Robotics

Summary

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Lecturer: Peter Englert

Teaching in SS 17

Machine Learning Course:

Exploiting large-scale data is a central challenge of our time. Machine Learning is the core discipline to address this challenge, aiming to extract useful models and structure from data.

Topics:

probabilistic modeling and inference
regression and classification methods (kernel methods, Gaussian Processes, Bayesian kernel logistic regression, relations)
discriminative learning (logistic regression, Conditional Random Fields)
feature selection
boosting and ensemble learning

Teaching in SS 17

Reinforcement Learning Course:

Reinforcement learning is an area of machine learning in computer science, concerned with how software agents ought to take actions in an environment so as to maximize some notion of cumulative reward.

Topics:

Markov Decision Process, Dynamic Programming
Temporal Difference Learning, Q-Learning
Deep Reinforcement Learning
Policy Search
Integrated Learning-Planning
Inverse Reinforcement Learning

Practical Course Robotics

Summer term 2017

In this course students get the chance to work on real robots (manipulators, mobile robots & dynamic robots), realizing the concepts learned in the robotics lecture in real world.

Participation in this course is recommended in preparation for future theses work in robotics. The course will be conducted in English and is targeted at students of MSc Computer Science, MSc Softwaretechnik, and Msc Informatik. The course is not designed for the INFOTECH curriculum.

The number of participants is limited to 12.

Contents

The course will fully take place in our robotics lab downstairs. We will have two regular sessions a week; about 1/4 of the time we present tutorials, the rest of the time you will code for the robot. The topics we aim to cover include, for instance,
1) Basic motion: feedback control in various task spaces,
2) Grasping & Manipulation,
3) ROS (Robot Operating System): basics, the navigation/SLAM packages,
4) Data collection and (Reinforcement) learning for basic control.

The course will culminate in a group project of your choice.

The available robots include the TurtleBot, the WillowGarage PR2 or the Rethink Robotics Baxter. Everything will be coded in C++, using our own as well as ROS interfaces to the robots.

Prerequisites

Successful completion of the **Robotics lecture** is mandatory, as well as good programming skills in C++. A familiarity with Git is also recommended.

Exam

- Tuesday, 14.02.17, 14:00 (V47.02.)
- Duration: 120 minutes
- You may only use your pen and scratch paper - no other materials (no textbooks, script, or mobiles) are allowed
- You may answer the questions in German or English

Exam

Topics

01-introduction

02-kinematics

03-dynamics

04-controlTheory

05-pathPlanning

06-pathOptimization

07-probabilities

08-mobileRobotics (Only PART I, no SLAM)

Exam

Topics

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Hints:

- No C++ coding questions in the exam
- Exam questions will be similar to exercise questions
- Focus on the definition and solution of the problems. Be able to derive/explain the solution and to apply the solution to small examples.
- Use bullet points in 16-Robotics-script.pdf to test yourself