

# Emerging to Converging Technologies Conference

The Future World

25 – 26 June 2019



**Gordon Institute  
of Business Science**  
University of Pretoria

**Georgia  
Tech** 

# Speakers: Day 1

## Keynote Speaker



Emerging  
Technologies and  
Our Future World  
**Dr. Kenneth Oye**

Imagine a scientific technique that would alter the genes of mosquitos to render them unable to transmit malaria. This is not as far-fetched as it seems.

Scientists have made notable progress in recent years in editing the genomes of organisms and substituting in variants of certain genes; these variants could then propagate throughout a population. While such changes could have benefits - such as limiting transmission of malaria - it's also possible to imagine unintended negative consequences.

The recent development of a powerful genome-editing tool, called CRISPR/Cas9, by a team at Harvard University, MIT and the University of California at Berkeley, allows scientists to insert, replace, delete, or regulate genes in many different species. The application of CRISPR/Cas9 is likely to enable the development of purpose-built gene drives in the next few years. Potential gene-drive applications include reprogramming insects to limit malaria and other insect-borne disease; reversing pesticide and herbicide resistance; and controlling invasive species. Gene drives might even be developed to 'undo', in part, genetic alterations that produce unwanted side effects.

In his keynote address, Professor Oye will address this scientific breakthrough as well as other potentially game-changing emerging technologies. How will these impact our world in the future?

**Dr. Kenneth Oye** is a political scientist and engineering systems expert with the Massachusetts Institute of Technology (MIT). He has a particular focus on studying government regulation. Professor Oye directs MIT's Program on Emerging Technologies. He is a faculty affiliate of the MIT Synthetic Biology Center, the Center for Biomedical Innovation and the Internet Policy Research Initiative. He chairs biosafety committees for the non-profit iGEM Foundation and the Broad Institute Biofoundry and has served as an invited expert to the United Nations Biological Weapons Convention, the World Health Organisation, the United States President's Council of Advisors and the National Research Council. Professor Oye is a recipient of the Levitan Award for Excellence in Teaching (2011), the Graduate Council Teaching Award (1998) and the Technology and Policy Program Faculty Appreciation Award (2003). He previously taught at Harvard University, the University of California, Princeton University and Swarthmore College. Professor Oye holds a BA in Economics and Political Science from Swarthmore College and obtained highest honours and a PhD in Political Science from Harvard University, for which he was awarded the Chase Dissertation Prize.

## Session 1

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Digital technology is already a mainstream reality. In recent years the likes of data science, artificial intelligence and machine learning have crept out of media headlines and into industries such as security, financial services, entertainment, automobiles, healthcare and more. Artificial intelligence and machine learning have, in particular, been touted as the technological disruptors of the coming decade, a world in which an avalanche of ground-breaking digital technologies from mobile to social media, big data, cloud, the IoT, artificial intelligence and machine learning will all converge, turning the global business world and society upside down. Big data and IoT, in particular, have catapulted the need for intelligent analytics systems powered by robotic assistants and self-teaching algorithms. What this trend indicates is that future business owners, leaders and individuals will have more time to invest on critical business issues as day-to-day data management tasks will be taken over by intelligent machines. The additional layer of machine learning and artificial intelligence capabilities have launched these technologies into the ultimate era of technological freedom; a world where man and machine cohabitate happily and effectively.

Due to the strong impact that machine learning and artificial intelligence are having in our world of work, and across society in general, there is a general belief that 'AI can solve it'. However, this belief leads to an unchallenged confidence in the decisions of a technology that often lacks transparency, fairness and explainability, while also exhibiting bias and other weaknesses.

In this session, Dr. Pokutta will delve into the impact of artificial intelligence and machine learning. He will explore high-profile failures, outline ethical and societal challenges with these technologies and discuss the vulnerabilities of machine learning.

**Dr. Sebastian Pokutta** is an expert in decision-making and machine learning, who also focuses his research on continuous optimisation techniques as well as analytics, with a focus on real-world applications across the likes of supply-chain management, finance, cyber-physical systems and predictive analytics. Dr. Pokutta is also interested in questions around the societal impact, fairness, transparency, and security of artificial intelligence and machine learning. He is the David M McKenney Family Associate Professor in the School of Industrial and Systems Engineering and an Associate Director of the Machine Learning at the Georgia Institute of Technology's @GT Center. Dr. Pokutta received both his diploma and PhD in mathematics from the University of Duisburg-Essen in Germany. He was previously a postdoctoral researcher and visiting lecturer at MIT and worked for IBM ILOG, and Krall Demmel Baumgarten, German. Prior to joining the Georgia Institute of Technology, Dr. Pokutta was a Professor at the University of Erlangen-Nürnberg in Germany.



Machine Learning  
and Artificial  
Intelligence  
**Dr. Sebastian  
Pokutta**

## Session 2

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Using Artificial  
Intelligence and  
Data Analysis to  
Solve Healthcare  
Issues in Africa

**Darlington  
Akogo**

The delivery of healthcare services in Africa is under pressure to change, yet few have a clear picture of how the industry will evolve. What is certain is that future trends will be driven by access to big data and to new models of care around driving innovative, affordable and accessible services across the continent. Many of Africa's 1.2 billion people are enjoying longer lives, however, due to the rise of non-communicable diseases (such as cancer, diabetes, respiratory and cardiovascular ailments) there is a growing recognition of the importance of digital innovation in delivering curative and preventive care.

Akogo will show how big data, data analysis and cloud computing can be used to optimise processes involved in healthcare and also make them affordable and scalable compared to the current practices being used throughout Africa. In addition the presentation will show how the use of artificial intelligence can be used to make health predictions, diagnoses and prognoses and to organise and store patient health records in the cloud for authorised healthcare personnel. Data collected can be intelligently organised with big data approaches and technologies, and continually analysed so important health information/stats on health centre patients are visualised and made available to physicians. At the same time, with the permission of the various health centers, all the health data can also be automatically saved and organised, which allows for National Health Records Databases to be updated. Furthermore visualised and analysed health information/stats are a good source of study and of detection of early patterns of outbreaks of infectious diseases nationally or continentally, so they can be managed before escalation. Collected data can also be used to train and develop more artificial intelligence healthcare models and systems.

**Darlington Ahiale Akogo** is a deep learning and machine learning engineer and researcher. He is the founder of minoHealth, an organisation created with the aim of democratising quality healthcare across the African continent. minoHealth develops artificial intelligence systems for medical diagnoses and prognoses and also uses data science and cloud computing to collect, analyse and visualise health data. Akogo heads minoHealth AI Labs where he and his team research and apply artificial intelligence to fields such as biotechnology, regenerative medicine/tissue engineering, neuroscience, optometry, epidemiology, dietetics/nutrition and agriculture. Akogo participated in MIT's Global Community BioSummit 2018. His research paper, *ScaffoldNet: Detecting and Classifying Biomedical Polymer-Based Scaffolds via a Convolutional Neural Network*, has been accepted by the IEEE-sponsored Future of Information and Communications Conference 2019. Alongside great minds including Yoshua Bengio, who is celebrated as one of the fathers of deep learning, Akogo is featured in and wrote for the book *Artificial Intelligence Simplified: 99 Use Cases and Expert Thoughts for Starters*, which was compiled by Data Science Nigeria. He has also written reports and essays for Synapse magazine.

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Use of telemedicine in Africa healthcare is becoming more prominent in rural areas and across African disaster zones. The unique set of healthcare challenges faced across Africa has opened the door for the use of telemedicine and its usage or adoption is growing across Africa's healthcare sector. Numerous factors have enabled this technology, from the low ratio of doctors to patients, the distance to hospitals to a lack of good roads to villages. In practice, telemedicine is simply the transmission of medical information via modern telecommunications, allowing for remote diagnosis, consultation and treatment.

Africa has a multibillion-dollar annual healthcare industry, with the departments of health in some countries moving towards eHealth solutions in line with World Health Organisation guidelines. However, despite the pervasive global trend towards digitisation, there is still minimal big data and business intelligence activity in Africa's medical ranks, despite the fact that the adoption of these technologies could relieve an already constrained healthcare sector. Current business trends point to data as a supreme asset across all industries. The multi-faceted medical industry naturally lends itself to being a highly data-driven sector.

In this session, Dr. Evangelos Apostoleris will focus on the current state and predicted future use of telemedicine and healthcare analytics in Africa.

**Dr. Evangelos Apostoleris** is a urology healthcare practitioner in private practice in northern Johannesburg. He previously worked in the public healthcare sector in South Africa, including rotations at one of the largest hospitals in the southern hemisphere, Chris Hani Baragwanath Hospital, which is also reported to be the third-largest hospital in the world. He is founder and MD of a men's health start-up company called My Health for Men, which uses world-class sensing devices and data analytics to improve the health of men. Dr. Apostoleris is a graduate of the University of the Witwatersrand and holds an MBA from GIBS.



Telemedicine  
and Analytics-  
Revolutionising  
Healthcare  
in Africa

**Dr. Evangelos  
Apostoleris**

## Session 3

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Big Data and the  
Internet of Things  
**Manoj Chiba**

Analytics is a key business strategy for making better decisions. Data streams are growing rapidly in size, speed and diversity, when you add in high-performance computing capacity, advanced statistical and operations research algorithms, the combination is extremely powerful. The perspective and skills of analytics are in high demand in a wide range of industries, and the need for fundamental research in analytics and big data-related areas is significant. To improve our ability to analyse, predict and optimize based on fast-moving and massive-scale data sets, organisations and institutions are working on cutting-edge research in many aspects of the theory, methodology, modelling and application of modern analytics.

In this session Manoj Chiba will examine current research and application areas that include aspects of business and industry such as strategic planning and dynamic operating decision-making in:

- Healthcare - including health policy and scarce resource allocation, quality and delivery of care, disease modeling and intervention strategies, hospital/clinic design and operation, preparedness, emergency response, equity, and predictive health.
- Energy-related planning, prediction, and operational decision-making.
- Finance, investment, sales and computational advertising.
- Scientific discovery.
- Sports analytics - including decision-making, scheduling, and prediction.

**Manoj Chiba** is a management professional with more than a decade's experience in senior management and a passion for driving the triple bottom line through evidence-based research. Some of his work includes price-setting strategies, market share analysis and strategic input. He also has a strong passion for education at the grass-roots level and assisting in solving youth unemployment in South Africa. Chiba is principal consultant and a data analyst specialist for ATBM Advisory and a Senior Lecturer at GIBS, focusing on analytical tools and techniques. Chiba holds an undergraduate and postgraduate science degree from the University of the Witwatersrand and an MBA from GIBS. He is currently studying towards his DBA at GIBS. Chiba is a member of the Golden Key International Honour Society, the world's largest collegiate honours society which recognises outstanding academic achievement.

## Session 4

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Timely and accurate information on fertilisers, seeds, weather, crop management and markets is essential information for both large- and small-scale farmers operating in rural areas. Rural smallholders account for more than 70% of the food produced in Africa. With the world's population expected to rise by an additional two billion people by 2050, and with more than half of that increase expected to occur in Africa, food will be in ever greater demand. Smallholder farmers find themselves at centre stage when it comes to bringing the new agricultural revolution to Africa; a revolution that has to start with data. Given the importance of data, it is vital that smallholder farmers are transformed into a knowledge-based community connected and powered by precise information.

This session will focus on how sensors and big data can be made actionable and useable for smallholder farmers in Africa.



Sensors and Big  
Data for Precision  
Farming  
**Brian Bosire**

**Brian Bosire** is a Kenyan entrepreneur and innovator, and a United Nations Young Leader. His interests lie in building water and agricultural technologies in emerging markets. Bosire has a passion for taking emerging technologies like big data, the IoT and artificial intelligence and applying them to solve the biggest challenges in Africa. At the age of 19, he developed a technology that reads soil to help inform thousands of smallholder farmers how to better utilize resources such as fertilizer and water. He has a particular focus on agriculture, water and sanitation and is inspired to build resilient food and water systems to support the world's growing population both today and in the future. Bosire is the founder of UjuziKilimo, which uses sensors to capture soil and farm data, and Hydrologistics Africa, a virtual water network operator.

## Session 5

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A blue rectangular graphic with a background of faint, glowing circuit-like patterns and data points. The text is white and positioned in the upper left area of the graphic.

Emerging Energy  
Technologies  
**Professor Pascal  
Van Hentenryck**

Most national energy policies have been built around the assumption that large-scale generation and centralised grid systems are the principal means for developing access to electricity. The result has been a tendency towards an 'all or nothing' approach. People within reach of the grid get electricity, subject to system reliability. But those out of reach are relatively neglected, with the exception of the piecemeal development of local mini-grids. The time has come to broaden national energy policies and fully embrace off-grid solutions with better specific policies that can stimulate further growth.

Policies have traditionally depended on the single pillar of large-scale generation linked to the central grid. Currently, three options are available for modern energy access: standalone systems, mini-grids and traditional extension of centralised grid systems. But off-grid solutions remain neglected within policy frameworks.

In this session, Professor Pascal Van Hentenryck examines the varying types of new energy as well as the success factors that have helped this sector grow. He also delves into the difficulties facing emerging energy technologies.

**Professor Pascal Van Hentenryck** is an expert in artificial intelligence, data science and operations research. His current focus is to develop methodologies, algorithms and systems to address challenging problems in mobility, energy systems, resilience and privacy. Professor Hentenryck is an A. Russell Chandler III Chair and Professor in the H. Milton Stewart School of Industrial and Systems Engineering at the Georgia Institute of Technology. He was previously a professor of computer science at Brown University, led the optimization research group at National ICT Australia (until its merger with CSIRO) and was the Seth Bonder Collegiate Professor of Engineering at the University of Michigan. Professor Van Hentenryck is also an Honorary Professor at the Australian National University and a fellow of both the Association for the Advancement of Artificial Intelligence and the Institute for Operations Research and Management Science. He has been awarded two honorary doctoral degrees from the University of Louvain and the University of Nantes, the IFORS Distinguished Lecturer Award, the Philip J. Bray Award for teaching excellence in the physical sciences at Brown University, the ACP Award for Research Excellence in Constraint Programming, the ICS INFORMS Prize for Research Excellence at the Intersection of Computer Science and Operations Research, and an NSF National Young Investigator Award. He received a Test of Time Award (20 years) from the Association of Logic Programming and numerous best paper awards, including at IJCAI and AAAI. Professor Van Hentenryck is programme co-chair of the AAAI'19 conference, a premier conference in artificial intelligence.



## Session 6

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Advances in technology are rapidly changing the options for energy production and are now available beyond the grid. Falling solar technology costs have spurred the growth of standalone home systems and are changing the economics of mini-grid systems. Other technological advances are set to also play an important role. Battery storage technology is fast evolving to the point where it is now playing a significant role in smaller-scale off-grid solutions and is beginning to feature in utility scale solar storage. Technologies such as fuel cells are also beginning to come of age. Fuel cells are now becoming widespread as a source of power for telecoms towers in areas with uncertain grid reliability and are also beginning to penetrate consumer electronics. Finally biomass-based energy production is beginning to play a key role in the production of energy in rural and low-income areas.

In this session we discuss these developments and look at what it will take for them to mushroom and fill the gaps in grid infrastructure. Elizabeth Nyeko will examine technologies that improve the performance of mini-grids, small-scale electricity generation and distribution systems that power homes and businesses in areas where extending national grids is too expensive.

**Elizabeth Nyeko** is CEO of Modularity Grid, a London-based start-up. Nyeko builds technologies that improve the performance of mini-grids, small-scale electricity generation and distribution systems that power homes and businesses in areas where extending national grids is too expensive. Yet mini-grids also have their limitations. Nyeko also founded Mandulis Energy, which built a biomass-fired mini-grid in northern Uganda. At Modularity Grid, Nyeko designed an intelligent cloud-based platform that enables mini-grid operators to better track and predict individual consumption; it then redirects excess electricity to specific users in need of constant power, called 'anchor loads'. At the Mandulis site in Uganda, where Nyeko is piloting her Modularity Grid solution, the anchor loads include the village rice mill, which also provides the rice husks used to fuel the mini-grid itself.



Energy Solutions  
for Rural  
Communities  
in Africa

**Elizabeth Nyeko**

## Session 7: Panel Discussion

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Emerging to Converging Technologies

**Moderator: Lew Roberts**

**Panelists:** Dr. Sebastian Pokutta, Brian Bosire, Dr. Pascal Van Hentenryck, Manoj Chiba, Elizabeth Nyeko

This session will focus on the convergence of IoT and sensor technology, big data and analytics, as well as artificial intelligence and the various applications for these technologies in the world and in Africa.

# Speakers: Day 2

## Session 1



Blockchain  
Technology  
**Professor  
Bitange Ndemo**

Blockchain technology has the potential to disrupt many industries thanks to low-cost transactions, immutability and enhanced security. Indeed, many blockchain implementations have already been developed, each exhibiting unique features tailored to specific uses. Blockchain technology has wide implications and scope and can be used to reshape whole industries, such as healthcare where a distributed encrypted ledger can be used to store and share patient details between hospitals and doctors worldwide. Supply-chain management is another option, where blockchain can enable everything along the supply chain to be monitored and verified from origin almost instantaneously.

The emergence of decentralised autonomous organisations (where decisions are made electronically via computer code) can also pave the way for new business models using blockchain. In such instances, people would agree to the rules of the organisation and then code these rules as a transparent program and execute it within the chain. As such there would be no central authority making or enforcing the rules.

In this session we will examine the use of blockchain technology across various applications including the ways in which blockchain can solve real-world problems. We will cover how, apart from being the underlying ledger for cryptocurrencies, blockchain is also emerged as the platform of choice for creating innovative smart contract-based distributed applications. In addition we will cover the application area of blockchain in creating a trusted, indelible, transparent 'transaction internet' which can be leveraged by businesses to bring massive efficiencies in their operations.

**Professor Bitange Ndemo** is an associate Professor of Entrepreneurship at the University of Nairobi's Business School where he teaches and researches on entrepreneurship and research methods. Most of his research work is focused on ICT and small- and medium-sized enterprises and their influence on economic development in Kenya. Professor Ndemo holds a PhD in industrial economics from the University of Sheffield in the United Kingdom, an MBA from the University of St Thomas (Minnesota) in the United States and bachelor's degree in finance from the University of Minnesota. He is the immediate past Honorary Chair of the Alliance for Affordable Internet and an advisor to the Better than Cash Alliance, a global initiative to digitise payments. Professor Ndemo is the immediate former Permanent Secretary in the Ministry of Information and Communication where he served from 2005 to 2013. He was awarded the prestigious presidential Chief of the Burning Spear of Kenya award for his distinguished services in 2006. Professor Ndemo is regarded as one of the key people who oversaw the transformation in the Kenyan ICT sector via the enactment of various ICT policies and projects such as launching of undersea submarine cables, the mushrooming of business process outsourcing industry, the dramatic reduction in mobile termination rates, initiating of the Kenya Open Data and the growth of tech hubs such as iHub and mLab in Kenya thanks to effective regulation.

## Session 2

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One of the most exciting applications of blockchain technology lies in serving so-called emerging markets. Emerging markets are characterised by high investments in productive capacity. These countries are also moving away from their traditional economies, which have relied on agriculture and the export of raw materials. However, the transformation of emerging markets is far from complete. Currently, 90% of the economic activity still happens through traditional outlets. There are several challenges that the nature of emerging markets presents for investment, including the development of economic structures. However, to ensure uptake these structures must be compatible with local cultures and daily life. For instance, the local nature of emerging markets means large costly financial infrastructures will not work to bring them into the digital economy. More appropriate are smaller collections of humans and devices building trust and working together in a collaborative manner.

CrowdForce Solution is an Africa-based start-up that plans to use blockchain technology to address the unique needs of emerging market economies. This session covers how bringing the billions of consumers in emerging markets into the digital economy requires both a human touch and the incentivisation of local and trusted retail agents in each community to offer financial services. In this session we cover how blockchain can be used to provide an alternative to the banking system in emerging markets in giving local merchants the capacity to be agent banks in their area. These agent banks are incentivized through commissions and can sign up and get started in less than a day by simply funding their wallet with cash that becomes their start-up capital. Furthermore, local agents can offer micro-services through the app, including utility bill payments, cash in/out accounts, and buying and selling cryptocurrency.

**Tunde Elijah Kelani** leads venture activities for CrowdForce globally, including identifying, investing, due diligence and portfolio analysis, as well as coordinating cross-functional teams to evaluate potential targets. He is integrally involved in developing innovative products and identifying necessary partnerships. Kelani oversees and leads industry research to identify opportunities for investment and access to technology within existing businesses or expansion into new areas. His responsibilities include growing local and international partner ecosystems by opening doors with potential partners and negotiating complex strategic partnerships and managing partnerships. Kelani is an experienced business strategist who has consulted to top private and public organisations, including Dangote Group, HP Nigeria, Nigeria Breweries and the American University of Nigeria.



How Blockchain  
Technology Can  
Serve Emerging  
Markets

**Tunde Elijah  
Kelani**

## Session 3

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Internet and Digital  
Technologies

**Dr. Soumen  
Ghosh**

In today's global, hyper-competitive marketplace customer requirements for demand fulfilment can vary widely for different types or categories of customers in various parts of the world, as well as for diverse product categories in a company's portfolio. As companies expand their global footprints, while trying to meet their customers' rising expectations, they often need to invest in advanced technologies that can help them assess their complex business networks to satisfy the demands of a constantly changing marketplace, these new technologies include big data, predictive analytics and the IoT. In line with these technological developments, organisations are learning new ways to collect, share, and use data to understand their customers and make better strategic business decisions. Organisations are also changing the way they work to accommodate these new technologies, including adapting their business models in line with and in support of the changing, speedier and more direct, global movement of goods and services from manufacturers to the end customer.

This session will address how strategy, practices and technology, particularly internet based and digital technologies, are shaping the future of the modern business, notably with regards to the changing movement of goods and services. Attendees will be exposed to the latest thinking and practices as well as to case studies illustrating how successful companies are adopting these technologies as an integral part of their survival and growth strategy.

**Dr. Soumen Ghosh** is a professor of operations and supply chain management in the Scheller College of Business at Georgia Institute of Technology. He is also the Faculty Director for non-degree and custom executive education programmes for corporate customers. He formerly served as the Director of the Center for Quality and Change Leadership at Georgia Tech for eight years. His primary areas of expertise are in supply-chain excellence capability and executive leadership development, operations and supply-chain strategy for competitive advantage, global supply chain and operations capability development, and strategic supply-chain network configuration and infrastructure development. He is the Academic Director of supply-chain excellence executive education programmes for corporate customers. In addition, he provides consulting and training services to organisations in several countries in the areas of operations/supply-chain strategy and capability development. He frequently conducts professional workshops on operations and supply-chain excellence around the world, and is a frequent speaker at conferences and company events, working with leading organisations such as Coca-Cola, Kimberly-Clark, IBM, General Motors, Brunswick, McKinsey and Apple South. Professor Ghosh's work experience focuses on operations and supply chain in the auto industry. His recent studies have centred around the impact of emerging technologies on business.

## Session 4

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Africans are watching technology develop and evolve in unprecedented ways. The continent already leads the way in terms of mobile payments, with money transfer service M-Pesa serving 30 million users across 10 countries. While technology is driving change across the continent, if not carefully implemented new technologies could amplify existing inequalities as an economy driven by changing technology can also result in the exclusion of lower-skilled workers from an evolving labour force, which can also contribute to a gender gap. New technologies could concentrate value in the hands of the wealthy, while people who haven't benefited from earlier industrialisations risk being left even further behind. As such it is vital to ensure that the future of Africa and of African employment is based on a competitive structure, rather than on a defensive, backwards-looking approach that will not be competitive in the long term. The Fourth Industrial Revolution is critical for Africa since the new technologies it creates will make it possible to transition into a circular economy. This will decouple production from the constraints inherent in the gathering of natural resources, ensuring that nothing goes to waste.

In this session, we cover the challenges surrounding Africa's uptake of the new technological economy, including adoption and the use of technologies in ways that improve inclusive growth. Covered in this session include insights into how new technologies have the potential to liberate humanity from repetitive tasks, freeing up individuals to become more productive.

**Njideka Harry** has over 13 years' experience in non-profit administration and planning, programme management and social impact. She is Founder, President and CEO of the international non-profit Youth for Technology Foundation, which focuses on using technology to solve developing world problems. She is a World Economic Forum (WEF) Schwab Foundation for Social Entrepreneurship Fellow, a member of the Women of West Africa and Entrepreneurship Council's advisory board and a board member for Promoting Readiness in Science and Math, which supports activities that help 12-15 year old girls achieve proficiency in science, technology, engineering and maths education. Harry has presented to various international audiences including the United Nations General Assembly, the WEF, the Atlantic Council and the Clinton Global Initiative. She serves on various think-tanks for the Fourth Industrial Revolution, providing input on these technologies and their relevance in industry. Harry earned her BBA from the University of Massachusetts, Amherst and holds an MBA from the Kellogg School of Management at Northwestern University. She completed her post-graduate studies at Stanford University where she was a Reuters Digital Vision Fellow. Harry is also an Ashoka Fellow.



Digital  
Technologies  
and Innovation  
in Africa

**Njideka Harry**

## Session 5

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Robotics and  
Field Applications  
**Dr. Peter Corke**

The boundaries between smart materials, artificial intelligence, embodiment, biology and robotics are blurring. From robots that can monitor and repair the natural environment, to nano robots to track and kill cancer, robots that will lead the way to planetary colonisation and robot companions to keep us from loneliness in old age, there is no part of our societies or lives that will not be affected by future robotics. Instead of a conventional robot that can be decomposed into mechanical, electrical and computational domains, we are increasingly thinking of robots in terms of their biological counterpart comprised of similar core components, including a body and a brain. The benefit of this artificial organism paradigm is that we are encouraged to exploit, and go beyond, all the characteristics of biological organisms. The realisation of this goal is only achievable by concerted research in the areas of smart materials, synthetic biology, artificial intelligence and adaptation. This session will delve into the advances being made in robotics and how these developments are predicted to affect the future world by impacting on society, work and key sectors such as healthcare.

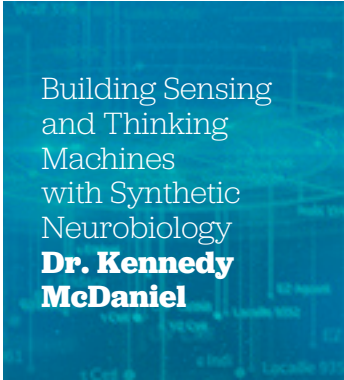
**Dr. Peter Corke** is a Distinguished Professor of robotic vision at the Queensland University of Technology, the director of the Australian Centre for Robotic Vision and one of the foremost roboticists in the world. He wrote the textbook *Robotics, Vision & Control*, authored the *MATLAB* toolboxes for *Robotics and Machine Vision*, and created the online educational resource: QUT Robot Academy. He has been a visiting Professor at Oxford University, University of Illinois, Carnegie-Mellon University and the University of Pennsylvania. He received his Bachelor of Engineering and Master of Engineering Science degrees, both in Electrical Engineering, and a PhD in Mechanical and Manufacturing Engineering, all from the University of Melbourne. Prior to QUT Professor Corke was a senior principal research scientist at CSIRO where he founded the Autonomous Systems laboratory, a 50-person team undertaking research in mining, ground, aerial and underwater robotics, as well as sensor networks. Subsequently he led a major cross-organisational “capability platform” in wireless sensor networks.

## Session 6

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The recent development of brain-like computers promises to emulate the mind of a human. The ability to learn and recognise patterns is viewed as a key next step in the evolution of artificial intelligence. However it is believed that brain-like processors are missing one key component, namely actual brains or, at least, living neurons. Rather than simply mimicking brain function with chips, the current evolution is the use of actual human brain material to create the chips. This includes integrating lab-grown neurons onto computer chips in an effort to make them far more powerful than their standard silicon forebears. The first batch of neuron-abetted chips are being developed and will have applications in such areas as detecting explosives, detecting illnesses and fruit ripening detection in agriculture for optimal harvesting and disease onset.

This session will cover the current state of development and use of neurotechnology devices which represent the merger of synthetic neurobiology/neuroscience and silicon technology. The discussion will focus on the nature of these devices and how they can be used to solve urgent real-world problems.



Building Sensing  
and Thinking  
Machines  
with Synthetic  
Neurobiology  
**Dr. Kennedy  
McDaniel**

**Dr. F. Kennedy McDaniel** is the Chief of Staff at Koniku Inc. Koniku is an early-stage synthetic neurobiology company based in Berkeley, California. She has over a decade of experience in neurobiology, beginning in graduate school by studying the molecular mechanisms underlying some human behaviours. She went on to develop a method for screening therapeutics across neural organoids, underwent 3 years of clinical training, and then moved into strategic analysis and planning in the biotech space. Dr McDaniel first learned about computational biology as a graduate student, and in 2017 she met Osh. Agabi, the Founder and CEO of Koniku. Through this conversation she realized that Koniku was not only a vision for the future, but also a powerful strategy to achieve this new frontier.

## Session 7: Plenary Session

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The Future World: The Impact  
of Emerging and Converging  
Technologies on Society and Business  
**Moderator: Abdullah Verachia**

**Panelists:** Dr. Kenneth Oye, Njideka Harry,  
Dr. Soumen Ghosh, Dr. Bitange Ndemo,  
Tony Christodoulou, Dr. Peter Corke

In this plenary session we will review and discuss how emerging and converging technologies are impacting our societies and businesses and the perceived impact of these technologies on our future. Each of the speakers in this session will provide a short address detailing how they perceive technology will continue to evolve and the perceived impact this will have on our future world. Opening comments will be followed by a panel discussion.

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For more information please visit  
**[www.gibs.co.za/georgiatech](http://www.gibs.co.za/georgiatech)**

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