Module Information

Module Identifier	**CS36110**
Module Title	**Machine Learning**
Academic Year	**2015/2016**
Co-ordinator	**Dr Yonghuai Liu (mailto:yyl@aber.ac.uk?subject=CS36110)**
Semester	**Semester 1**
Pre-Requisite	**CS12320 (?m=CS12320)**
Other Staff	**Dr Yonghuai Liu (mailto:yyl@aber.ac.uk?subject=CS36110)** **Dr Chuan Lu (mailto:cul@aber.ac.uk?subject=CS36110)**

Course Delivery

Delivery Type	Delivery length / details
Lecture	20 lectures

Assessment

Assessment Type	Assessment length / details	Proportion
Semester Exam	2 Hours Written Exam	100%
Supplementary Exam	2 Hours Resit failed examination	100%

Learning Outcomes

On successful completion of this module, students will be able to:
1. Formalise and represent experience, using techniques like feature-value pairs;
2. Apply concept learning, decision making tree, artificial neural networks, Bayesian learning, genetic algorithms, and reinforcement learning to solve a range of simple problems in applications like customer attitude prediction, banking business, handwritten character recognition, medical diagnosis, artificial life, robot path optimization, etc.;
3. Compare and choose different learning algorithms for different applications;
4. Appreciate the range of applicability of intelligent learning concepts and techniques; ;
5. Explain the state of the art of intelligent learning concepts and techniques;

Brief description

This module explores real world applications of machine learning. To this end, a small number of topics are studied in depth in order to give insight and understanding of the methods and issues involved in the state-of-the-art applications of the various learning techniques.

Content

1. Introduction - 2 lectures

Possibility and necessity of learning, target function, components in a learning system, performance measurement of learning systems.

2. Concept learning - 3 lectures

This chapter will use concept learning to develop applications to predict whether students like this module or not: Generality ordering of hypotheses, FIND-S algorithm, version space, the LIST-THEN-ELIMINATE algorithm, inductive bias

3. Decision tree learning - 3 lectures

This chapter will use decision tree learning to develop applications about banking business: Entropy, best attribute, information gain, best tree, inductive bias, Occam's razor, over-fitting, reduced error pruning, rule post-pruning.

4. Artificial neural network - 3 lectures

This chapter will use artificial neural network learning to develop applications to recognize handwritten characters: Perceptron, linear separability, gradient decent, sigmoid function, back propagation algorithm, over-fitting.

5. Bayesian learning - 4 lectures

This chapter will use Bayesian learning to develop applications about medical diagnosis: Bayesian theory, maximum a posteriori hypothesis, maximum likelihood, probability density, normal distribution, minimum description length principle, Bayes optimal classifier, naive Bayes classifier.

6. Support vector machines - 3 lectures

This chapter will introduce the ideas, formulations and applications of support vector machines: Binary linear classifier, maximum margin hyperplane, linear separability/non-linear separability, kernel function, hard/soft margin, primal/dual form, quadratic programming, cross validation, applications.

7. Reinforcement learning - 2 lectures

This chapter will use reinforcement learning to develop applications about robot path optimization: Reward, Markov decision process, utility function, Q-learning.

Notes

This module is at CQFW (http://wales.gov.uk/topics/educationandskills/qualificationsinwales/creditqualificationsframework/?lang=en) Level 6