

Course title: Topical Research Themes – Mobile Sensing

Course code: 63545C

ECTS: 6

Professor: Veljko Pejovic

Prerequisite knowledge:

- **Java or Kotlin programming proficiency (mandatory).** Please do not take this course if you have no Java/Kotlin programming experience.
- **Android programming proficiency (mandatory starting from Week 2).** Prior experience in building Android applications is a must! We will not teach Android from scratch as we expect that you have taken UL FRI Platform Based Development or a similar course. In case you don't have suitable Android experience, you must take care of learning Android fundamentals by yourself by the start of Week 2! Courses, such as Programming Mobile Applications for Android Handheld Systems: Part 1 and Part 2 on Coursera are appropriate for this. In addition, Android Studio Development Essentials by Neil Smyth is available at the FRI library and DiKUL.
- **Machine learning fundamentals.** We will use both conventional machine learning (e.g. SVM, Bayesian, Random Forest, etc.) as well as neural networks. We expect you to at least be familiar with conventional machine learning techniques. The Elements of Statistical Learning by Hastie et al. is a good introductory book. For deep learning, we suggest Neural Networks and Deep Learning by Aggarwal. Both books are available at the FRI library.

Short course description:

The course investigates the use of sensors, embedded in mobile computation devices (e.g. smartphones, smartwatches, etc.), for understanding a user's context, modelling a user's behaviour, and devising novel applications based on the acquired information. The course equips students with tools for a practical realisation of mobile sensing. The framework of choice is Android, the most popular mobile operating system. Within Android, the course investigates methods for one-off and periodic sensing of different sensors, data pre-processing, and on-device machine learning, with a unique focus on federated learning. **The core component of the course (90% of the final mark) is a practical project** where students will implement a state-of-the-art mobile sensing solution.

The solutions will be developed in small (two people) teams, will be continuously guided by the instructors, progress will be checked via two in-class presentations, and the final report, in the form of a workshop paper, that will be written for each of the projects.

Lectures are accompanied by mandatory labs, where students will implement theoretical concepts in practice. Certain labs will be based on the analysis of publicly available mobile sensing research datasets, some will cover Android programming concepts, while some labs will be focused on specific issues that emerge during the students' project development. Finally, each student will be in charge of presenting a seminal research paper from the field, and this presentation will carry 10% of the final mark. This course has one short oral exam and **no written exams**.