COOPERATIVE AND GRAPH SIGNAL PROCESSING

COURSE DESCRIPTION:

The goal of this course is twofold: 1) to introduce the principles of solving various inference and decision tasks over networks of agents; 2) to study signals whose support, rather than time (as it is the case for time series) or space (which is the case for images), are graphs. In both cases applications of these techniques will be explored, focusing on sensor networks, social networks and power grids.

PREREQUISITES

The course is recommended for PhD students interested in signal processing and machine learning, optimization and control and information networks. In requires good preparation in algebra, digital signal processing, probability theory and random processes. Basic knowledge of detection and estimation theory is preferred. No knowledge of graph theory is required, though it is a plus.

Reference: P.M. Djuric' and Cédric Richard, "Cooperative and graph signal processing, principles and applications", Academic Press, 2018

TOPICS:

PART 1

- Basics of graph theory and of spectral graph theory
- Peer to peer algorithms for collaborative computation and optimization
- Signal processing over networks
    - Estimation and detection techniques (classical and Bayesian)
- Collaborative signal processing under Byzantine attacks

PART 2

- Graph signal processing
    - Sampling and recovery
    - Graph filters
    - Network inference

PART 3

- Applications and models of graph signals
    - Social networks
    - Power systems analytics
    - Big data