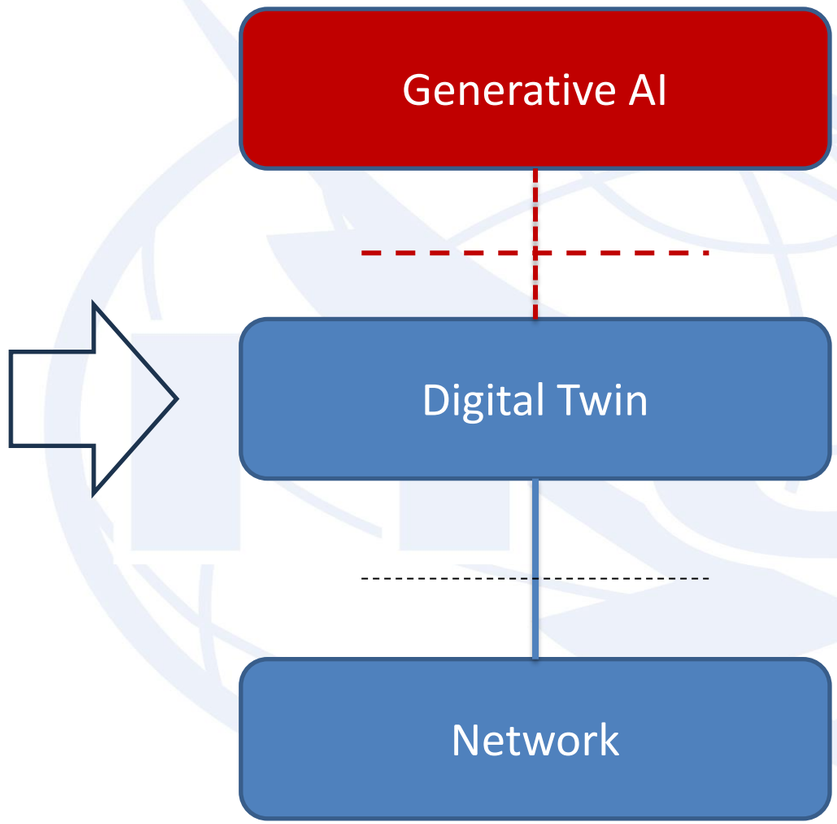
Network slicing Use Case(Vertical Industries)



Collaborate to study the locally relevant use cases.

How to reduce the cost of innovation?





When you don't have $$$ for innovation budget, Generate data and innovations.

Question: Can Generative AI solve the problem of biased data for 6G?

Network orchestration

- We refer to Network Service Orchestration (NSO) as the automated management and control processes

- This involved service deployment and operations performed mainly by telecommunication operators and service providers, involving different types of resources and potentially multiple providers

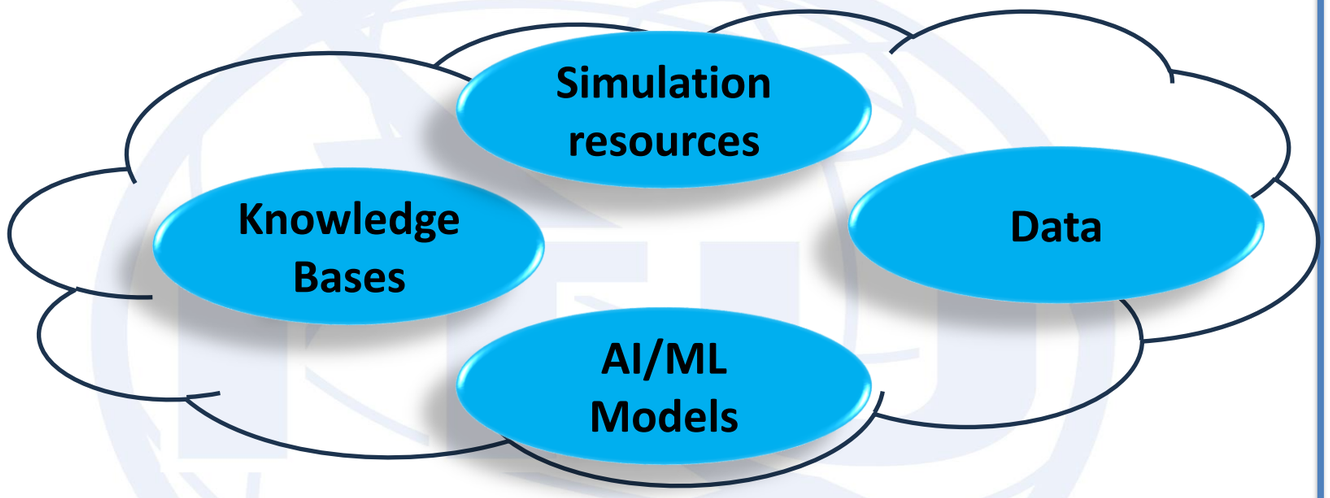
- *Network orchestration is simply network automation – it can be described as policy-based or event-driven automation.*

- *While automation involves 'making a single task run by itself without human intervention,' orchestration goes many steps further by automating entire 'processes,' i.e., 'a sequence of interrelated tasks.'*

- *The mechanism of orchestration is defined by a set of rules or policies laid down by the organization*

How to reduce the cost of automation?

- As part of WINEST presentation to ITU-T RG13 AFR
- The analysis of Zero-touch network and Service Management Requirements document was done.
- Reference points, requirements and gaps related to AN were derived.



A Pre-standard study of sharing knowledge base, simulation resources, Models and data is must for cost-conscious regions.

Pool knowledge bases and experiments From ITU

Challenges in Africa

- Epileptic power Supply
- Internet Connectivity
- Low percentage penetration in terms of AI/ML awareness
- Lack of Proper Mentorship
- Funding Challenges

The WINEST blueprint for ITU Academia collaboration

ITU FG ML5G Student projects

- More than 3 contributions from WINEST

ITU News Magazine for ML in 5G

- Article highlighting the research projects in Nigeria.

ITU RG13 AFR 7th workshop

- “Use cases and solutions for migrating to IMT-2020 networks in emerging markets”

ITU RG13 AFR 8th workshop

- “An in-depth study of existing standards related to autonomous networks”

ITU FG AN Build-a-thon

- 2021: 1st Position, Network resource allocation for emergency management based on closed-loop analysis
- 2022: 3rd Position, Baseline representation of AN controllers

ITU TinyML Challenge

- 3rd Position, Development of a smart weather Station

Step-1: Form a team of scholars and students

Step-2: Weekly meetings brainstorming the relevant problem statements

Step-3: Wider consultation in ITU meetings and submissions

A seat in the table for Students and professionals from Africa Region

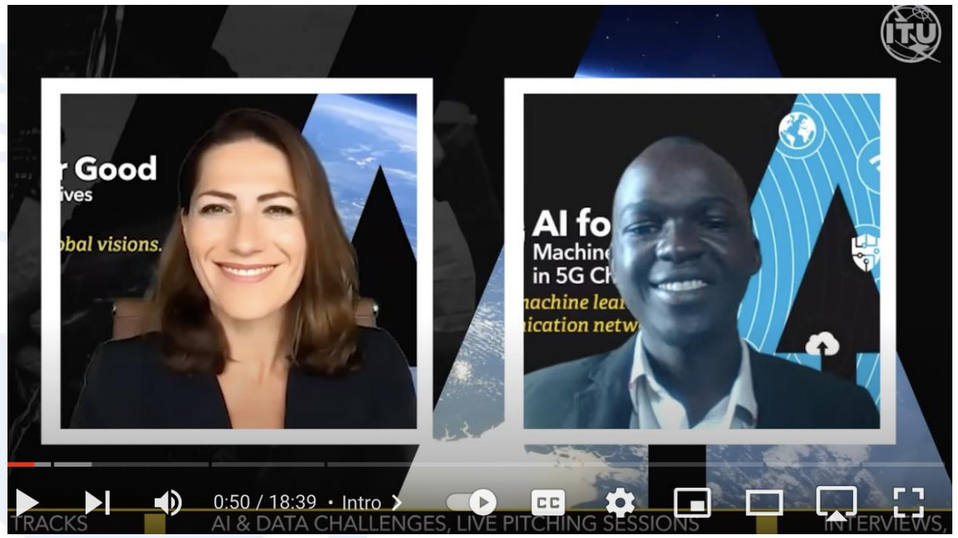
Research projects in Nigeria advancing education and speech recognition

By James Agajo, Associate Professor and Head of WINEST Research Group, Department of Computer Engineering, **Abdullahi Sani Shuaibu** and **Blessed Guda,** Students, Federal University of Technology, Minna, Nigeria

https://www.itu.int/en/itunews/Documents/2020/2020-05/2020_ITUNews05-en.pdf

What is important take away from today?

- Developing nations' perspective gives an opportunity and challenge at the same time.
- WINEST, FUT Minna, Nigeria is an important local partner in the region, we have been contributing significantly to ITU and Regional groups.
- It is important that ITU continues its initiatives for academia, bringing pre-standards research.
- It is high time to start a focus group for machine learning in 6G. WINEST group will collaborate with ITU to contribute to such efforts.

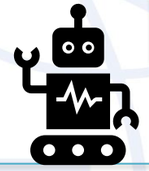


https://www.youtube.com/watch?v=PmFM8i_zYxk

What we need in ML6G?

Mentoring: Collaborating with ITU is important for academia in developing countries.

AI for developing nations:



Open RAN and AI and network autonomy can be help developing nations.

Creating open knowledge bases: Publish open knowledge bases and lower the barrier for contributions.

Reference LLM hubs:

Publish open LLMs for 6G

WINEST Nigeria is helping to train a chatbot which can talk to contributors

ITU FG-AN

- The use cases and architecture deliverables of ITU FG AN been collaboratively done with participation from developing countries such as Nigeria has help the team immensely.
- In addition, one of the important initiatives of the FG has been the proof of concept implementations in the form of Build-a-thon.
- Build-a-thon has enabled diverse participation from developing countries such as Nigeria of which WINEST is a beneficiary.

Events

- Build-a-thon 2021 and 2022 were major initiatives of ITU-T FG AN in collaboration with ITU-T AI/ML in 5G Challenge.

WINEST Research Group FUT Minna, Nigeria has featured in all event.

Focus Group on Autonomous Network

FG-AN provided reference code and hands-on workshops with demonstrations from across the world helped the teams to understand and contribute much needed practical demonstrations of the use cases.

ITU Events/Activities

- 12 teams from across the world (including from Nigeria) registered to participate in 2021.
- A collaborative paper was published in ITU Journal on Future and Evolving Technologies in 2021 co-authored by FUT Minna team.
- And another paper based on 2022 Build-a-thon was submitted to ITU J-FET, co-authored by FUT Minna team.
- 2022 Build-a-thon paper that was submitted to ITU J-FET and co-authored by FUT Minna team has been published

Research carried out by WINEST Research Group

- Import and Export of knowledge in an autonomous network -2023

- Intent Driven Closed Loops for Autonomous Networks. - 2022

- PANDEMIC MANAGEMENT USING AI/ML IN AFRICA called Pandemic Tracing Application (PTA) to manage the COVID-19 pandemic. -2020

- Research projects in Nigeria advancing education and speech recognition -2019

ITU News MAGAZINE

No. 5, 2020

AI and Machine Learning in 5G

Lessons from the ITU Challenge

Research projects in Nigeria advancing education and speech recognition

By James Agajo, Associate Professor and Head of WINEST Research Group, Department of Computer Engineering, **Abdullahi Sani Shuaibu** and **Blessed Guda,** Students, Federal University of Technology, Minna, Nigeria

As part of our participation in the ITU Focus Group on Machine Learning for Future Networks including 5G (FG-ML5G), in March 2019, our WINEST (Wireless Networks and Embedded Systems Technologies) Research Group launched a study on "use cases and solutions for migrating to IMT-2020/5G networks in emerging markets".

Improving education in Africa

This study led us to propose the "AI-Based Classroom" project,

MENTORS ENCOURAGEMENT AWARD

ITU AI/ML in 5G Challenge

In recognition of their active participation in their problem, we appreciate

Guda Blessed, Ibrahim Aliyu, and James Agajo

for having completed and submitted a solution to the problem statement "Build-a-thon(PoC): Network resource allocation for emergency management based on closed loop analysis" in the ITU AI/ML in 5G Challenge 2021

14 December 2021

Houlin Zhao
Secretary General, ITU

Chaesub Lee
Director, ITU Standardization Bureau

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Ministry of Science and ICT

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ITU

FINALIST CERTIFICATE

ITU AI/ML in 5G Challenge

This is to recognize

Ebeledike Frank Chukwubuikem, Emmanuel Othniel Eggah, Abel Oche Moses, Yemisi Esther Akinseli, Agabaidu Abraham Sunday and Dr. James Agajo

who were members of the team which completed and submitted a solution, and who were also finalists in the Grand Challenge Finale for the problem statement "BYOC: Build your own Closed loop" in the ITU AI/ML in 5G Challenge 2022

14 December 2022

Houlin Zhao
Secretary General, ITU

Chaesub Lee
Director, ITU Standardization Bureau

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WINNER CERTIFICATE

tinyML Challenge

Bronze Champion (3rd prize)

is presented to

Aaron Emmanuel, Michael Selnan Meshach, Isaiah Terhide Barnabas, and Blessed Guda

for their innovative solution to the problem statement
"Smart weather station" in the ITU AI/ML in 5G Challenge 2022

15 December 2022

Houlin Zhao
Secretary General, ITU

Chaesub Lee
Director, ITU Standardization Bureau

NETWORK RESOURCE ALLOCATION FOR EMERGENCY MANAGEMENT BASED ON CLOSED-LOOP ANALYSIS

Guda Blessed[1], Ibrahim Aliyu[2], James Agajo[1], Thiago Lima Sarmento[3], Cleverson Veloso Nahum[3], Lucas Novoa[3], Rebecca Aben-Athar[3], Mariano Moura[3], Lucas Matni[3], Aldebaro Klautau[3], Deena Mukundan[4], Divyani R Achari[4], Mehmet Karaca[5], Doruk Tayli[6], Özge Simay Demirci[5], V. Udaya Sankar[7], Sai Jnaneswar Juvvisetty[7], V.M.V.S. Aditya[7], Abhishek Dandekar[8], Shabnam Sultana[9], Jinsul Kim[2], Vishnu Ram OV[10]

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Abstract *– The telecommunication system being a critical pillar of emergency management, intelligent deployment and management of slices in an affected area will help emergency responders. Techniques such as automated management of Machine Learning (ML) pipelines across the edge and emergency responder devices, usage of hierarchical closed-loops, and offloading inference tasks closer to the edge can minimize latencies for first responders in case of emergencies. This study describes the major results from building a Proof of Concept (PoC) for network resource allocation for emergency management using a hierarchical*

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BUILD YOUR OWN CLOSED LOOP: GRAPH-BASED PROOF OF CONCEPT IN CLOSED LOOP FOR AUTONOMOUS NETWORKS

Jaime Fúster de la Fuente[1], Álvaro Pendás Recondo[2], Paul Harvey[3], Tarek Mohamed [4], Chandan Singh[5], Vipul Sanap[5], Ayush Kumar[5], Sathish Venkateswaran[6], Sarvasuddi Balaganesh[6], Rajat Duggal[6], Sree Ganesh Lalitaditya Divakarla[7], Vaibhava Krishna Devulapali[7], Ebeledike Frank Chukwubuikem[8], Emmanuel Othniel Eggah[8], Abel Oche Moses[8], Nuhu Kontagora Bello[8], James Agajo[8], Wael Alron[9], Fathi Abdeldayem[9], Melanie Espinoza Hernández[10], Abigail Morales Retana[10], Jackeline García Alvarado[10], Nicolle Gamboa Mena[10], Juliana Morales Alvarado[10], Ericka Pérez Chinchilla[10], Amanda Calderón Campos[10], Derek Rodríguez Villalobos[10], Oscar Castillo Brenes[10], Kodandram Ranganath[6], Ayushi Khandal[6], Rakshesh P Bhatt[6], Kunal Mahajan[11], Prikshit CS [11], Ashok Kamaraj[6], Srinwaynti Samaddar[6], Sivaramakrishnan Swaminathan[6], M Sri Bhuvan[12], Nagaswaroop S N[12], Blessed Guda[13], Ibrahim Aliyu[14], Kim Jinsul[14], Vishnu Ram[15]

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Conclusion

- The ITU collaboration with academia is of great benefit to the students now
- Its has up-skill the student beyond their other contemprories
- We look up to future collaboration in this regards


感謝你
Danke
Grazie
Gracias
Merci
Thanks!
THANK YOU!

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