Botswana's COVID-19 Dashboard

BIUST
BOTSWANA INTERNATIONAL UNIVERSITY OF SCIENCE & TECHNOLOGY

Visualisation, Monitoring, and Modelling the Spread of the COVID-19 Pandemic in Botswana

Through strong scientific partnerships with South Africa's iThemba Laboratory for Accelerator Based Sciences (iThemba LABS) and the School of Physics at the University of the Witwatersrand (WITS), Botswana International University of Science and Technology (BIUST) has embarked on a project for visualising, monitoring, and modelling the spread of the COVID-19 pandemic in Botswana.

The Botswana dashboard is managed by Otsile Tikologo, an MSc student who has been trained at iThemba LABS in the application of Monte Carlo methods for designing biological shielding for nuclear particles and radiation. Tikologo is also heavily involved in training his counterparts in Namibia, Zimbabwe, and Mozambique to setup and manage their own COVID-19 dashboards.

"We are proud of the fact that our dashboard has been designated as the official dashboard for the COVID-19 Presidential Task Force of the Republic of Botswana," says Professor Gregory Hillhouse, Head of the Department of Physics and Astronomy at BIUST. "In addition to visualisation aspects, we are working closely with iThemba LABS and Wits to use the data for model predictions that will inform policy and decision makers in Botswana."

The nature of the collaborative COVID-19 project is interdisciplinary, where medical data and expertise need to be combined with a wealth of methodologies and algorithms used in advanced analytics, Big Data and Data Science.

Assumptions used in the project revolve around our current level of understanding of advanced analytics driven by Data Science and other disciplines. Both main-stream statistical frameworks, frequentist and Bayesian are an underlying assumption to model development. Input from the different medical, virology and custodians of static data pertaining to populations, social and medical vulnerabilities, access to medical infrastructure, prevalence of various relevant pre-existing conditions are also underlying assumptions.

"The project encapsulates methodologies in Data Science and Artificial Intelligence that effectively combine medical and other data to provide a comprehensive synthetic view of the predictive landscape," says Professor Bruce Mellado of Wits University and iThemba LABS.

The chief goal of the project is to control the number of people infected, hospitalisations, ICU admissions and mortality. These outcomes are predicted as a function of non-pharmaceutical interventions in the post-lockdown period to allow for the economy to reactivate.

Analytical and predictive tools developed by these projections will assist policy makers to enact rules and regulations with which to revive economic activity while preventing a massive outbreak of the virus. This is

essential to alleviate the economic impact of the virus in African countries, in particular to slow down the rate of job losses.

The above foray into the COVID-19 project has emerged as a natural extension to existing collaborative links between BIUST, iThemba LABS, and Wits University, through official Memoranda of Understanding in the areas of Big Data, Nuclear Physics, Radiochemistry, Collider Physics, and Materials Science. One of the successes of this collaboration includes the first Motswana student, Gaogalalwe Mokgatitswane [Supervisors: Dr. Kureba (BIUST), Prof. Mellado (Wits and iThemba LABS)] to complete an MSc research project, and who is currently pursuing a PhD, at the European Organisation for Nuclear Research (CERN) which operates the largest and most advanced particle physics laboratory in the world.

"It is gratifying to see that the transferable Physics skills that I acquired during my MSc project at CERN can be applied to develop predictive models for informing the health and economic sectors of countries." says Mokgatitswane, whose PhD degree at Wits focusses on employing sophisticated data analysis frameworks together with the state-of-the-art Artificial Intelligence techniques to search for new exotic particles from huge amounts of data recorded by the ATLAS detector at the Large Hadron Collider facility at CERN.
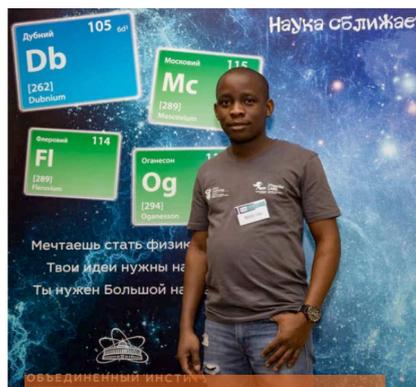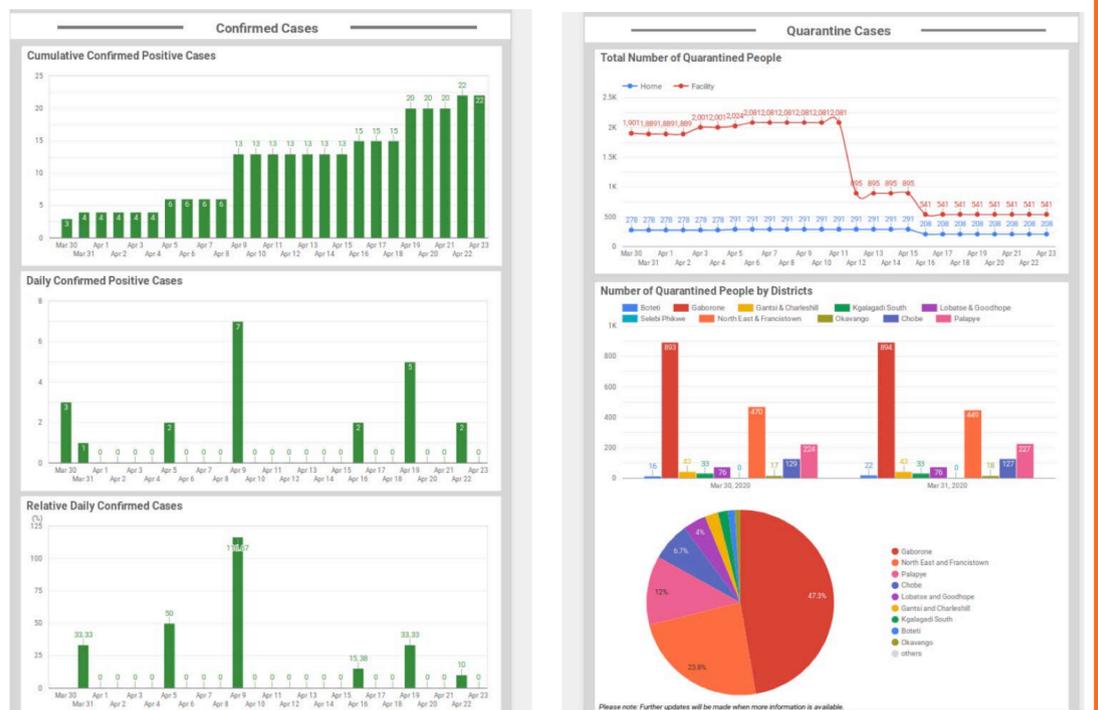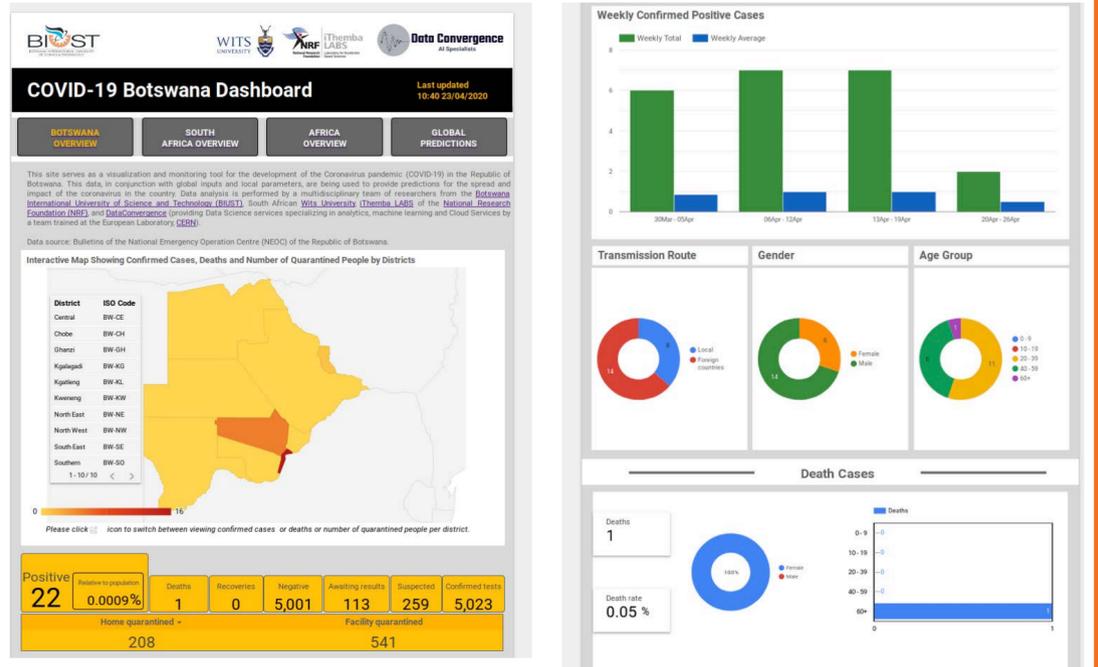
A further highlight of the collaboration with iThemba LABS is that Adolf Motetshwane [Supervisors: Prof. Hillhouse (BIUST), Dr. Steyn (iThemba LABS)] is the first Motswana student to complete an MSc degree using the proton beams at iThemba LABS to study production yields of radioisotopes for medical applications.

"The importance of accurate and speedy testing in stopping COVID-19 virus cannot be overstated. Apparently one of the most reliable and widely used laboratory methods for testing for COVID-19 virus is a nuclear-derived technique called REAL-TIME REVERSE TRANSCRIPTION-POLYMERASE CHAIN REACTION (RT-PCR) and many countries are working with the International Atomic Energy Agency to use this technique. With my Nuclear Physics background I am prepared to collaborate with researchers from other fields, especially Biological and Chemical Sciences and start the ball rolling for applying this technique locally." says Adolf Motetshwane who is currently working on his PhD project at iThemba LABS.

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https://www.wits.ac.za/covid19/covid19-news/latest/wits-covid-19-dashboard-gets-grant-award-from-the-ieee.html
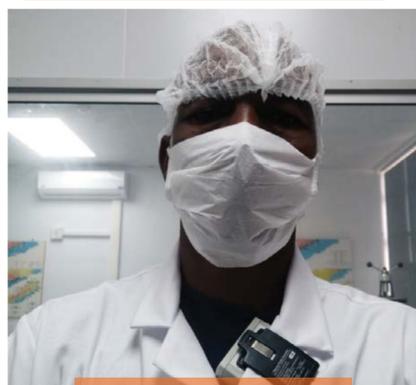
Snapshots of the BIUST COVID-19 Visualisation Dashboard

Otsile Tikologo, manager of the BIUST COVID-19 Dashboard

Professor Gregory Hillhouse (left) and Professor Bruce Mellado (right)

Adolf Motetshwane

Gaogalalwe Mokgatitswane

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