PRESS RELEASE

Villejuif, 1 February 2021

ARTIFICIAL INTELLIGENCE HELPS TO PROVIDE MORE PERSONALISED AND PREDICTIVE CARE FOR COVID-19 PATIENTS

A new Artificial Intelligence (AI) tool has been developed to provide doctors with a severity score for COVID-19 patients as soon as they are diagnosed to predict outcomes. The new tool is the result of a collaboration between doctors and researchers from Gustave Roussy, Université Paris-Saclay, the Bicêtre Hospital – AP-HP, the French Institute for Research in Computer Science and Automation (INRIA) and the start-up Owkin. Its code has been made available to all and published in the review *Nature Communications*. The Radiology Department at Gustave Roussy has used the tool for the past month and it has proven useful in the clinical management of Covid patients. The clinical implementation of this AI tool in just six months is an excellent example of the advancement of research for patients during the COVID-19 pandemic.

The progression of Covid-19 in patients varies greatly and being able to predict a patient's risk of deterioration (i.e. oxygen needs and transfer to intensive care) as soon as they are diagnosed is imperative.

This new AI tool produces a severity score that combines different variables to predict the patient's progression. It has recently become part of the clinical routine at Gustave Roussy's Radiology Department. Calculating the score takes just two to three minutes and it can be given to doctors at the same time as the scan report for each patient assessed.
The score ranges from 1 (very low risk) to 5 (very high risk). It alerts doctors and allows them to adapt how the patient is monitored to anticipate deterioration. As a result, the tool allows for a more personalised therapeutic management of Covid-19 patients.

The severity score was developed as part of the ScanCovIA study led by Prof Nathalie Lassau, radiologist at Gustave Roussy, and conducted in close collaboration with teams from Gustave Roussy, Université Paris-Saclay, the Bicêtre Hospital – AP-HP, the French Institute for Research in Computer Science and Automation (INRIA) and Owkin.
The study is based on the cross-analysis of various clinical, biological and radiological variables using artificial intelligence. The study makes use of a key tool, chest CT scans, which assess the extent and nature of lesions in the thorax and diagnoses lung damage.

The deep learning AI model was trained and then validated on over 1,000 patients, simultaneously analysing and combining heterogeneous data from CT scans, clinical and biological data, as well as patients' medical history and comorbidities. Of the 65 variables analysed, five proved to be particularly important in determining the prognosis: oxygen saturation, platelet counts (medullary function index), urea (renal impairment), age and gender.
By combining these five variables and CT scans, the AI model is able to accurately calculate a severity score that can categorise patients according to their possible outcome, the likelihood of being transferred to intensive care, and whether they will require respiratory assistance, etc. The tool helps doctors answer essential questions in regard to urgent care and predict patients' needs and therapeutic options.

In the article published in *Nature Communications*, a comparative study ranked ScanCovIA's AI model as the best performing AI tool out of 11 studies published to date. Its code is open source and can be used by imaging departments in France and around the world.

The study has benefited from the support of donors, including Malakoff Humanis.

Source

Integrating deep learning CT-scan model, biological and clinical variables to predict severity of COVID-19 patients

Nature Communications, published online 27 January 2021
DOI: 10.1038/s41467-020-20657-4

Nathalie Lassau[1,2], Samy Ammari[1,2], Emilie Chouzenoux[3], Hugo Gortais[4], Paul Herent[5], Matthieu Devilder[4], Samer Soliman[4], Olivier Meyrignac[4], Marie-Pauline Talabard[4], Jean-Philippe Lamarque[1,2], Remy Dubois[5], Nicolas Loiseau[5], Paul Trichelair[5], Etienne Bendjebbar[5], Gabriel Garcia[1], Corinne Balleyguier[1,2], Mansouria Merad[6], Annabelle Stoclin[7], Simon Jegou[5], Franck Griscelli[8], Nicolas Tetelboum[1], Yingping Li[2,3], Sagar Verma[3], Matthieu Terris[3], Tasnim Dardouri[3], Kavya Gupta[3], Ana Neacsu[3], Frank Chemouni[7], Meriem Sefta[5], Paul Jehanno[5], Imad Bousaid[9], Yannick Boursin[9], Emmanuel Planchet[9], Mikael Azoulay[9], Jocelyn Dachary[5], Fabien Brulport[5], Adrian Gonzalez[5], Olivier Dehaene[5], Jean-Baptiste Schiratti[5], Kathryn Schutte[5], Jean-Christophe Pesquet[3], Hugues Talbot[3], Elodie Pronier[5], Gilles Wainrib[5], Thomas Clozel[5], Fabrice Barlesi[6], Marie-France Bellin[2,4], Michael G. B. Blum5*

1.Imaging Department Gustave Roussy. Université Paris Saclay, Villejuif, F-94805
2.Biomaps. UMR1281 INSERM, CEA, CNRS, Université Paris-Saclay. Villejuif, F-94805
3.Centre de Vision Numérique, Université Paris-Saclay, CentraleSupélec, Inria, 91190 Gif-sur-Yvette, France
4.Radiology Department, Hôpital Bicêtre – AP-HP, Université Paris Saclay, Le Kremlin-Bicêtre, France 5.Owkin Lab, Owkin, Inc. New York, NY USA
6.Département d'Oncologie Médicale, Gustave Roussy, Université Paris-Saclay, Villejuif, F-94805, France
7.Département Interdisciplinaire d'Organisation des Parcours Patients, Service de Medecine intensive réanimation, Gustave Roussy, Université Paris-Saclay, Villejuif, F-94805, France
8.Département de Biologie, Gustave Roussy, Université Paris-Saclay, Villejuif, F-94805, France
9.Direction de la Transformation Numérique et des Systèmes d'Information, Gustave Roussy, 94800 Villejuif, France.

PRESS CONTACT

GUSTAVE ROUSSY:
Claire Parisel – + 33 (0) 1 42 11 50 59 – + 33 (0) 6 17 66 00 26 – claire.parisel@gustaveroussy.fr