IBM Research Opens in South Africa; Cognitive Computing and the IoT help Track Diseases and Forecast Air Quality

Projects include tracking the spread of tuberculosis, anticipating wildfires and searching for new discoveries in the universe

Johannesburg, South Africa and Armonk, NY - 25 Aug 2016:IBM Research (NYSE: IBM) today opened its second research location on the African continent and announced several new project collaborations in the areas of data driven healthcare, digital urban ecosystems and astronomy.

IBM researchers in South Africa with backgrounds in machine learning, mathematics, computer science, robotics, genomics and computational biology, are exploring the use of cognitive computing, the Internet of Things and Big Data to support South Africa's national priorities, drive skills development and foster innovation-based economic growth.

"South Africa is a tremendous growth and transformation story, yet its increasing population and healthcare delivery shortfalls continue to pose challenges in the country," said Solomon Assefa, director, IBM Research – Africa. "With the ability to detect patterns and discover new correlations, cognitive and cloud computing and the Internet of Things can provide potential solutions."

The lab's team of scientists are already collaborating extensively with local universities, research institutions, innovation centers, start-ups and government agencies. This will help foster South Africa's emerging technology ecosystem and develop and scale new innovations.

As part of a 10-year investment program through South Africa's Department of Trade and Industry and working closely with the Department of Science and Technology, the new research lab is based at the University of the Witwatersrand (Wits). The university was recently ranked amongst the top 10 in emerging economies by the Times Higher Education World University Rankings.

"The launch of the IBM Research laboratory is an exciting milestone in the move towards a new era of globally competitive research, innovation and entrepreneurship that will be emerging out of the Tshimologong Precinct in Braamfontein. Wits is delighted to be collaborating with IBM. We look forward to seeing top talent congregate to address the continent's most intractable problems and work on the world's next game changing technologies," said Professor Adam Habib, Vice-Chancellor and Principal of the University of the Witwatersrand.

Aligned with areas of strategic national importance, the lab's focus areas include:

Data Driven Healthcare

- In support of the World Health Organization's End TB (Tuberculosis) Strategy, IBM scientists are designing wearable

sensor technology connected to the Watson Internet of Things to trace the spread of highly infectious, communicable diseases. This innovation will help healthcare organizations and health officials develop prevention strategies and respond effectively.

- IBM scientists are developing cognitive learning approaches to transform cancer reporting, prevention and precision medicine in Africa. In a proof of concept study, IBM scientists have discovered a basic molecular link between cancer causing genes and those associated with metastasis, the cause of 90% of cancer related deaths*. Preliminary results from this work have been presented recently. Using anonymous, unstructured data provided by the National Cancer Registry in South Africa and in collaboration with the University of Witwatersrand Medical School, the team is developing cognitive algorithms to automate the inference of national cancer statistics in South Africa. This technology is expected to reduce a five-year time lag in cancer statistics reporting to real-time.

- With the support of the City of Johannesburg, IBM scientists have collected 65 samples of microbes and bacteria from 19 bus stations across the city as part of the global Metagenomics and Metadesign of the Subways and Urban Biomes (MetaSUB) international consortium. Once the samples are processed the results will be available to city planners, public health officials and scientists who will use the data to help officials predict and prepare for future disease outbreaks and discover new species and biological systems.
- In early September, scientists from IBM, H3ABioNet and the University of Notre Dame will host a hackathon on anti-malarial drug resistance and drug combination prediction.

Digital Urban Ecosystems

- Building on IBM's global Green Horizons initiative, researchers at the new lab are working closely with experts from South Africa's Council for Scientific and Industrial Research to analyze historical and real-time data from environmental monitoring stations. Using machine learning and cognitive models, the data collected in the City of Johannesburg, the City of Tshwane and the Vaal Industrial Triangle will help provide more insight about air pollution and model the effectiveness of intervention strategies. The project has recently been extended to predict ground level ozone and air quality forecasting.
- Commuters in the City of Johannesburg currently spend 35 minutes extra travel time per day due to traffic congestion, according to the TomTom Traffic Index. Unreliable traffic light infrastructure provides challenges to traffic light management in the city. Using real time anonymized traffic data from TomTom combined with Twitter, IBM scientists have developed a traffic optimization recommendation tool which can help city officials dispatch traffic volunteers, known locally as pointsmen, to the intersections where they are most urgently needed.
- The City of Cape Town often battles with devastating wild fires, due to its unique topography and vegetation. Using data from The Weather Company, an IBM business, and the City of Cape Town's Open Data portal, IBM scientists have developed a cognitive dashboard. This can assess fire incidence risk and severity to help officials raise public awareness and prepare for emergency response.
- The number of people living off-the-grid in Africa has grown by 114 million since 2000**. To help meet the energy needs of communities who are living remotely or would like to make use of renewable energy, IBM scientists have developed a mobile app which uses analytics to determine the solar requirements of users based on their energy needs and location.

Exploring the Universe

- In 2018 the, Square Kilometer Array (SKA), the world's largest radio telescope, will be built in South Africa and Australia. IBM scientists are collaborating with SKA South Africa (SKA-SA) on the development of unsupervised algorithms which can make groundbreaking astronomical discoveries. Scientists expect to eventually apply the cognitive technology to other applications, including the development of new pharmaceuticals and genomics. IBM and SKA-SA have signed an

agreement to explore the advancement of this technology and to lead some major developments in data science over the next decade.

- IBM scientists in South Africa are joining NASA, the SETI Institute and Swinburne University to develop an Apache Spark application to analyze the 168 million radio events detected over the past 10 years by the Allen Telescope Array (ATA). The volume and complexity of the data requires advanced machine learning algorithms to separate noise from true signals of interest. These requirements are well suited to the scalable in-memory capabilities offered by Apache Spark when combined with the big data capabilities of the IBM Cloud and IBM Bluemix Spark.

Open Infrastructure, Sustainable Design

The new lab features an Infrastructure-as-a-Service (IaaS) platform based on OpenStack connected to IBM Storwize for efficiently provisioning 80TB of storage for research projects.

The lab is located in the Tshimologong Precinct in Braamfontein – an inner-city area which is today re-emerging as a vibrant Johannesburg district. The two-level, 900 square meter lab has a DIY maker space with electronic design equipment and a 3D printer.

Agile work spaces provide a collaborative environment for IBM scientists to train and mentor Wits students and local start-ups. Developer communities across Africa will also have access, at no charge, to a LinuxONE Community Cloud located in Johannesburg, which acts as a virtual R&D engine for creating, testing and piloting emerging applications via the cloud.

IBM Research Innovating for Africa

IBM has operated in Africa for almost 100 years. Today, its operations span 24 countries, including South Africa, Morocco, Egypt, Nigeria, Ghana, Angola, Kenya and Tanzania. IBM Research - Africa is the first commercial research organization on the continent, conducting applied and far-reaching exploratory research into Africa's grand challenges and committed to delivering commercially-viable innovations that impact people's lives.

IBM's first African research lab was opened in Nairobi, Kenya in 2013. The South African research facility supports IBM's Equity Equivalent Investment Programme (EEIP). In recent years, IBM has also invested in the development of an IBM Client Centre, an Innovation Centre, Service Delivery Centre and a number of offices and data centers across South Africa.

About IBM Research

For more than seven decades, IBM Research has defined the future of information technology with more than 3,000 researchers in 12 labs located across six continents. Scientists from IBM Research have produced six Nobel Laureates, 10 U.S. National Medals of Technology, five U.S. National Medals of Science, six Turing Awards, 19 inductees in the National Academy of Sciences and 20 inductees into the U.S. National Inventors Hall of Fame. For more information about IBM Research, visit www.ibm.com/research.

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Photos are available here: https://www.flickr.com/gp/ibm_research_zurich/3j9Md4

*Weigelt, B., Peterse, J. L. & van 't Veer, L. J. Breast cancer metastasis: markers and models. Nat. Rev. Cancer **5,** 591–602 (2005)

**Off-Grid Solar Market Trends Report 2016, published by Bloomberg New Energy Finance and Lighting Global, an innovation of the World Bank Group. In cooperation with Global Off-Grid Lighting Association

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https://mea.newsroom.ibm.com/2016-08-25-IBM-Research-Opens-in-South-Africa-Cognitive-Computing-and-the-IoT-help-Track-Diseases-and-Forecast-Air-Quality