

Introduction to Federated Machine Learning

Brief outline of the topics to be covered

The first half of the tutorial will cover the overarching aims of federated machine learning, fundamental challenges related to the approach and ongoing efforts in academia and industry. In the second half, the focus will be on the FEDn framework and on its design philosophy, architecture, implementation details, and results based on cross-device and cross-silo use cases. In the final half of the tutorial, the attendees will get the opportunity to get the hands-on experience of a federated training environment using the FEDn framework.

Lecturers

Associate Professor Salman Toor, Uppsala University, Sweden

Assistant Professor Mays AL-Naday, University of Essex, UK

Detailed agenda of the tutorial

Total Duration 6 hours

Start time: 09:30 - 17:00

1. Introduction (45 minutes, 09:30 - 10:15)
 - a. Introduction to federated machine learning
 - b. Challenges related to Federated machine learning
 - c. Different architectures (central, hierarchical and fully distributed)
2. Break, (20 minutes)
3. Federated learning and networks (45 minutes, 10:40 - 11:25)
 - a. Federated learning for networks - intelligent resource management
 - b. Network protocols for federated learning
 - c. Network impact on the learning process
4. Discussion session (35 minutes, 11:25 - 12:00)
5. Lunch Break (90 minutes, 12:00 - 13:30)
6. FEDn Framework (45 minutes, 13:35 - 14:20)
 - a. Introduction to the FEDn framework
 - b. Design philosophy and architecture
 - c. Live demo with interface details of FEDn framework
7. Hands-on Session (60 minutes, 14:20 - 15:10)
8. Break (20 minutes)
9. Hands-on Session (60 minutes, 15:30 - 16:30)
10. Summary and closing remarks (30 minutes)

Type of support materials to be supplied to attendees

GitHub link: <https://github.com/scaleoutsystems/fedn>

YouTube channel: <https://www.youtube.com/channel/UCZVv30LFXMQUOswNDKuQpNA>

Weblinks: <https://www.scaleoutsystems.com/federated-machine-learning>

Scientific article:

Morgan Ekmeffjord, Addi Ait-Mlouk, Sadi Alawadi, Mattias Åkesson, Prashant Singh, Ola Spjuth, Salman Toor, Andreas Hellander (2022) *Scalable federated learning with FEDn*, to appear in the 2022 IEEE/ACM International Conference on Cluster, Cloud and Grid Computing (CCGrid).

ArXiv preprint: <https://arxiv.org/abs/2103.00148>

Requirements

Attendees need to have a stable internet connection, access to a Linux machine, and a basic understanding of the Linux commandline environment.

Hardware requirements:

Memory requirement, more than 4GB

Standard four core physical or virtual machine.

Storage requirement, 5GB.

Software requirement:

Access to a Linux (Ubuntu 20.04 or above) machine, physical or virtual environment

A community version of Docker and Docker-compose environments.

Python 3.8

Preferably the latest version of a browser