# AI helps to identify new COVID-19 hotspots in Gauteng

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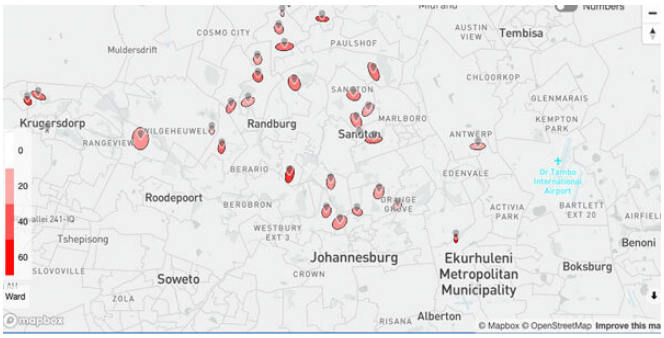


Map of the active hot spots in the Gauteng Province. Credit: Wits University

Accurate modeling is one of the tools being used to fight the COVID-19 pandemic globally. It is essential for policy makers, experts and the population to get access to reliable information on the evolution and severity of the pandemic based on relevant and robust advanced analytics and modeling.

In the last two weeks there has been a large increase in the daily number of cases throughout South Africa. These increases show clear signs of being the beginning of the second surge experienced in many countries around the world. In order to manage the rapidly growing numbers in Gauteng, it is vital to be able to target areas where the spread of the virus is growing fast and can be categorized as a hotspot. The determination and modeling of hotspots are complex tasks that require the use of techniques derived from artificial intelligence (AI).

In order to make this exercise possible, back in August the Gauteng Government launched a dashboard with IBM Research, Wits University and other stakeholders to visualize the data and modeling for the province. The partners have now updated the dashboard to visualize hotspots in the Gauteng Province. The tool provides information about the location, the number of cases, the area, affected administrative regions and the level of severity for each hotspot.

In order to fully characterize the danger that may be associated with a hotspot it is essential to assign to it an index in addition to its location and other characteristics. This index is referred to as the index of severity. This index is intended to enable policy makers and authorities on the ground to determine the best course of action to most efficiently curb the hotspots.

The Wits Institute for Collider Particle Physics (ICPP) applies analytical methods and tools used at the CERN (European Organization for Nuclear Research), to develop indexes that help policy makers and other stakeholders track the evolution of the pandemic. These indexes are developed on the basis of extensive research and observations of how the pandemic is evolving in South Africa and internationally.

"One of the indexes that our team developed is the risk index for the second wave. This index is a tool for the early detection of the second wave and it can be visualized and tracked for the different administrative regions of South Africa. The development of the severity index for hotspots is a continuation of earlier studies," says Thuso Mathaha and Kgomotso Monnakgotla, researchers at the ICPP.

"We are observing a sharp increase in the number of infections across the province. We identified hotspots and the active ones are mapped in our dashboard that is available for free to the public, researchers and policy makers. We encourage public use of this information as it is relevant for following the movement of the pandemic and to be alerted to emerging hotspots. We urge the public to continue to adhere to the regulations so that we can reduce infections and save lives," says

Mduduzi Mbada, Head of Policy at the Gauteng Office of the Premier.

"This dashboard contributes to the COVID-19 pandemic response by making data on the spatial location of active hotspots in Gauteng readily available to the public, researchers and policy makers. It is anticipated being able to visualize the specific locations of hotspots will influence people's perceptions of COVID-19 risk and potentially shape personal protective behavior. The dashboard also provides data useful for the Advisory Committee to guide policy makers on where to target interventions for mitigating the pandemic. Further, the dashboard provides policy makers granular data useful for planning and monitoring the pandemic response at ward level," says Dr. Mary Kawonga, Public health Medicine Consultant at Wits University and Chair of the Gauteng Premier COVID-19 Advisory Committee.

"The problem is how to identify areas of high activity of coronavirus. Given the locations of COVID-19 patients provided by the Health Department, we must group the cases into severely infectious zones, or clusters. We are able to find these clusters optimally within the Gauteng region, by using technologies in artificial intelligence. With this information, we can compare the growth of a cluster to epidemiological models derived for infectious disease spread, thereby giving accurate predictions for the evolution of any cluster. This means we can now describe the severity of coronavirus cases for various locations within the province. The success of this integration of AI algorithms with standard epidemiological models is a powerful example of how 4IR research can be used to aid South Africa," says Roy Gusinow, a researcher at the ICPP.

"Hotspots areas are defined thorough a thorough analysis of the first wave using AI together with advanced analytics we are able to examine each cluster of cases geographically and through epidemiological modeling. Once the dynamics of normal clusters and hot-spot clusters is clearly understood we are able to extract potentially vulnerable and volatile clusters as hot-spots and/or developing hot-spots and visualize them through IBM's specially developed platform. Through the gpcoronavirus platform, stakeholders in all industries are able to identify hot-spots and enforce appropriate measures, distribute necessary resources and/or provide guidance to the area's population to control the spread of COVID-19," says Benjamin Lieberman, a researcher at the ICPP.

This fruitful collaboration between the Gauteng Department of Health, and other stakeholders in Gauteng, IBM and Wits University involves many individuals from diverse backgrounds. This includes policy makers, practitioners and researchers from a wide range of disciplines.

"The new hotspot visualization in the dashboard includes the severity of infectiousness in an area and is grounded on epidemiological models that capture the dynamics of the spread of the disease," says Dr. Sibusisiwe Makhanya, a research scientist at IBM Research—Africa.

"Artificial intelligence is a versatile set of tools in modern analytics that allows us to tackle modeling of complex system through learning from experience. AI has proven to be very effective in the inter-disciplinary ecosystem established to tackle a this major crisis," says Professor Bruce Mellado, Director of the Wits ICPP, who is also a senior scientist at iThemba LABS and a member of the Gauteng Premier COVID-19 Advisory Committee.

**More information:** The dashboard is available via the IBM Cloud using the latest Chrome or Firefox web-browsers at https://gpcoronavirus.co.za.

Provided by Wits University