

PRESS RELEASE

INTESA SANPAOLO SUPPORTS UNIVERSITY OF MILAN CORONAVIRUS RESEARCH AT SACCO HOSPITAL

- Since the early days of lockdown last March, the Artificial Intelligence Laboratory of Intesa Sanpaolo Innovation Center has been providing professional support and technology to the Infectious Diseases Laboratory of the University of Milan at the Sacco Hospital for genomic sequencing and mapping of the Coronavirus.
- Massimo Galli, Director of the Infectious Diseases Clinical Division at Sacco Hospital: *“The noteworthy results confirm the importance of a multidisciplinary approach combined with scientific rigour. We hope to continue our partnership with Intesa Sanpaolo Innovation Center well into the future.”*
- Maurizio Montagnese, Chairman of Intesa Sanpaolo Innovation Center: *“We have chosen to support the Covid-19 research conducted by the team of university researchers led by Professor Massimo Galli at the Sacco Hospital in Milan, by providing expertise and technology from the very start.”*

Milan/Turin, 10 November 2020 – Last March, in the early days of the lockdown, **Intesa Sanpaolo Innovation Center**, the company dedicated to innovation of the Intesa Sanpaolo Group, and the **Infectious Diseases Laboratory of the Luigi Sacco Biomedical and Clinical Sciences Department of the University of Milan (Sacco Hospital)** began working in close collaboration on the **genomic sequencing and geographical mapping in Italy of SARS-CoV-2, the virus that causes COVID-19, and in reconstructing the virus’ origins and how it is being spread among the population in Italy.**

The close and longstanding relationship between **Intesa Sanpaolo**, the **University of Milan** and **Sacco Hospital**, in the areas of health and workplace safety, thanks to the commitment of the Bank’s **Safety and Protection Department**, has been further strengthened in the area of applied research.

The **Artificial Intelligence Laboratory of Intesa Sanpaolo Innovation Center** supports the research of the **Infectious Diseases Laboratory of the University of Milan at the Sacco Hospital** by creating a research environment (servers, databases, user access, licences and IT tools) that makes **IT, statistical and data science expertise and human capital available, as well as, increased computing power**. This research environment has led to the development of programming codes to **automate a significant part of the research, such as the selection and cleaning of genomic sequences**.

The partnership has been instrumental in analysing the vast amount of genomic sequences stored in public databases and in the structures that form the **Infectious Diseases Laboratory** network – the leader of the genomic sequencing and geographical mapping of the Coronavirus project which involves more than 20 Italian clinics.

This project, which is vital for the molecular surveillance of SARS-CoV-2, has resulted in the **publication of a scientific paper in the international medical journal *Viruses***, entitled “*Molecular tracing of SARS-CoV-2 in Italy in the first three months of the epidemic*”. The study, which was conducted on 59 new viral genomes obtained in different regions of Italy, has made it possible to observe that almost all the viruses present in Italy belong to the B.1 lineage, which later became the most widespread in the world. It also confirmed that it most likely began circulating in Italy, according to estimates from time-calibrated phylogenetic trees, between the end of January and the beginning of February 2020 - at least one month before the first cases of COVID-19 were documented in Italy. The study also made it possible to estimate the transmission parameters of the virus, which increased from February onwards until they peaked around mid-March, when the number of secondary cases resulting from a single infected person was 2.3 (estimated basic reproduction number denoted as R).

“The noteworthy results confirm the importance of a multidisciplinary approach combined with scientific rigour and the fundamental role of public-private partnerships in research” – said **Massimo Galli, Professor of Infectious Diseases at the University of Milan and Director of the Infectious Diseases Clinical Division of the Sacco Hospital**. *“We hope to continue our partnership with Intesa Sanpaolo Innovation Center, with its IT, statistical, mathematical and data management expertise, well into the future with the creation of an open research environment for archiving and sharing genomic sequences and related biographical and clinical data. This would be extremely useful for the Italian network including the Infectious Diseases Laboratory and, ultimately, for the entire international scientific community.”*

*“During the Coronavirus pandemic, the Intesa Sanpaolo Group provided various forms of support to several hospitals throughout the country, particularly in the most heavily affected areas. Intesa Sanpaolo Innovation Center has chosen to support the Covid-19 research conducted by the team of university researchers led by Professor Massimo Galli at the Sacco Hospital in Milan, by providing expertise and technology from the very start” – explained **Maurizio Montagnese, Chairman of Intesa Sanpaolo Innovation Center.** “Our ongoing partnerships with leading universities and research centres have facilitated the development of new professions within our organisation such as the data scientists and analysts in the Artificial Intelligence Laboratory, who can bridge the gap between essential research and the challenges of business and not just with regard to finance. Their work, in synergy with the University’s researchers, has led to the creation of a secure IT environment, called Smart IT. We are continuing to expand this environment together with the commitment and expertise of other structures of the Bank to reinforce and develop what we have started and make it available to other structures and institutions in the fight against the Coronavirus.”*

Summary of the research conducted by the University of Milan at the Sacco Hospital and the contribution of Intesa Sanpaolo Innovation Center

In the field of molecular biology and genetics, a **genome** is all genetic material of an organism. In coronaviruses, it consists of RNA.

Whole genome **sequencing** is the process of determining the complete nucleotide sequence of an organism’s entire genome. A **genomic sequence** is therefore the sequence of nucleotide bases in a genome. The **size of the Coronavirus genome** is about 30,000 nucleotide bases (adenine, guanine, cytosine, thymine).

In order to explain how correlated two or more organisms are from an evolutionary point of view, a **phylogenetic analysis** is carried out to produce phylogenetic trees which illustrate the evolutionary relationship between one organism (genome) and the other.

Intesa Sanpaolo Innovation Center, in collaboration with **Intesa Sanpaolo’s Safety and Protection Department**, supported **researchers of Occupational Medicine and Infectious Diseases Clinical Medicine of the University of Milan**

at the Sacco Hospital in Milan (ASST Fatebenefratelli Sacco di Milano) in achieving three objectives:

- the **study of models for dating the phylogenetic trees of the virus genomes** to reconstruct the spread of the infection in Italy and Europe by estimating key epidemiological parameters such as the basic reproductive number (R0) and the doubling time of infections;
- **the identification and analysis of mutations in viral genes** to identify possible changes in their virulence;
- the **management and organisation of the analysis on an exceptionally large amount of data** relating to the sequences of the Italian laboratories in the Sacco Hospital network.

In the first phase, the **Artificial Intelligence Laboratory of Intesa Sanpaolo Innovation Center**, in collaboration with the **University of Milan and the Sacco Hospital**, has:

- provided the research environment;
- constructed, populated and managed the database of Italian sequences even with purpose-built user-friendly interfaces;
- gathered open source data, working alongside the **Sacco Hospital** to gather the Italian sequences belonging to the **Infectious Diseases Laboratory** network.

The partnership continues to:

- **select, clean and align the sequences gathered**, measure the degree of similarity and identify any mutations (replacements, insertions and deletions);
- **reconstruct the phylogeny** using methods based on likelihood or Bayesian approaches, validating the strength of the tree using statistical techniques (Bootstrap, Bayesian Inference);
- **estimate the epidemiological parameters and reconstruct how the infection spread** using phylogeographic approaches;
- **experiment with new tools** for automating the processing and visualisation of results through an interactive control panel.

Intesa Sanpaolo is one of the soundest and most profitable banks in Europe. It offers commercial, corporate investment banking, asset management and insurance services. It is the leading Bank in Italy, with approximately 11.8 million customers who are assisted through both digital and traditional channels. The Group's international subsidiary banks serve 7.2 million customers across Eastern Europe, the Middle East and North Africa. Intesa Sanpaolo is considered one of the most sustainable banks in the world. For the Group, creating value means being a driver for growth, for the benefit of both society and the economy. As regards the environment, the Group has set up a 5-billion-euro fund for the circular economy. Intesa Sanpaolo supports major economic inclusion and poverty reduction projects, including an impact fund of 1.2 billion euro for loans available to social groups who struggle to access credit. Intesa Sanpaolo has a high level of involvement in cultural initiatives, organised by the Bank or in collaboration with other entities in Italy and further afield. These include permanent and temporary exhibitions showcasing the Bank's impressive artistic heritage at the Gallerie d'Italia, the Group's museums located in Milan, Naples, Vicenza and soon Turin.

Intesa Sanpaolo Innovation Center is the company of the Intesa Sanpaolo Group dedicated to the world of innovation. The company invests in applied research projects and high potential startups, to encourage the Group's and its customers' competitiveness and speed up the development of the circular economy in Italy.

With an office in the Turin skyscraper designed by Renzo Piano and a national and international network, the Innovation Center aims to represent an engine enabling relationships with other stakeholders from the innovation ecosystem such as companies, startups, incubators, research centres and universities, promoting new forms of entrepreneurship to access venture capital, including through its wholly-owned subsidiary Neva Finventures.

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