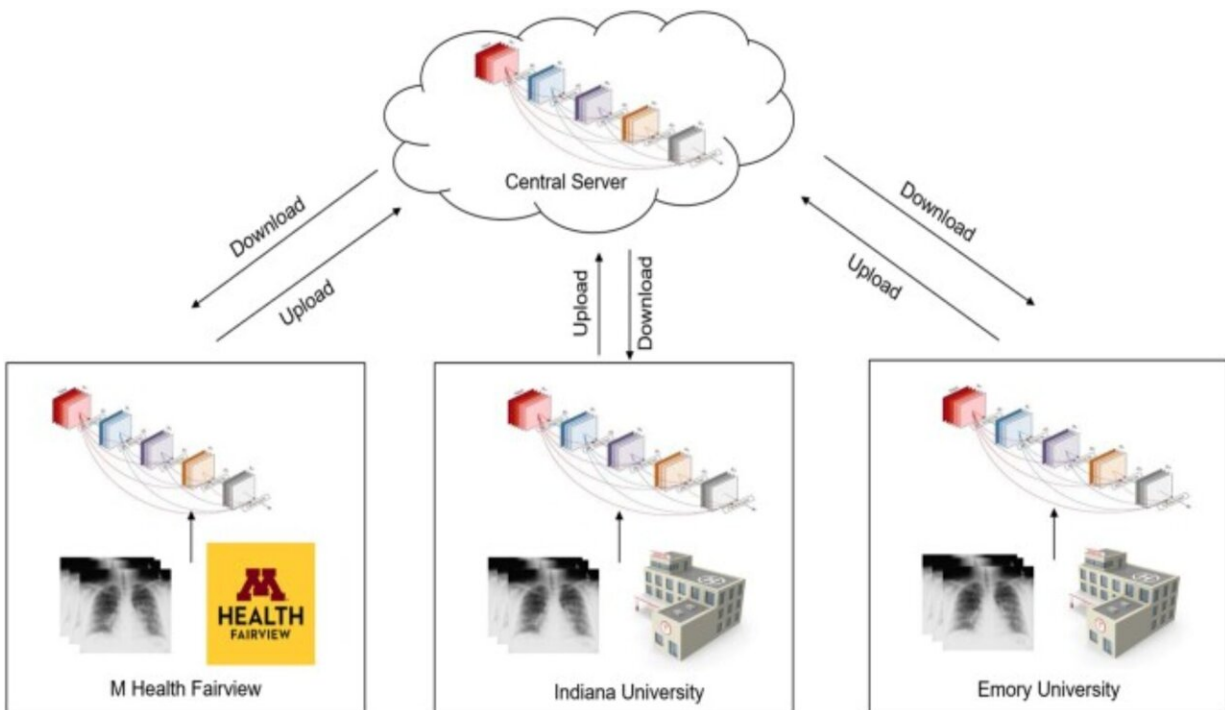# Evaluating use of new AI technology in diagnosing COVID-19

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Overview of federated learning in Nvidia Clara Train. Credit: *Journal of the American Medical Informatics Association* (2022). DOI: 10.1093/jamia/ocac188

As published in the *Journal of the American Medical Informatics Association*, University of Minnesota researchers led a study evaluating federated learning variations for COVID-19 diagnosis in chest X-rays. Federated learning is an artificial intelligence (AI) technique that enables

multiple parties to develop and train AI models collaboratively without the need to exchange or centralize data sets.

This research is a collaboration between the U of M, M Health Fairview, Emory University, Indiana University School of Medicine and University of Florida.

The research team compared the performance of a single site to a three-client federated model using a previously described COVID-19 diagnostic model. They found personalized federated learning may offer an opportunity to develop both internal and externally validated algorithms.

"Federated learning is an important future solution for AI in health care," Christopher Tignanelli, MD, MS, an associate professor at the University of Minnesota Medical School. "As all machine learning methods benefit greatly from the ability to access data that provides closer to a true global distribution, federated learning is a promising approach to obtain powerful, accurate, safe, robust and unbiased models."

Dr. Tignanelli co-led this study with Ju Sun, Ph.D., an assistant professor in the College of Science and Engineering. Both are leaders of the Program for Clinical AI in the Center for Learning Health System Sciences at the U of M Medical School.

"We're proud to be among the first teams implementing and further refining federated learning in real-world health care settings, with the strong support of industrial partners including Nvidia and Cisco," said Sun. "Data is the oil for modern AI, and federated learning makes the perfect oil refinery to advance AI for health care."

By enabling multiple parties to train collaboratively without the need to

exchange or centralize data sets, the research team says federated learning helps protect sensitive medical data and may open new research and business avenues to improve patient care.

State-of-the-art algorithms are usually evaluated on carefully curated data sets originating from only a few sources, rather than truly representative data. This can introduce biases where demographics or technical imbalances skew predictions and adversely affect the accuracy for certain groups or sites. Researchers say to capture subtle relationships between disease patterns, socio-economic and genetic factors, and complex and rare cases, it is crucial to expose a model to diverse cases.

The research team says other potential benefits of federated learning include:

- Improved medical image and text analysis;
- Better diagnostic tools for clinicians;
- Collaborative and accelerated drug discovery;
- Decreased cost and time-to-market for pharmaceutical companies;
- Rare disease cases where no single institution has enough cases to train models.

"We truly believe the potential impact on precision medicine and ultimately improving medical care is very promising," said Dr. Tignanelli.

More information: Le Peng et al, Evaluation of federated learning variations for COVID-19 diagnosis using chest radiographs from 42 US and European hospitals, *Journal of the American Medical Informatics Association* (2022). DOI: 10.1093/jamia/ocac188

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