

## Autonomous Adaptive Systems Engineering

2 units (selection)

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**Target**) This class provides the knowledge and skills necessary for understanding the basic concepts, theories and application techniques concerning the emergent systems design methodologies for autonomous and adaptive intelligent agent systems.

**Outline**) Recently, autonomous adaptive systems have been studied that are able to improve their own performance autonomously, adaptively and incrementally during the course of interactions with the environments, and those design methodologies have been explored for the systems. This class covers the emergent design methodologies for autonomous adaptive agents and multi-agent systems, mainly based on machine learning and evolutionary computation.

**Style**) Portfolio

**Keyword**) *autonomous adaptive systems, emergent systems design, reinforcement learning, evolutionary computation, multi-agent systems*

**Fundamental Lecture**) “Autonomous Intelligent Systems”(0.5)

**Relational Lecture**) “Applied Knowledge Systems”(0.5)

**Goal**) This class aims at the understanding of an overview of the emergent design methodologies for autonomous adaptive agents and multi-agent systems, mainly based on reinforcement learning, evolutionary computation, genetic programming, and neural networks, as well as the applicabilities and limitations of the methodologies.

**Schedule**)

1. Emergent systems design methodologies
2. Foundations of emergent systems design: reinforcement learning (1)
3. Foundations of emergent systems design: reinforcement learning (2)
4. Foundations of emergent systems design: evolutionary computation (1)
5. Foundations of emergent systems design: evolutionary computation (2)
6. Foundations of emergent systems design: genetic programming
7. Foundations of emergent systems design: neural networks
8. Emergent systems design methodologies based on reinforcement learning (1)
9. Emergent systems design methodologies based on reinforcement learning (2)
10. Emergent systems design methodologies based on neuro-evolution (1)
11. Emergent systems design methodologies based on neuro-evolution (2)
12. Emergent systems design methodologies based on genetic programming

13. Emergent systems design methodologies based on co-evolution

14. Emergent systems design methodologies for multi-agent systems (1)

15. Emergent systems design methodologies for multi-agent systems (2)

**Evaluation Criteria**) Assignment count 100%.

**Textbook**) To be introduced in the class.

**Reference**) To be introduced in the class.

**Contents**) <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216705>

**Student**) Able to be taken by only specified class(es)

**Contact**)

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**Note**)

- ◇ 授業を受ける際には、2時間の授業時間毎に2時間の予習と2時間の復習をしたうえで授業を受けることが、授業の理解と単位取得のために必要である。
- ◇ 授業計画 1~ 15 に関しては、レポートにより達成度評価を行なう。