Omicron BA.2 predicted through Exeter professor's mathematical modelling

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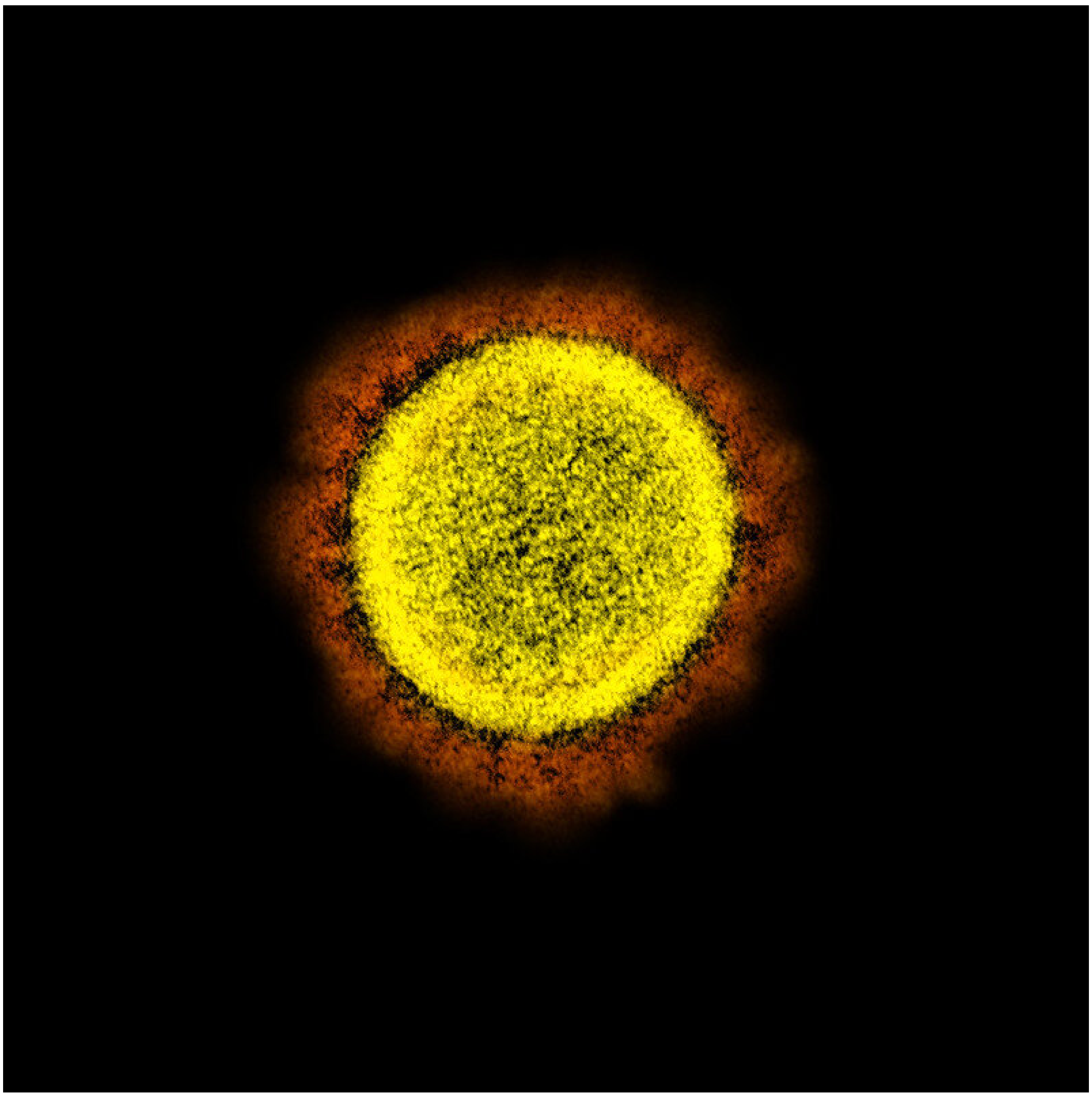

Novel Coronavirus SARS-CoV-2 Transmission electron micrograph of SARS-CoV-2 virus particles, isolated from a patient. Image captured and color-enhanced at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: National Institute of Allergy and Infectious Diseases, NIH

Professor Livio Fenga, a senior lecturer at the University of Exeter Business School's Centre for Analysis, Simulation and Models, used complex mathematical tools to detect the possible presence of the BA.2 omicron sub-variant in December, before the genetic sequence was identified.

The sub-variant of omicron has now been detected in at least 57 countries, according to the WHO, and in some countries is thought to account for more than half of sequenced omicron cases.

Dr. Fenga made the discovery by analysing the official data on COVID for Italy released by the Italian ministry of health and applying an ensemble of mathematical modelling methods including spectral entropy, wavelet theory, feature extraction and multi-spectral imaging.

It allowed him to detect anomalies in the data for northern Italy in the form of weak, hard-to-detect data peaks occurring only at certain frequencies, which he correctly interpreted as a warning sign of a potential new variant.

"Detecting these anomalies is far from simple: often they are very weak signals and to be able to detect their presence, we use these mathematical filters that allow us to highlight in the data peaks that occur only at certain frequencies," Professor Fenga explained.

He compares his technique to the idea of an office building where a lot of electricity is being consumed but which experiences a freak surge once a week when all the office equipment happens to be used at once.

"This is something that is not easily detectable because people are using the printers and the photocopiers all the time, so there's a low signal to noise, but if you break down the frequencies you can see something, and that's what we did."

Dr. Fenga hopes news of his role in predicting BA.2 will spread awareness of the importance of mathematical models in fighting COVID-19.

He said: "Throughout the pandemic we have quite rightly heard a lot from virologists, epidemiologists and doctors, but mathematicians have an important role to play in serving communities and tackling these real-life problems too.

"Analysis tools like these can be very important in anticipating the arrival of new variants, potentially saving lives by helping us to react more quickly."

Provided by University of Exeter

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