

COURSE "AUTOMATED PLANNING: THEORY AND PRACTICE"

CHAPTER 00: INTRODUCTION

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M.S. Course: Artificial Intelligence Systems (LM)
A.A.: 2023-2024
Where: DISI, University of Trento
URL: `https://bit.ly/3zOkGk8`



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USEFUL INFORMATIONS

- PERIOD: I Semester, 12/09/2023 \implies 23/12/2023
- DELIVERY: “Blended”
- DURATION: \approx 14 weeks
- Lecture (accademic) hours (including exercices): \approx 54
- CREDITS: 6

USEFUL INFORMATIONS: LECTUERES

- In presence:
 - Monday 13:30-15:30
 - Room A110 - Povo
 - Thursday 15:30-17:30
 - Room A212 - Povo

USEFUL LINKS

- Web site of the course

<https://bit.ly/3zOkGk8>

- Moodle (course material + recordings)

<https://webapps.unitn.it/gestionecorsi/>

- Esse3

<https://www.esse3.unitn.it/>

Remember to register to the course within Moodle!

OBJECTIVES

- Provide a comprehensive theoretical view of a wide range of planning and scheduling techniques
 - Evaluate and apply a variety of planning techniques and tools for classical planning and scheduling as well as planning and scheduling under different kind uncertainty
 - Explain the practical advantages and disadvantages of different levels of expressivity in planning and scheduling models
- Hands-on experience in constructing and modeling planning domains to solve specific planning problems
 - Model classical planning and scheduling problems in commonly used languages (e.g. PDDL)
 - Evaluate and apply common techniques for goal-directed planning, such as various forms of heuristics and control rules.
- Experiment the control of robotic agents.
 - With realistic robotic agents (physical and/or simulated).

PRE-REQUIREMENTS

- Basic knowledge and understanding of data structures and algorithms
- Basic knowledge of propositional logic and satisfiability and discrete mathematics
- Knowledge of basic artificial intelligence techniques and concepts (e.g. state-space search, heuristics, A*)

TENTATIVE PROGRAM

- Introduction, applications
- Classical Planning Problems and PDDL
- Planning as Search - an overview of the general concepts
- The forward state space search, algorithms and examples
- The backward state space search, algorithms and examples
- The partial order causal link search space, algorithms and example
- A comparison of general search strategies applicable to all search spaces
- Hierarchical task networks
- Introduction to heuristics in planning
- Simple heuristics, Landmark Heuristics, Relaxed planning graph Heuristics, Pattern Database heuristics
- Planning with control formula
- Temporal Planning and Scheduling
- Planning under uncertainty
- Planning within the ROS infrastructure (ROSPlan/PlanSYS2)

REFERENCE DOCUMENTS

- Notes from the lectures
- Handouts/slides (Available within moodle)
- Suggested books:
 - Malik Ghallab, Dana S. Nau, Paolo Traverso: “Automated planning - theory and practice”. Elsevier 2004, ISBN 978-1-55860-856-6, pp. I-XXVIII, 1-635
 - Hector Geffner, Blai Bonet: “A Concise Introduction to Models and Methods for Automated Planning”. Synthesis Lectures on Artificial Intelligence and Machine Learning, Morgan & Claypool Publishers 2013, ISBN 9781608459698, pp. 1-141
 - Patrik Haslum, Nir Lipovetzky, Daniele Magazzeni, Christian Muise: “An Introduction to the Planning Domain Definition Language”. Synthesis Lectures on Artificial Intelligence and Machine Learning, Morgan & Claypool Publishers 2019
 - Malik Ghallab, Dana S. Nau, Paolo Traverso: “Automated Planning and Acting”. Cambridge University Press 2016, ISBN 978-1-107-03727-4

- Mode 1
 - Assignments during the course on planning and on the use of the ROS infrastructure
- Mode 2
 - Joint assignments between this course and the course "Robot Planning and its application" by Prof. Palopoli

TIPS

- Attend all the lectures!!!!
- Ask clarifications for what not understood
- Do not postpone the study
 - Study and try to implement/model after any lecture
- Always do the “proposed exercises”
- ...

INTERACTION

- Ask question during lecture
 - Strongly recommended
 - Do not be shy!
- Ask question during pauses
 - Full availability
- Office hours clarifications: on request, with time to be agreed (via email or after lecture),
 - More frequently during lecture period, but always available
- Email
 - Always available, but with moderation (see next slides)
- NEVER VIA PHONE!

TIPS ON THE USE OF EMAILS

All emails shall be sent from `name.surname@studenti.unitn.it`, and shall have in the subject “AFTP”!

GOOD REASONS TO SEND AN EMAIL

- Request for a face-to-face clarification meeting
- Report possible errors in the slides, problems in accessing the web site, etc.
- Reporting objective problems (e.g. overlapping of lectures, ...)
- Reporting of individual/personal problems e.g.:
 - Students with DSA
 - Students non yet registered/waiting for transfer
 - Working students
 - Students with particular problems/situations

In this case it is strongly recommended to ask for a face-to-face meeting.

- ...