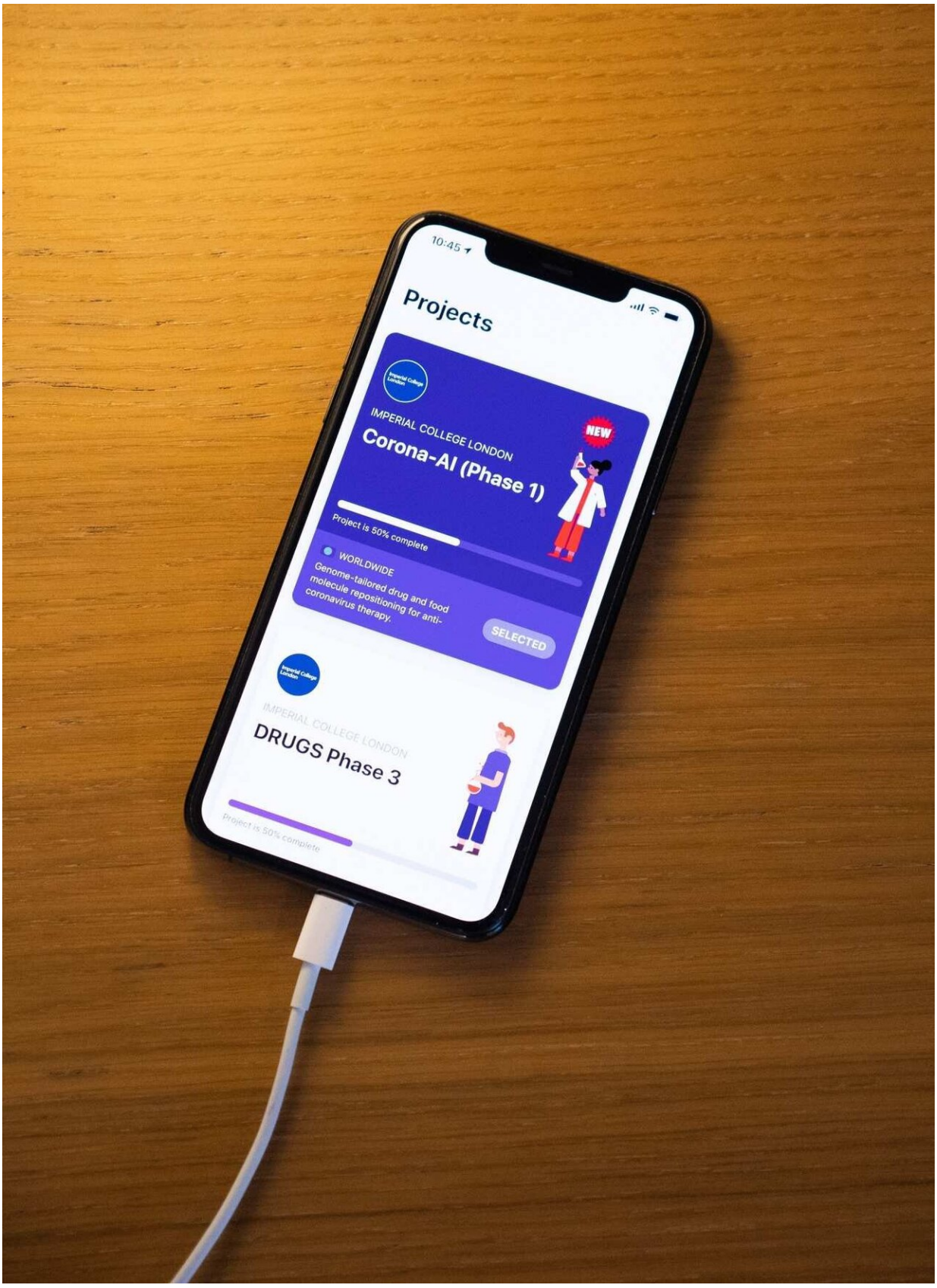
New COVID-19 project will use the power of smartphones to search for treatments

April 8 2020, by Hayley Dunning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Projects
IMPERIAL COLLEGE LONDON
Corona-AI (Phase 1)
NEW
Project is 50% complete
WORLDWIDE
Genome-tailored drug and food molecule repositioning for anti-coronavirus therapy.
SELECTED
IMPERIAL COLLEGE LONDON
DRUGS Phase 3
Project is 50% complete

Credit: Imperial College London

Imperial researchers will look for potential new treatments for COVID-19 using the computing power of people's smartphones.

Working with Vodafone Foundation, the "Corona-AI' project will use the free DreamLab app, which crunches calculations using a smartphone's computing power while its user sleeps. The app has already helped find potential new cancer drugs and is now aiming to help in the fight against the coronavirus pandemic.

Data generated from the calculations will help Imperial scientists identify existing drugs and food-based molecules with antiviral properties. Ultimately, they hope to enable tailored treatments to be developed for patients with COVID-19.

The app works by creating a network of smartphones to power a virtual supercomputer, capable of processing billions of calculations, without collecting or disclosing users' location data. No personal data is downloaded to or processed from the user's device.

Researchers believe that in the long run this work could speed up access to effective drugs and enable tailored treatments against this infectious disease.

Dr. Kirill Veselkov from the Department of Surgery and Cancer at Imperial College London, who is leading the research, said: "We urgently need new treatments to tackle Covid-19. There are existing drugs out there that might work to treat it, and the great thing about repurposing existing drugs is that we already know they are safe to use

and so we could potentially get them to patients quickly.

"However, we have to do difficult and complicated analyses using artificial intelligence to find out which molecule or combinations of molecules might be able to disrupt the virus when it's inside the body. We want to target not just one protein but the whole network that the virus creates in order to survive. Then we can see which drugs containing these molecules might be possible candidates to fight the virus, and we can also look at which foods containing helpful molecules might boost the body's ability to fend it off.

"All of this takes a huge amount of computing power and DreamLab creates a supercomputer that enables us to do this important work in a relatively short timeframe."

Speeding up the job

While traditional experimental research and standard research methods could take years to develop, the mobile cloud-based processing approach of DreamLab can drastically reduce the time taken to analyse the huge amount of data that exists. A desktop computer with an eight-core processor running 24 hours a day would take decades to process the data, but a network of 100,000 smartphones running six hours a night could do the job in just a couple of months.

Instead of looking for brand new drug molecules, the project will search through a database of thousands of existing drugs that could be repurposed to fight COVID-19. As these drugs are already known to be safe, they could be used much sooner than new drugs.

In addition, the project will comb through a database of food molecules that could potentially boost the drugs' ability to fight COVID-19 in the body.

Multiple lines of attack

Coronaviruses need their hosts—us—to survive and replicate. They do this by 'hijacking' cellular processes, using our own proteins to help them survive. The complex interactions between the virus' proteins and our own are called 'virus-host interactome networks."

Traditional antiviral drugs only target one of the proteins involved, but this leaves the possibility of the virus mutating to get around the roadblock created by the drug. Instead, any treatment needs to be able to tackle multiple parts of the virus-host interactome network.

This is where the supercomputing power of the nation's smartphones comes in. DreamLab uses machine learning, on a mobile supercomputing network, to analyze billions of combinations of existing drug, food-based molecules and genetic interactions, fundamentally reducing the time needed to make discoveries.

The best treatment could include existing drugs and supportive molecules found in foods. However, mapping how combinations of molecules interact with the virus-host interactome network is very complicated, and combinations of three, four, or even more compounds would be impossible to test in the lab.

A member of the DreamLab collaboration, Professor Michael Bronstein from the Department of Computing Imperial College London, said: "We are using network-based AI methods to identify antiviral compounds amongst a dataset of thousands of molecules, by modeling the network effects of the interactions between these molecules and biomolecules in our body.

"We have previously successfully used these methods to find 'hyperfoods' containing anti-cancer drug-like compounds, are now

retooling them for the new disease."

Eventually, the team hopes that multi-drug therapies with supportive diets could be prescribed to help COVID-19 patients recover.

Improving patient outcomes

Head of the Department of Surgery and Cancer at Imperial, Professor George Hanna, said: "These are unprecedented times that demand radical and unprecedented scientific solutions. The DreamLab: Corona-AI project team have taken their knowledge and success in using AI technology to discover anti-cancer properties in existing drugs and foods and put that to use against this new global threat."

Member of the project team, Dr. Reza Mirnezami, Consultant Colorectal Surgeon, Royal Free Hospital, said: "The DreamLab team are working on harnessing the power of AI to identify how commonly used, approved drugs could be 'redeployed' in the war against COVID-19. Moreover, we are looking at how to improve outcomes in COVID-19 patients using diet, which will undoubtedly affect host immunity and gut microbiotal resilience."

Provided by Imperial College London

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