

Three Spanish Hospitals use privacy-preserving Artificial Intelligence to help the speed and accuracy of COVID-19 screening

- ***Hospital Ramón y Cajal, Hospital 12 de Octubre and Hospital Sant Pau improve COVID-19 diagnosis with chest X-ray using Distributed Artificial Intelligence.***
- ***The Federated Learning platform, developed by Capgemini, allows the hospitals to share trained Artificial Intelligence (AI) models to create a global model that is significantly better than any of the local versions, while assuring the protection of sensitive patient information.***

Madrid, November 24th 2021 – A collaboration among radiologists from three Spanish hospitals with a high volume of patients - Hospital 12 de Octubre and Hospital Ramón y Cajal, in Madrid, and Hospital Sant Pau in Barcelona – plus technology partner experts in Artificial Intelligence (AI) and IT, is rapidly progressing the use of cutting-edge technologies in healthcare, while maintaining patient data privacy by applying federated learning with hardware-enhanced security. This collaboration aggregates the clinical experience of each hospital to develop automated medical diagnosis models, to facilitate and improve patient care.

Although the definitive diagnosis of COVID-19 is made by microbiological tests - such as PCR or antigen tests -, the main symptomatic alteration in patients is respiratory. Therefore, the chest X-Ray has become the default initial screening test for all patients with suspected symptoms, and its availability and immediacy make it crucial.

During the pandemic, radiologists have analyzed a large number of chest X-rays, combining their previous experience with the learning derived from the findings of the X-rays of thousands of patients. However, the need to analyze a huge number of images with subtle findings requires time, training, and experience, making Artificial Intelligence a highly suitable tool for this purpose.

Federated Learning

The Federated Learning platform developed by Capgemini for the research study, based on sharing AI models trained with image data, allows the creation of a global diagnostic model that significantly improves local versions, especially benefiting healthcare facilities with less experience. The accuracy in the diagnosis of COVID-19, obtained in this research study is 89% for the global model, while the previous best of the local versions reached only 71% accuracy. And all this in addition to rigorously preserving patient data privacy.

The clinical protocol was developed as part of a collaboration between Capgemini and the Multisystemic Diseases Group of the Ramón y Cajal Institute for Health Research (IRYCIS). They have also had the support of various technology partners such as Cisco, Intel, Vodafone Spain and Microsoft with clinical cases from the hospitals mentioned above. Gilead Sciences Spain, a pharmaceutical company expert in virology and a pioneer in developing an effective treatment for COVID-19, has supported this project from the beginning, providing its knowledge and experience to contribute to the success.

Computation is also essential. Cisco and Intel provided the computing infrastructure to perform the experiments. Each hospital has a local computing node - fueled by third-generation Intel Xeon Scalable processors with Intel Software Guard Extensions (SGX). Furthermore, each has built-in AI accelerators and Cisco UCS servers - which contains the model that learns from radiological images.

According to **Dr. José Carmelo Albillos**, Head of Radiology Department at Hospital 12 de Octubre, "AI allows us to analyze large numbers of images almost automatically and with high precision, which makes it easier to prioritize their review and reporting. For this reason, it reduces the workload while speeding up diagnosis."

Dr. Javier Blázquez, Head of Radiology Department at Hospital Ramón y Cajal, highlights: "Federated learning allows us to improve our diagnostic reliability without disrupting data privacy, since the experience of a hospital is shared among several others, the results improve a lot with respect to those obtained separately."

Dr. Beatriz Gomez-Anson, Clinical Head and Principal Investigator at Sant Pau Hospital, points out that "this project shows the added value of AI tools to be implemented by medical specialists in radiology".

"At Capgemini we are very proud to be driving this project forward by contributing our knowledge to improve diagnostic methods without the need to share private data. Furthermore, thanks to the application of the latest areas of research in Artificial Intelligence, we can ensure patient privacy and data security," highlights **Daniel Iglesias**, Managing Director of Capgemini Engineering in Spain.

The project has been financed with contributions from Intel and the Cisco's Country Digital Acceleration (CDA) program for Spain, called Digitaliza.

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About Hospital de Sant Pau

Hospital de la Santa Creu i Sant Pau is a high-complexity hospital that has existed for more than six centuries. Its activity is mainly centered in Barcelona but extends throughout Catalonia; it also has considerable influence in the rest of Spain and notable international projection.

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