

UJ faculty positions itself to lead the charge on machines that think

By [Tom Nevin](#)

6 Jan 2016

A new super science venture, the Institute for Intelligent Systems, is being installed in the University of Johannesburg's faculty of engineering. It brings science to Africa at the speed of light as globally interconnected computers join forces to tackle highly complex problems. The institute will draw lecturers, researchers and students primarily from Brics countries - Brazil, Russia, India, China and SA.



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"Intelligent systems is a couple of steps up from artificial intelligence," says Prof Bhekisipho Twala, newly appointed head of the institute. He is head of the university's department of electrical and electronic engineering science.

Tackling complex problems

Artificial intelligence "applies algorithms to superfast computers to arrive at outcomes in a fraction of the time it would take the human brain to complete the same task. This process becomes even faster and more thorough when you connect an armada of such machines to tackle the most complex and vexing problems known to man. The results are virtually unimaginable," Twala says.

One of the major challenges is to increase the intelligence capacity of computer systems in such a way that they become more "free thinking" and adaptive, allowing them to handle unexpected, changing conditions appropriately. They should also be able to solve complex problems by retrieving the relevant information, by constructing models based on data and by offering capabilities to reason with such models. The operation is the first of its kind on the continent.

"We will confront complex challenges in society and industry where big data is available on the African continent and in Brazil, Russia, India, China and SA," says Twala. "And we'll do that by designing, building and implementing intelligent systems capable of learning and improving their own processes for the economic benefit and sustainable growth of diverse stakeholders."

Big challenges in society and industry - such as fraud prevention, better water resource management and more efficiently controlled traffic flows - could be tackled more effectively with the combination of big data and the intelligent systems designed to analyse and act on them. "By developing African expertise in Africa, we ensure the sustainable development of expertise for our continent's future," says Twala. "What we learn for our region can be applied globally as well."

First steps

The target date for the institute's first-phase implementation is 2018. "By then, the institute should have developed into a fully fledged cognitive computing centre with professional staff and equipment and scientific and academic personnel. We'll also have collaboration in place with a global industry player."

The hunt is on for postgraduates for the first intake of next year followed by undergraduates for courses such as intelligent systems, cloud computing, bio-informatics and computational biology. The institute wants to develop pioneering researchers, engineers, scientists and academics. It is recruiting a multidisciplinary team of scientists and engineers ranging from computer science, health sciences, management and accounting.

"Africa is a rapidly growing continent, presenting huge opportunities, challenges and complex problems that can be tackled with intelligent systems, but most of this kind of expertise is still developed outside the continent," Twala says. "This is a good time to establish the first world-class institute for systems intelligence and related multidisciplinary research centres and facilities in Africa."

Twala's experience includes a postdoctoral research fellowship at the UK's Brunel University on empirical software engineering and as an adviser at the Council for Scientific and Industrial Research.

His industry experience includes managing the methodology section for a labour force survey re-engineering project for Statistics SA, and consulting on a project at Imperial College London tackling the effect of HIV/AIDS on education systems in developing countries. He has also served as chief technical officer for the ministry of public works and transport in Swaziland.

Scientific momentum

The intelligent systems innovation has been described as "a new wave of embedded and real-time systems highly embedded with massive processing power to perform complex applications. Their pervasiveness is reshaping the real world and how society interacts with digital life." Twala agrees. "Such intelligent systems are creating new opportunities for industry and business, and new experiences for users and consumers. And they're everywhere - in rail, automotive, energy, consumer economics, aerospace, energy, healthcare and telecoms," he says.

The scientific momentum in intelligent systems is irresistible and mounting. "Billions of devices will be connected in the next half-decade and the opportunities offered by what science is now calling the 'internet of things' will have a massive impact on consumers and professional users in all industries." The increased scope of connectivity is spreading from domestic and personal devices to include industrial machines. As a result, the 'internet of things' is morphing into the 'internet of machines' in the industrial world.

"Very little is untouched - robotics, cars, trains and planes and medical equipment are all being swept along in the wave of connectivity opening the door to their data and enabling the emergence of new applications and revenue streams."

Source: Business Day

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