

AI 828 Complex Adaptive Systems (3. 0)

Pre-requisite: None

Recommended Books:

Complex and Adaptive Dynamical Systems: A Primer (2011), by Claudius Gros, Springer, 2nd Edition.
Complexity: A Guided Tour (2011), by Melanie Mitchell, Oxford University Press, 1st Edition.
Credit Hours: 3 (3, 0)

Course Objectives:

- On completion of the course, the student should be able to:
- Explain a comprehensive, clear and accessible outline to the new area of complex adaptive systems and its application in different areas.
 - Understand about the dynamics of cooperation and competition, looking at how and why agents work together to create local patterns of organization.
 - Understand the process of self-organization and answer the big questions about how do we get and sustain ordered patterns out of randomness and chaos?
 - Explain the process of evolution as a powerful and relentless force that shapes complex adaptive systems on the macro scale.

Topics / Contents	Allocated Periods
Complex adaptive systems (CAS) are a broad class of systems consisting of multiple interacting adaptive agents. These systems, which span a wide range of disciplines, have a number of characteristics in common. They are large distributed systems consisting of many self- similar components that interact and adapt. These interactions among the distributed components are self-organizing and produce emergent collective behavior in the system as a whole. CAS tend to be difficult to analyze using traditional analytical models. Agent-based models have been shown to be effective methods for studying CAS. This course will introduce the basic definitions of CAS, discuss example cases of CAS and their features, and implement and analyze computational simulations of CAS. The content include, Overview of CAS, Properties of CAS, Cellular automata, Social systems, Evolution of cooperation, Emergence, Self-organization, Swarm Intelligence, Social networks	45