Hasso Plattner Institut
IT Systems Engineering | Universität Potsdam

Winter Term 21/22

Adversarial Self-Supervised Learning with Digital Twins

Org & Introduction

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Key Facts

- Weekly Hours: **4**
- Credit Points: **6**
- Teaching Form: **Project Seminar**
- Enrolment Type: **Compulsory Elective Module** (“Wahlpflichtmodul”)
- Course Language: **English**
- Study Programs and Modules:
  - **IT-Systems Engineering MA**
    - Mandatory module : *„IT-Systems Engineering Analysis“*
    - Mandatory module: *„IT-Systems Engineering Design“*
    - Specialization module(s): *„Software Architecture & Modeling Technology“*
  - **Data Engineering MA**
  - **Digital Health MA**

Dates

- Enrollment deadline: **22.10.2021**
  - Cancellation deadline for enrollment: **30.01.2022**
- Introductory meeting: **27.10.2021** **[NOW]**
- Meetings:
  - *Lectures - scheduled*
  - *Update meetings – on demand, usually weekly*
- Final Presentations at end of the semester: **To be decided**
  - *We will be present at the lecture room, but we will also be joining via Zoom.*

Communicantion Plan

Motive	Content	Medium
Artifacts	Source code, Data Documentation, Wiki	Github - https://github.com/orgs/hpi-sam/
Papers	Copyrighted material	Bib-Admin
Messaging ad hoc	Questions, Suggestions, Sharing	Our Slack group: **adversarialre-o743758.slack.com**
Official communications	Schedule, Orientations, Administrative issues	Email christian.adriano@hpi.de
Meetings	Lectures, Status, Work meetings	Zoom, Skype
Emergency	Call, SMS, messaging	Chris mobile number (check Chris' Slack profile)

Seminar Work, Deliverables and Grading

- Work **alone or in groups** on **one selected topic/project**.
- Each team has on-demand update meetings.

Project Execution: [60% of final grade]

- Weekly update meeting
- Intermediary Presentations

Written deliverables: [30% of final grade]

- Final report on findings
  - Length: approx. 10 pages ACM Format per team participants
  - Some parts must be attributable to each individual author

Final Presentations: [10% of final grade]

- Presentation on findings
- Questions and feedback for other students' presentation

Road Map (1/2)

		Objectives
1. Intro and Course Organization 2. Self-Adaptive Systems (mRubis)	**Week-1 Organization**	Setup the environment Form groups
3. Digital Twins 4. Model-Free Reinforcement Learning 5. Model-Based Reinforcement Learning	**Week-2 Foundations**	Acquire conceptual knowledge General architecture of projects
6. Underspecification & Generalization 7. Simulation and Sim2Real 8. Robust RL 9. Safe RL	**Week-3 Challenges**	Understand a phenomenon Select and describe the problems
10. Adversarial Training 11. Continual & Curriculum Learning 12. Transfer & Meta-Learning RL 13. Representation Learning & Causal RL	**Week-4 Solutions**	Understand solution space (degrees of freedom) Select solutions Choose evaluation methods Plan experiments

Roadmap (2/2)

- **Project Phase 1: Learn fundamentals - Lectures**
  - Goal: learn fundamentals
  - Deadline: Mid-End of December
- **Project Phase 2: Present Proposal - Reading and Writing**
  - Goal: learn about the state of art of one application area
- **Project Phase 3: Apply a method - Coding and Evaluation**
  - Goal: learn to apply and evaluate a method
  - Present update in weekly meetings

- **Final Presentations** in one session in **February 2022**
- **Submission of final report** one week after the presentation

Project Proposal

Team size: up to four people.

Project proposal in two stages:

1- State-of-art (one page, double column) – in 6 weeks (First week of December)

- Each person covers at least five well-selected papers (group covers at least 20 papers)

2- Plan - first draft in 8 weeks (before New Years Break)

- Detail the problem (what is it? why should I care?, why is it challenging?)
- Describe the dataset (source, size, main features, cite any papers that used it)
- Determine the metrics and algorithms to be used (preliminary insights, it might change)
- Discuss how you will evaluate your results (benchmarks and baselines)

END