Advanced Programming in Computational Intelligence in Games

Summer

(in German: Advanced Programming in Computational Intelligence in Games)

Module-ID: FIN-INF-120495

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
AP-CIG	6	Summer	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessability:	
Responsibility:	Sanaz Mostaghim
Lecturer:	Sanaz Mostaghim
Classes:	• Lecture *Advanced Programming in Computational Intelligence in Games* • Tutorials *Advanced Programming in Computational Intelligence in Games*
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INGINF: Informatik - M.Sc. WIF: Informatik - M.Sc. DKE: Applied Data Science - M.Sc. VC: Computer Science

Intended learning outcomes:
Students ...

- carry out a large programming project using the concepts from the theoretical part of the course.
- have a full understanding of the algorithms of computational Intelligence in Games.
- learn to develop new ideas and apply them to new problems in the context of AI and Games.
- learn to program the methodologies from the lectures in teams.

Content:
This course addresses the basic and advanced topics in the area of computational intelligence and games and contains three parts: Part 1 addresses the basics in Evolutionary Game Theory (EGT). In this part you will learn about simple games such as scissors/rock/paper and the focus on the strategies for playing games. Part 2 is about learning agents, and we focus on reinforcement learning mechanisms. There are three questions for games:

- How can we use the information from a search mechanism to learn?
- How can we use reinforcement learning to find for a better strategy?
- How can we use reinforcement learning as a search mechanism?

The application is on board games. Part 3 contains the advanced topics in games and artificial intelligence How can we consider physical constraints of a spaceship while moving in an unknown terrain. Other topics are Monte Carlo Tree Search, Procedural Content Generation, Decision Making and Multi-Objective Learning.
Workload:
56 contact hours + 94h self study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	• Hausarbeit (home work containing programming) • Exercises and Tutorials • Klausur (written Exam) 120 Minuten	• lectures (2 SWS) • exercise classes (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
none	Programming experience

Media:	Literature:

- Ian Millington and John Funge, Artificial Intelligence for Games, CRC Press, 2009
- Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press, Cambridge, MA, 1998
- Jorgen W. Weibull, Evolutionary Game Theory, MIT Press, 1997
- Thomas Vincent, Evolutionary Game Theory, Natural Selection, and Darwinian Dynamics, Cambridge University Press, 2005
- Josef Hofbauer, Karl Sigmund, Evolutionary Games and Population Dynamics, Cambridge University Press, 1998

Comments:

Revision #1
Created 2026-11-19 09:30:59 UTC by Fakultät für Informatik
Updated 2026-11-19 09:30:59 UTC by Fakultät für Informatik