



Course Syllabus

Course Code COMP-380	Course Title Machine Learning	ECTS Credits 6
Prerequisites COMP-211 MATH-225	Department Computer Science	Semester Spring, Fall
Type of Course Elective	Field Computer Science	Language of Instruction English
Level of Course 1 st Cycle	Lecturer(s) Prof. Athena Stassopoulou Dr. Ioannis Katakis	Year of Study 3rd
Mode of Delivery Face to Face	Work Placement N/A	Corequisites None

Course Objectives:

Machine Learning is concerned with computer programs that automatically improve their performance through experience (e.g., programs that learn to identify fraudulent credit card transactions, recommend music and movies, categorize news articles based on the topic, etc). This course covers the theory and practical algorithms for machine learning such as: classification, decision trees, Bayesian networks, neural networks, support vector machines, clustering. Emphasis will be given to recent applications of Machine Learning and text and web data processing.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. demonstrate an understanding of the various machine learning algorithms used for classification and prediction.
2. analyze a machine learning problem and evaluate the likely effectiveness of different learning methods on that problem
3. evaluate models/algorithms with respect their accuracy
4. implement a machine learning method and apply that method to a problem
5. understand the basic principles of recommender systems and their applications
6. apply reinforcement learning to a variety of machine learning tasks

Course Content:

1. Introduction to Machine Learning: Definitions, overview of various topics, examples.
2. Classification: Basic Concepts
3. Decision Tree Classifiers: How the tree works, building the decision tree, measures for selecting best split, algorithm for Decision Tree Induction.
4. Bayesian classifiers: using Bayes Theorem for classification, Naïve Bayes Classifier, Bayesian Networks.
5. Artificial Neural Networks (ANN): Perceptron, Multilayer ANN.
6. Evaluating Classifiers: Metrics, ROC curves, class imbalance problem
7. Recommender Systems: Collaborative filtering, Content-based filtering, Hybrid Recommender Systems.
8. Reinforcement Learning: MDP, model based learning, temporal difference learning, applications of reinforcement Learning in Game Playing.

Learning Activities and Teaching Methods:

Lectures, Practical Exercises and Assignments.

Assessment Methods:

Homework, Projects, Midterm Exam, Final Exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Data Mining: Practical Machine Learning Tools and Techniques (3 rd edition)	I. H. Witten , E. Frank, M. A. Hall	Morgan Kaufmann	2011	0123748569

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Machine Learning	Tom Mitchell	McGraw Hill	1997	0071154671

Pattern Recognition and Machine Learning	Christopher Bishop	Springer	2007	0387310738
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