

# Distributed Optimization over Multi-Agent Networks: Project Description

In recent years, distributed convex optimization over multi-agent network has played an important role in applied mathematics. During these ten years, an interest research direction of distributed convex optimization is the problem of minimizing a sum of locally convex objective functions distributed over a directed network via cooperation of agents. The problem appears in diverse areas of science and engineering frequently, such as source localization in sensor networks, parameter estimation and detection, resource allocation in wireless cellular networks, utility maximization.

This project aims to guide students in the development of foundational distributed optimization algorithms using multi-agent networks. These algorithms are designed to minimize a global objective function, often expressed as a sum of local objective functions associated with local individual agents or nodes. Through this project, students will gain a solid understanding of static and time-varying graphs. Additionally, they will have the opportunity to build distributed algorithms based on fundamental approaches such as (stochastic) gradient descent, which they have learned during their undergraduate studies. Finally, the students will understand how to utilize their designed distributed algorithm to realize the minimization of the global function. The study of convergence rates related to the distributed optimization algorithms will be also highlighted in this project. This practical application of their knowledge will add an exciting dimension to the project.