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Intel Works with University of Pennsylvania in Using Privacy-Preserving AI to Identify Brain Tumors

SANTA CLARA, Calif.--(BUSINESS WIRE)-- **What's New:** Intel Labs and the Perelman School of Medicine at the University of Pennsylvania (Penn Medicine) are co-developing technology to enable a federation of 29 international healthcare and research institutions led by Penn Medicine to train artificial intelligence (AI) models that identify brain tumors using a privacy-preserving technique called federated learning. Penn Medicine's work is funded by the Informatics Technology for Cancer Research (ITCR) program of the National Cancer Institute (NCI) of the National Institutes of Health (NIH), through a three-year, $1.2 million grant awarded to principal investigator Dr. Spyridon Bakas at the Center for Biomedical Image Computing and Analytics (CBICA) of the University of Pennsylvania.

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Federated learning is a distributed machine learning approach that enables organizations to collaborate on machine learning projects without sharing sensitive data such as patient records. (Credit: Intel Corporation)

> *"AI shows great promise for the early detection of brain tumors, but it will require more data than any single medical center holds to reach its full potential. Using Intel software and hardware and support from some of Intel Labs' brightest minds, we are working with the University of Pennsylvania and a federation of 29 collaborating medical centers to advance the identification of brain tumors while protecting sensitive patient data."*
> *– Jason Martin, principal engineer, Intel Labs*

How It Works: Penn Medicine and 29 healthcare and research institutions from the United States, Canada, the United Kingdom, Germany, the Netherlands, Switzerland and India will use federated learning, which is a distributed machine learning approach that enables organizations to collaborate on deep learning projects without sharing patient data.

Penn Medicine and Intel Labs were the first to publish a paper on federated learning in the medical imaging domain, particularly demonstrating that the federated learning method could train a model to over 99% of the accuracy of a model trained in the traditional, non-private method. This paper was originally presented at the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) 2018 in Granada, Spain. The new work will leverage Intel software and hardware to implement federated learning in a manner that provides additional privacy protection to both the model and the data.

"It is widely accepted by our scientific community that machine learning training requires ample and diverse data that no single institution can hold," Bakas said. "We are coordinating

a federation of 29 collaborating international healthcare and research institutions, which will be able to train state-of-the-art AI models for healthcare, using privacy-preserving machine learning technologies, including federated learning. This year, the federation will begin developing algorithms that identify brain tumors from a greatly expanded version of the International Brain Tumor Segmentation (BraTS) challenge dataset. This federation will allow medical researchers access to vastly greater amounts of healthcare data while protecting the security of that data."

Why It Matters: According to the American Brain Tumor Association (ABTA), nearly 80,000 people will be diagnosed with a brain tumor this year, with more than 4,600 of them being children. In order to train and build a model to detect a brain tumor that could aid in early detection and better outcomes, researchers need access to large amounts of relevant medical data. However, it is essential that the data remain private and protected, which is where federated learning with Intel technology comes in. By utilizing this approach, researchers from all partner organizations will be able to work together on building and training an algorithm to detect a brain tumor while protecting sensitive medical data.

What's Next: In 2020, Penn and the 29 international healthcare and research institutions will use Intel's federated learning hardware and software to produce a new state-of-the-art AI model that is trained on the largest brain tumor dataset to date — all without sensitive patient data leaving the individual collaborators. The subset of collaborating institutions expected to participate in initiating the first phase of this federation includes the Hospital of the University of Pennsylvania, Washington University in St. Louis, the University of Pittsburgh Medical Center, Vanderbilt University, Queen's University, Technical University of Munich, University of Bern, King's College London and Tata Memorial Hospital.

More Context: Federated Learning for Medical Imaging (blog) | Advancing Both AI and Privacy is Not a Zero-Sum Game (Fortune Op-Ed) | Artificial Intelligence at Intel | Federated Learning in Medicine

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