

Syllabus of the course “Machine learning”

Course Meeting Times

Lectures: 40 hours, 10 sessions, 4 hours / session

Description

This course provides a broad introduction to the area of robotics and DataMining. Topics include:

- Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks).
- Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI).
- Basics of robotics and ROS.
- Basics of python programming.

The course will also draw from numerous case studies and applications, so that students will also learn how to apply learning algorithms to building smart robots (perception, control), text understanding (web search, anti-spam), computer vision, database mining, and other areas.

Problem Sets

There will be a total of 4 problem sets. The content of the problem sets will vary from theoretical questions to more applied problems.

Each problem set is graded with 5 scores.

Problem sets (5 grades for each):

1. Basics of Linux
2. ROS mapping
3. ROS path planning
4. Computer vision for ROS

Grading

Activities	Grades	Percentage
Problem sets	20	70%

Topics

1. Introduction to ML and Robotics
2. Introduction to python programming
3. Basics of mathematics for machine learning
4. Basics of machine learning
5. Neural networks
6. Basics of Robotics operating system (ROS)
7. Mapping and positioning with ROS and Gazebo
8. TF system. Odometry. Navigation
9. Open CV for computer vision in robotics

10. Deep learning with Keras and Theano

Requirements for students: linear algebra, statistics, basics of programming, linux

References

1. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.
2. <https://www.coursera.org/learn/machine-learning>
3. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989. Available on-line <http://www.inference.phy.cam.ac.uk/mackay/itila/book.html>
4. <http://ros.org>
5. <http://learn.turtlebot.com>
6. http://github.com/ulstu/robotics_ml