Computational Intelligence in Games

Summer

Game Theory, Reinforcement Learning and Beyond

(in German: Computational Intelligence in Games)

Module-ID: FIN-INF-110515

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
CIG	5	Summer	starting at 4.	1 Semester	english	Bachelor

Link:	LSF
Limited accessability:	
Responsibility:	Sanaz Mostaghim
Lecturer:	Sanaz Mostaghim
Classes:	• Lecture *Computational Intelligence in Games* • Exercise *Computational Intelligence in Games*
Applicability in curriculum:	- B.Sc. INF: Informatik - Wahlpflicht - B.Sc. INF: Studienprofil: Computer Games - B.Sc. CV: Informatik - Wahlpflicht - B.Sc. CV: Anwendungsfach - Computer Games - B.Sc. INGINF: Informatik - Wahlpflicht - B.Sc. WIF: Gestalten und Anwenden - Wahlpflicht - B.Sc. INF (bilingual): Informatik - Wahlpflicht

Intended learning outcomes:
The students will learn the concepts in reinforcement learning, Game Theory and beyond and can

apply them to various domains, particularly in Games. The students can program the learned algorithms and will get an understanding about the functionality of the algorithms.

Content:

- This course addresses the basic and advanced topics in the area of computational intelligence and games and contains three parts:
- Part one addresses the basics in Evolutionary Game Theory (EGT). In this part you will learn about simple games such as scissors/rock/paper and the main focus on the strategies for playing games.
- Part two 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 three contains the advanced topics in games and artificial intelligence such as how can we program an agent who can pass a Turing test? How can we consider physical constraints of a spaceship while moving in an unknown terrain?

Workload:
56 contact hours + 94 h self study

Pre-examination requirements:	**Type of examination:**	**Teaching method / lecture hours per week (SWS):**
	• Written exam • Hausarbeit	• Lecture (2 SWS) • Exercise class (2 SWS)

Prerequisites according to examination regulations:	**Recommended prerequisites:**
none	Intelligente Systeme

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:

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