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Introduction to Open Multi-Agent Systems

Abstract: Methods for control, optimization, and learning in multi-agent systems are often developed under the assumption that the number of agents is fixed throughout the execution of the algorithms. In many real-world applications, however—including multi-robot systems, swarms, distributed energy systems, and sensor networks—the set of interconnected agents changes over time as agents join or leave the network. The framework of open multi-agent systems addresses this challenge by explicitly accounting for such dynamics, with the aim of extending tools from control, optimization, and learning to provide formal guarantees in these more realistic settings.

This course introduces the modeling of open multi-agent systems, including application-driven scenarios. It also presents the main research problems in this area, including stability, consensus, optimization, and learning.