

# **Distributed Optimization and Resource Allocation: Algorithms and the Mirror Relation**

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Thursday, October 18, 2018, 11:00 am – 12:00 pm  
ENGR 2901

## **Abstract**

In this talk, we discuss the problems of consensus optimization and resource allocation, and how to solve them in a decentralized manner. These two problems are known to be closely related to empirical risk minimization in machine learning and management problems in operations research, respectively. By saying “decentralized”, we mean that the tasks are to be completed over a set of networked agents in which each agent is able to communicate with adjacent agents. For both problems, every agent in the network wants to collaboratively minimize a function that involves global information, while only a piece of information is available to each of them. Specifically, we will first introduce these two problems in the context of decentralized/distributed optimization, review the literatures for both problems, and then study the interesting “mirror relation” between them. Afterwards, we will enumerate a few state-of-the-art algorithms for solving the decentralized consensus optimization problem, and then correspondingly develop a few algorithms for solving the decentralized resource allocation problem based on the “mirror relationship”. Finally, we provide some numerical experiments to demonstrate the efficacy of the concerned algorithms and validate the methodology of using the “mirror relation”.

## **Short Bio**

Wei (Wilbur) Shi is currently a postdoc at the ECE of Princeton University working with Dr. Mung Chiang and Dr. Yuxin Chen. He was a postdoc at Arizona State University, Boston University, and University of Illinois at Urbana-Champaign under the supervision of Dr. Angelia Nedich and Dr. Alex Olshevsky. His current research interests distribute in optimization, learning, and control, and applications in cyber physical systems. He received a Young Author Best Paper award from the IEEE Signal Processing Society in 2018.