

# Low-latency Mobile Edge Networks: Federated Learning and Optimization

## Keywords

Artificial Intelligence, Federated Learning, Edge Computing, Internet-of-Things

## Description

In recent years, mobile devices are equipped with increasingly advanced sensing and computing capabilities. Coupled with advancements in Deep Learning (DL), this opens up countless possibilities for meaningful applications. Traditional cloud based Machine Learning (ML) approaches require the data to be centralized in a cloud server or data center. However, this results in critical issues related to unacceptable latency and communication inefficiency. To this end, Mobile Edge Computing (MEC) has been proposed to bring intelligence closer to the edge, where data is produced. However, conventional enabling technologies for ML at mobile edge networks still require personal data to be shared with external parties, e.g., edge servers. Recently, in light of increasingly stringent data privacy legislations and growing privacy concerns, the concept of Federated Learning (FL) has been introduced.

In particular, end devices use their local data to train an ML model required by the server. The end devices then send the model updates rather than raw data to the server for aggregation. FL can serve as an enabling technology in mobile edge networks since it enables the collaborative training of an ML model and also enables DL for mobile edge network optimization.

## Goal

The goal of the thesis is twofold. On one hand, we discuss and analyze the challenges of enabling edge services in the low-latency network with FL approach, including cooperative computation and content-aware offloading. On the other hand, we are interested in edge-assisted federated learning approach to improve the FL performance and efficiency. The student is expected to carry out an in-depth and research-focused thesis for selected topics.

## Requirements

- Basic knowledge on mathematical optimization/wireless communications
- MATLAB and/or Python programming skill is a plus
- Motivation to learn new material and work efficiently

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