Digital Health and Connected Healthcare
Prof. Dr. Bert Arnrich
Master's Thesis Proposal

Digital Health Center
by Hasso-Plattner-Institut

PHILIPS

Overcoming Data Privacy Boundaries

Federated Learning in Medical Imaging – In Cooperation with Philips Research (Hamburg)

In this Master's Thesis the applicability of Federated Learning [1] in medical imaging will be investigated. In the last years, Deep Learning has become the state-of-the-art method in the computer vision domain for image classification and segmentation. Training and optimization is usually performed centralized, using large data repositories, a concept which is often prohibitive in the presence of sensitive healthcare information.
In this context, Federated Learning evolved as a new field of research that deals with training on decentralized data, minimizing the need for data exchange. Within the scope of this thesis, selected methods for distributed learning should be implemented and evaluated on a large corpus of chest X-ray images. Chest radiography is the most frequently employed imaging examination in clinical practice and has received substantial interest in the field of Deep Learning.

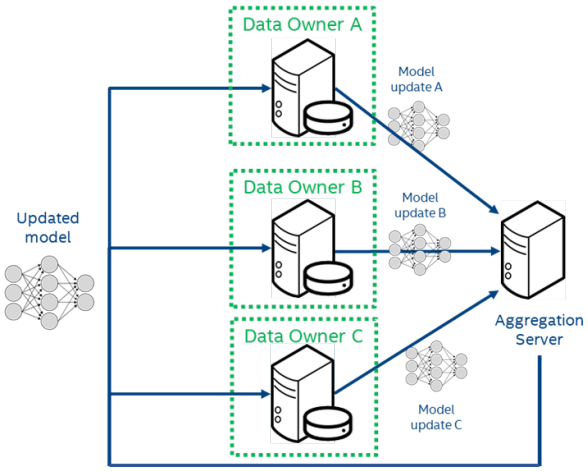

Figure 1: Federated Learning Architecture [2]

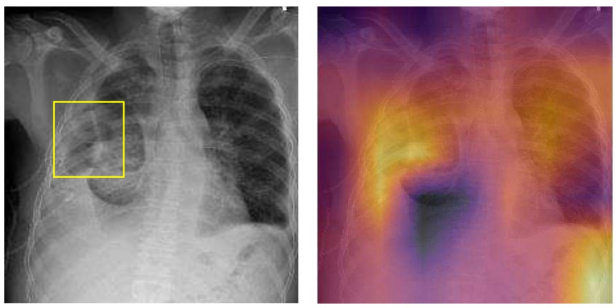

Figure 2: Chest X-ray with Pneumothorax (left), CNN Grad-CAM [3] (right) [4]

Your Responsibilities

- Get acquainted with recent developments in the area of Federated Learning
- Implement (and adapt) existing learning concepts for the classification of medical image data
- Train and evaluate different Federated Learning techniques, using different simulated environments

Your Profile

- Student of Computer Science, Mathematics, Physics or Electrical Engineering
- Knowledge in areas of Deep Learning and image processing
- Good programming skills (Python, C/C++) and experience in Deep Learning frameworks (e.g. PyTorch)
- Experience with Linux and Windows
- Team player and strong communicator
- Work on own initiative
- Quick learner and willing to share knowledge
- Good English skills
- Excellent grades are expected

About Philips

Philips Research is the source of many advanced developments in Healthcare, Lifestyle and Technology. Building on 90 years' experience in industrial research and our world-leading patent position, we're dedicated to meaningful innovations. In the healthcare domain, we are enhancing imaging and monitoring systems, as well as exploring innovative personal healthcare. In lifestyle, we're helping people see, hear, remember and share content, anywhere and anytime. Our vision focuses on simplicity, making technology an integral - but invisible - part of everyday life.

If you are interested in machine learning, data privacy & security or medical imaging, please contact:

Bjarne Pfitzner
Bjarne.Pfitzner@hpi.de
+49 (0) 331 5509-1374
G-2.1.12, Campus 3

Prof. Dr. Bert Arnrich
Bert.Arnrich@hpi.de
+49 (0) 331 5509-4851
G-2.1.14, Campus 3

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