CSC Newsletter

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Post COVID-19: Restructuring Computing Programmes in Nigerian Universities

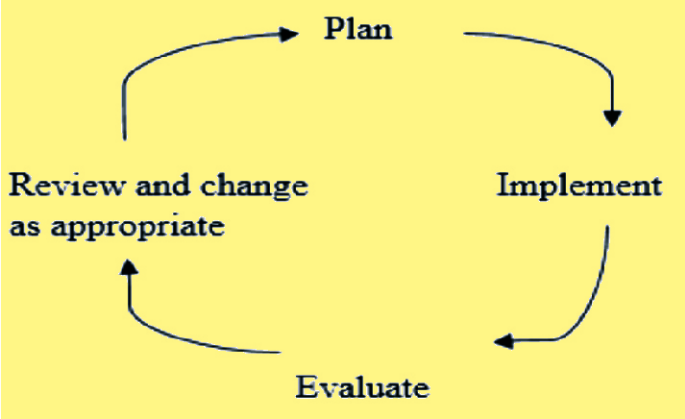
Governments, businesses and academic institutions around the world are currently facing unprecedented crises caused by the coronavirus disease (COVID-19). Universities and colleges including primary and secondary schools have remain closed while most vital meetings of government and business agencies are now held via virtual communication. However, few schools have partially resumed activities by leveraging on the support of Information Technology (IT) tools such as Zoom meeting, Google Classroom, Microsoft Teams and Skype technologies, among others for teaching and learning. In this period of COVID-19, arguments have been on the survival of citizens as many jobs are at risks and are expected to be lost after the pandemic.

Prof. Olusegun Folorunso,
Head, Department of Computer Science

There are many public opinions that most organisations may require jobs with computing skills and supporting services for the Post COVID-19 era. This indicates that skilled computing graduates would be highly marketable and employable despite shocks in the global employment market. As computing programmes are offered in almost all universities (private and public) and other higher education institutions across Nigeria at undergraduate and graduate levels, the quality of such programmes needs to be evaluated or appraised to ensure compliance with international best practices. Restructuring computing programmes is necessary to meet up with societal demands for highly-skilled computing professionals with adequate knowledge in software engineering, information systems, cyber and information security, computer network systems, human-computer interactions, Artificial Intelligence and other areas that are needed in solving analytical problems.

Hence, academic quality assurance in computing departments of universities is now of utmost importance more than ever before. In the context of computing programmes in Nigerian universities, quality assurance is defined as the systematic planning, monitoring and evaluation to sustain and improve the standards of teaching computing courses, conduction of computing researches, and applying its outputs as solutions to community challenges. It is needed to maintain high quality in computing education, which depends on the learning environment that encourages updated computing knowledge.

Quality assurance should take place in accordance with a plan that ensures continuity and has an overview. Schematically, it can be described as a recurring process consisting of four phases as follows:



QUALITY ASSURANCE CYCLE

During the planning phase, educational objectives of floating the computing department are to be defined and the pedagogy of teaching planned. In the implementation phase, knowledge, skills and general competence are to be acquired and evaluation carried out to determine the progress made in accordance with the set objectives. On completion of a computing course in a semester or academic session, students' results are to be reviewed and aimed at improving the course according to its objectives. Quality assurance development system ensures the output by academic and non-teaching staff in terms of sufficient and quality practical skills, equipment in computing laboratories, libraries, access to Internet for e-resources and students' enrolment. Universities should enforce only merit-based enrolment exercise as the process for admitting computing students should be evaluated and reviewed annually by the admissions committee since the quality of students enrolled would metamorphose into the quality of graduates being produced.

Curriculum delivery is very important to the lecturers in respect of providing national relevance as well as producing globally-competitive and innovative graduates. The quality and relevance of research undertaken by staff and students have to be reviewed and notes compared with other world-class universities on the acceptable standards of teaching, research and publishing scientific studies in high impact journals. To ensure quality, essential support services from centres in the universities should be given to the computing department. Performance indicators such as student-success ratio, post-course success ratio and client/stakeholders' satisfaction of graduates should be used for internal quality assessment.

Meanwhile, external assessments, which are usually conducted by government agencies such as the National Universities Commission (NUC), also called NUC accreditation exercise, occur every five years for each programme. The tools used to conduct the exercise include the Benchmark Minimum Academic Standards (BMAS), self-study reports and accreditation evaluation forms. This edition also covers interesting topics such as Trust Management: Useful Tool for Mobile Edge Computing; What it takes to Develop Mobile App- CSC Student Shares IT Experience; CSC Collaborates Tourism Sector for Mobile App Development; Sustainable Development Goals stories; and Upcoming Event.

Prof. Olusegun Folorunso is the Head, Department of Computer Science, Federal University of Agriculture, Abeokuta.

Trust Management:

USEFUL TOOL FOR MOBILE EDGE COMPUTING

Dr. Olaniyi Aborisade

The Fifth Generation (5G) is the mobile network designed to address the challenges posed by the demand for high rate of mobile communications, fully connected societies, 3D video, work and play in the cloud, virtual and augmented reality, massive machine-to-machine, and remote medical services. According to Huawei (2016), a 5G technology is expected to lead to a new paradigm where one network service would effectively support several service demands and mark the beginning of the migration from personal digitalisation to society digitisation.

With 5G mobile technologies, many smart cities would be created through the connection of people, devices, things, data, applications, and transport systems. An expected increase in the growth of devices, data and the need for its transfer in decades to come has necessitated the design of 5G technology. Choi et al (2018) highlighted remote surgery, robotic telesurgery, virtual realities, Internet of Things (IoT), Machine-to-Machine (M2M) communication, Device-to-Device (D2D), robotics autonomy, virtual interactive presence, and smarter medication as some of the emerging technologies that would characterise the era. The need for large storage and processing capabilities for huge volume of real-time data (3D video and image) that would meet the latency power introduced by 5G, has brought about Mobile Edge Computing (MEC). MEC is an emerging technology for 5G networks. Zhang (2018) described MEC as a natural development to move the computing and storage unit to the edge of the network close to where data is generated.

In the aforementioned technologies, the need to ensure interoperability of the different devices and transacting technologies in 5G era cannot be over-emphasised for there is a need for effective trust management of the entities that 5G would drive. According to Fan et al (2020), trust management involves trust propagation, trust aggregation, trust description, trust data storage by determining the component parts of trust and how to calculate trust. It also involves the anticipation or trustworthiness level of an individual or a machine for better and effective service provisioning. Figures 1 - 4 below depict how the four different trust management schemes could support 5G-based systems. Figure 1 talks about a prediction-based trust management where similar minded entities (service consumers) are more likely to trust each other. The service consumer x has some capabilities and interests as represented in a vector space model by $i_x = \{i_1, i_2, \ldots\ldots i_n\}$ and a certain minimum trust threshold T_x, which is used to determine whether to the other cloud service consumer, the same threshold is applied to determining trust among service providers.

Figure 2 describes the recommendation technique where a service consumer x recommends consumer z to the service provider y because there is a trusted relation between x and y. Figure 3

shows the architecture for policy-based architecture where a consumer applies certain control policy credentials or credibility to determine whether to proceed with a transaction or not. Figure 4 shows reputation model where the service consumer i with a certain minimum trust threshold T_n and the service provider j with trusted relation $Tr(j) = \{r_1, r_2, .r_m\}$ which gives trust feedbacks on the service provider given as $Tf(j) = \{f_1, f2, ...f_n\}$ These feedbacks are used to calculate the reputation of j, which is Rep(j) . The service consumer i determines whether to proceed with the transaction based on the reputation result of j .

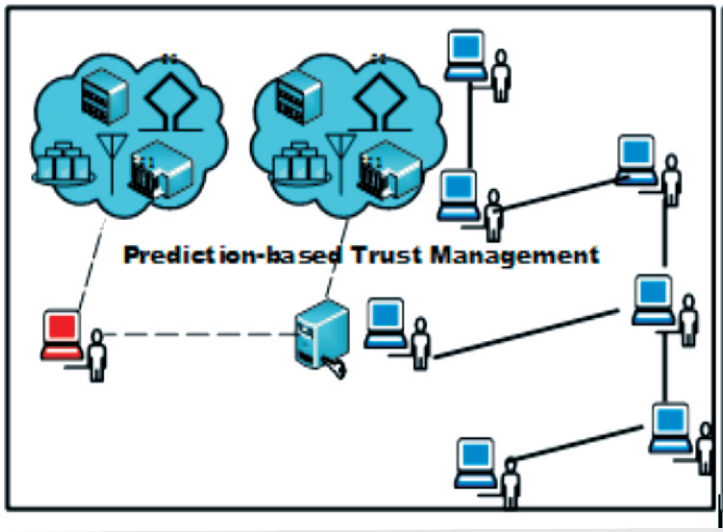


Figure 1: Prediction-based Trust Management

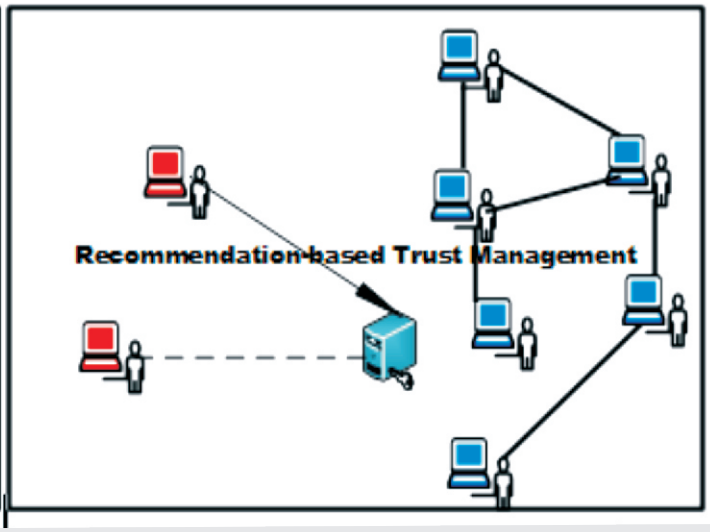


Figure 2: Recommendation-based Trust Management

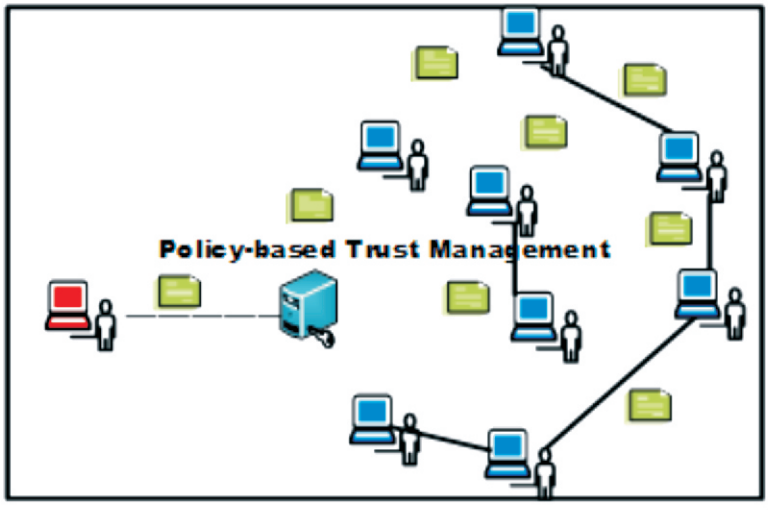


Figure 3: Policy-based Trust Management

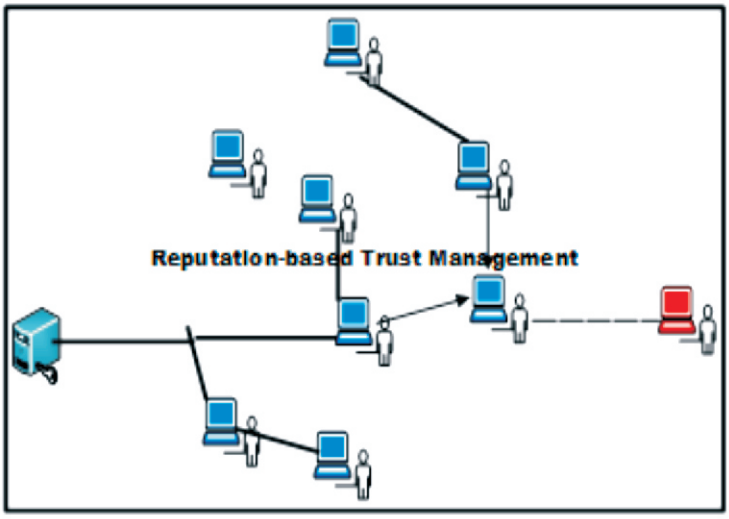


Figure 4: Reputation-based Trust Management

Dr. Olaniyi Aborisade is a lecturer, Department of Computer Science, Federal University of Agriculture, Abeokuta with special interest in Cyber and Information Security

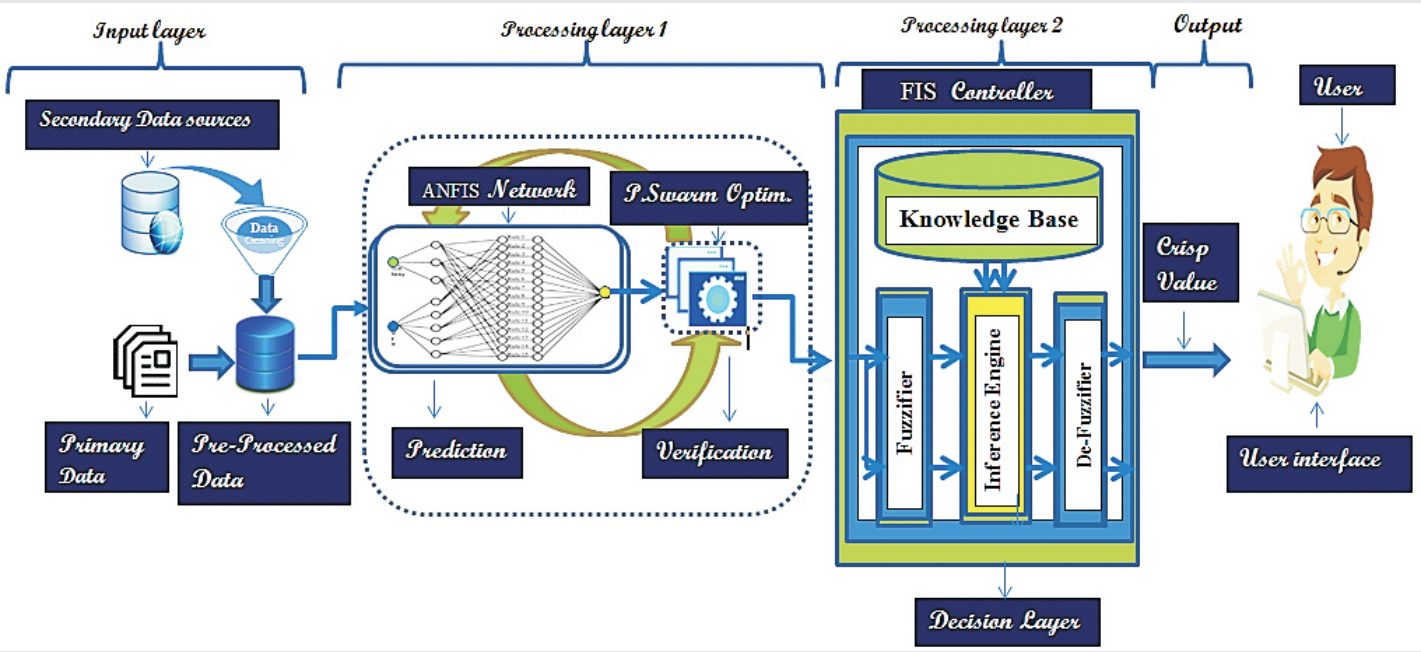
COVID-19 CONTROL: FLATTENING THE CURVE WITH ANFIS-PSO MODEL.

A novel pandemic disease termed COVID-19, which first appeared in Wuhan city of China in December 2019 is ravaging the world causing outrageous number of deaths. Its damaging effects has suspended many productive activities thereby crumbling the world's economy into a maimed and handicapped state.
Several scientific discoveries, technological developments, researches and social measures are ongoing to proffer solutions to the pandemic. Currently, many countries including Nigeria have adopted social measures to control the spread of COVID-19, as there are no World Health Organization (WHO) certified vaccines or medications to combat the disease.

A dual-layer Adaptive Neuro-Fuzzy Particle Swarm Optimization(ANFIS-PSO) model can be integrated into the development of real-time mobile intelligent systemto flatten the curve of COVID-19 transmission. The model can reduce the spread rate, decrease number of cases, increase productivity of health care practitioners and enhance the decision analysis of the safety of a particular place at a given period of time.

The ANFIS-PSO model which consists of three (3) layers uses a hybrid propagation technique to learn the input data which are socio economic measures, social distancing, movement restrictions, public health measures and compliancy level. In the first layer, a knowledge requisition module is activated to acquire a set of fuzzy rules from the input data accompanied by learning parameters achieved by assigning membership functions to the inputs with optimally adjusted values to minimize errors and establishing a network structure.

The result generated can further be improved using Particle Swarm Optimization (PSO) to iteratively tune the input membership functions until a minimized number of case is determined. Furthermore, the number of optimized cases will serve as input into the second fuzzy inference system where decisions about the safety of a particular place can be determined by the user at a given period of time through an installed mobile application.



Proposed ANFIS-PSO Model for COVID-19 Transmission Control

Femi Temitope Johnson
Postgraduate Student, Department of Computer Science

WHAT IT TAKES TO DEVELOP MOBILE APP - FORMER NACOSS PRESIDENT

A **mobile application**, commonly referred to as **mobile app or app,** is a type of application software that is designed to run on a mobile device such as the smartphone, tablet, or watch. Apps were originally intended for productivity assistance such as e-mails, calendars and contact databases but the public demands for apps have caused rapid expansion of applications for mobile games, factory automation, location-based services, order-tracking, and ticket purchases thereby leading to the existence of millions of apps. Apps are generally downloaded from application distribution platforms, which are operated by the owner of the mobile operating system such as App Store (iOS) or Google Play Store.

Some apps are free while others come with a price with the profit being shared between the creator of the app and the distribution platform. Mobile applications often stand in contrast to desktop applications that are designed to run on desktop computers and web applications, which run in mobile web browsers rather than directly on the mobile device. Mobile applications are basically categorised into three, namely: **Native,** a mobile application that runs only on specific hardware for which it is designed; **Web-based,** a mobile application that makes use of Internet connectivity to provide some or all of its functions; and **Hybrid, a** combination of native and web-based apps. Mobile app development tools are software designed for the creation of mobile applications. There are native mobile development tools and cross-platform mobile development tools. Native mobile development tools can create specialised apps that operate with ease, of high quality, and can take advantage of all features on their designated platform.

Cross-platform mobile development tools create a generic app for multiple platforms simultaneously by greatly cutting the cost and time needed to create an app but this comes with a trade-off. Open source mobile app development tools include Build fire. js, Framework 7, Ionic framework, jQuery Mobile, Mobile Angular UI, and Xamarin. Basically, a functioning laptop or computer system with at least 4GB RAM, 500GB hard disk, Core i5 Intel processor, a development tool, Internet connection, a testing device (such as mobile phone) and coding skills are required to build a mobile app. Android studio is an Android Development Software built by Google. Its implementation editor is very useful for Android developers. Android studio provides shortcuts for coding and designing while its layout design makes it very easy to use and helps reduce the time spent on coding.

Android studio also provides drag-and-drop features to design the layout of projects. Programming languages mostly used for mobile app development include Java, Swift, Objective-C, JavaScript, HTML5, C++, PHP, C#, Python, and Ruby, among others. The official programming language for Android app development is Java, which powers majority of Android apps. However, other languages can be used, through the Android Software Development Kit (SDK), to build Android-based mobile apps. The following are the eight easy ways to create a mobile app: Define your objectives of the app, lay out the functionality and features of the app, create a wireframe and story board, define the backend of your app, make the app with a development tool and programming language, test your live app, launch the app in the App store, and improve your app with user feedback.

Afolami Yusuf is the immediate past President, National Association of Computer Science Students, Department of Computer Science, Federal University of Agriculture, Abeokuta.

CSC Student Shares IT Experience

Mr. Israel Akin-Akinsanya, a 300-level student in the Department of Computer Science has documented his Industrial Training (IT) experience. According to him,"I submitted many applications for IT placement but I was only invited to few interviews. I realised that many organisations were not interested in students without skills or basic practical knowledge. However, I had the opportunity of being an Intern in three different organisations. At my department in the first organisation, which specialises in Networking and Computer Engineering, I acquired some networking skills while acclimatising to a working environment; a completely different one from the four walls of a university, he said.

"Two months into my IT, I got invited for an interview unexpectedly. I successfully passed the screening processes and commenced my IT in the organisation. The placement was a bigger opportunity as it was a better learning ground for me. I acquired in-depth networking, hardware and software development skills. I was taken through different processes with several hands-on practicals. It was quite tedious due to the strict structure of the organisation. However, I was only granted three months of IT placement in the organisation. In my third placement, I did more of administrative duties. On analysing the three IT placements, I realised that it was a balanced experience, which can increase my employability level after graduation. It was really an inspiring experience needed for the future", he added.

Israel Akin-Akinsanya is the President, National Association of Computer Science Students, Department of Computer Science, Federal University of Agriculture, Abeokuta.

CSC Collaborates Tourism Sector for Mobile App Development

Omoba Abiola Ogundeko

There is an ongoing collaboration between Voyage Afrique Cruise and Tours Limited and the Department of Computer Science Department, Federal University of Agriculture, Abeokuta (FUNAAB), Nigeria. An hour online pre-collaboration meeting was held recently where it was agreed that the partnership would aim at supporting the involvement of the Nigerian youth in computer and IT-related fields in the development of user-friendly and world-class mobile applications for the tourism industry. The Chief Operating Officer, Voyage Afrique Cruise and Tours Limited, Omoba Abiola Ogundeko, who is an alumnus of FUNAAB, would soon be having an official meeting with the Head of Department, Prof. Olusegun Folorunso, members of staff and student representatives in the department. The Directorate of Research, Innovations and Partnership (DRIP) of FUNAAB is expected to be represented at the meeting.

Aligning IT to support SDG Goals (Part 3)

In the previous editions of CSC Newsletter, we highlighted how Information Communication Technology (ICT) has aligned to support the United Nations Sustainable Development Goals 1,2,3,7 and 9. This edition focuses on SDGs 11 and 13.

United Nations Sustainable Development Goals

SDG 11: How to Achieve Sustainable Cities, Communities with Smart Mobility

Information and Communications Technology (ICT) serves as a support structure for all of the 17 Sustainable Development Goals (SDGs). The 2030 United Nations' agenda for sustainable development can experience accelerated progress with ICT. Every goal, from ending poverty and halting climate change to fighting injustice and inequality, can be impacted positively by ICT. SDG 11, which is on Sustainable Cities and Communities, aims at making cities inclusive, safe, resilient, and sustainable. One of the objectives of Goal 11 is the provision of access to safe, affordable, accessible and sustainable transport systems for all by improving road safety, notably by expanding public transportation with special attention accorded those in vulnerable situations, women, children, persons with disabilities, and older persons.

ICT is essential in offering innovative approaches to managing cities more effectively and holistically with ICT, basic infrastructure, and applications such as smart buildings, smart water management, and intelligent transport systems. A significant approach to achieving SDG 11 is the development of smart cities. Smart mobility is a key solution for smart cities, and integral to the success of our cities.

Smart mobility describes new technologies to reorganise new and existing transport methods. Elements of smart mobility are ride-sharing, bicycle commuting, car-sharing and on-demand transportation, which help to reduce the number of cars on the road.

Four major benefits of smart mobility with the aim of optimising transportation include reduced fatalities, decreased traffic congestion, improved economy, and decreased pollution. Big data and the Internet of Things (IoT) can be leveraged to alleviate congestion, manage assets in a more holistic way, improve infrastructure and the quality of life by ensuring a stronger and smarter future. Electronic IoT sensors are being used to collect data, which are analysed to provide insights into effective management of assets, resources and services.

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SDG 13, ICT AND CLIMATE CHANGE ACTION

Information and Communication Technology (ICT) is a revolutionary technology and fast becoming the most popular and fastest growing technology in almost all concerns of human life activities. With ICT, the United Nations' 13th Sustainable Development Goal (SDG), which is Climate Change Action, can be achieved. ICT is highly correlated with the progress of any of the SDGs. Variations in global climatic conditions have devastating effects on ecosystems and human habitats. Climate change includes global warming, changing weather pattern, heavy monsoon, unexpected rain fall, rapid urbanisation, pollution and industrialisation, and losses of crop due to drought. Hence, there is an urgent need to combat climate changes and its negative effects. ICT can play a pivotal role in monitoring, mitigation and adaptation of climatic change. Smart ICT applications can help tackle climate change and mitigate its effects.

Geographical Information System (GIS), Wireless Sensor Networks (WSN), Mobile Technology (MT), Web-based applications, Satellite Technology, and Remote Sensing (RS), are some technologies that can monitor climate change actions.An ICT-based system called e-Arik has been designed for sharing climate-smart agricultural practices among farmers. In Brazil, ICT-based systems have been developed for monitoring deforestation. This includes using a satellite-based monitoring system called the Programme for Calculating Deforestation in the Amazon (PRODES) and Deforestation Detection in Real Time (DETER), which have been deployed by the government of Brazil. ICT can optimise value chains; reduce resource usage, waste, and also play crucial role in sharing climate and real-time weather information, forecasting early warning systems, supporting resilience, and climate adaptation.

Morenikeji Kareem is a Graduate Assistant, Department of Computer Science, Federal University of Agriculture, Abeokuta.

Upcoming Event

Prof. Faith-Michael Uzoka

Prof. Faith-Michael Uzoka is a Professor of Computer Science and Information Systems. The erudite scholar has been teaching Computer Science and Information Systems in various universities since 1992. He is of the Department of Mathematics and Computing, Mount Royal University, Alberta, Canada; an Adjunct Professor in the Faculty of Commerce, Catholic University of Eastern Africa, Kenya; and the ICT University in Baton Rouge, United States of America. His research interests are Medical Informatics, Evaluation Systems, Computing Disciplinary Studies, and Technology Adoption and Innovation. He is on the editorial board and programme committees of the following journals and conferences: International Journal of Biomedical Engineering and Consumer Informatics, Information Systems Conference, Axioms, and ACM SIGMIS-CPR Conference.

He recently reviewed the Journal of Healthcare Engineering, ACM Transactions on Computing Education (TOCE), Technological Forecasting and Social Change, ACM Inroads, Iranian Journal of Fuzzy Systems, The Behaviour and Information Technology, Medical Informatics and Decision Making, Information and Management, Telecommunications Policy, Fuzzy Sets and Systems, International Journal of Scientific Research in Education, Journal of Network and Computer Applications, and Expert Systems with Applications. Prof. Uzoka is expected in Nigeria after the ravaging coronavirus disease (COVID-19). He is to visit the University of Port Harcourt, and University of Uyo through a Carnegie African Diaspora fellowship programme. He is also scheduled to be guest at the Department of Computer Science, FUNAAB and share his wealth of experience with staff and students in the area of Grant and Academic Writing during a workshop.

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