Course Outline

Course Number and Title: CSE 4101: Artificial Intelligence and CSE 4111: Artificial Intelligence Lab

Credit Hours: 3

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Course Description

An introduction to the basic principles, techniques, and applications of Artificial Intelligence. Coverage includes perception and learning, searching and logical inference and knowledge base. Methods used in this course will have wide applications in different artificial intelligent systems such as expert system, robotics, computer vision, and natural language processing. Students will have practical experience in designing and implementing components of an intelligent system.

Specific Objectives (SO)

SO-1   Become familiar with basic principles of AI toward problem solving
SO-2   Understanding the basics of machine learning
SO-3   Experiment with tools and writing code for developing different aspects of intelligent systems

Course Learning Outcomes (CLO)

The following course learning outcomes achieved by students upon a successful completion of this course:

CLO-1   Ability to understand What Ai is about and different types of AI agents and its components.
CLO-2   Ability to understanding search-based optimization in discrete state-spaces
CLO-3   Ability to understand and apply gradient based continuous optimization methods to build learning models
CLO-4   Knowing how to build logical agents using propositional and first order logic
CLO-5   Knowing how to reason under uncertainty
CLO-6   Ability to use tools, libraries to design and implement components of a learning agent. They should be able to use modern languages appropriate for AI systems such as Python – NumPy, PyTorch library to write code.

Textbook

1. [CA] David Poole and Alan Mackworth, Artificial Intelligence: Foundations of Computational Agents, 1st ed., Cambridge University Press, 2010 https://artint.info/2e/html/ArtInt2e.html

2. [AIMA] Stuart Russell and Peter Norvig, Artificial Intelligence. A Modern Approach, 3rd edition, Prentice Hall, Inc. (2010)

Similar Courses

1. CMU: https://www.cs.cmu.edu/~15381-s19/
2. UBC: https://www.cs.ubc.ca/~conati/322/322-2017W1/course-page.html
3. UC Berkeley: https://inst.eecs.berkeley.edu/~cs188/fa18/ [YouTube playlist]
3. JHU http://www.cs.jhu.edu/~phi/ai/

Tentative Syllabus

Course Contents		# of lectures	CLO mapping
Introduction	AI and Society Intelligent agents: a discussion on what Artificial Intelligence is about and different types of AI agents.	3	CLO-1
Search	Optimization on a Discrete state-space - Uninformed and informed search methods – BFS, DFS, IDS, A*, and IDA* search methods	3	CLO-2 CLO-6
Constraint Satisfaction Search	Constraint Satisfaction Problems (CSP), Arc consistency algorithm	3	CLO-2
Local search	Hill Climbing, Simulated Annealing, Genetic algorithms, Swarm intelligence – Particle Swarms, Ant Colony Optimization	3	CLO-2
Logical Reasoning	Propositional logic, Reasoning-Forward and Backward Chaining, Searching, #First order Logic and Reasoning	2	CLO-4
Optimization	Review of Linear Algebra and Calculus for Multivariate Functions. Optimization of multivariate functions, Directional Derivatives, Gradient, Hessian, Gradient-based Optimization, Numerical Differentiation	3	CLO-3 CLO-6
Machine Learning I	Concept learning, Supervised learning, Regression, Classification methods - formulation of Linear Regression, Logistic regression, Linear classifiers	3	CLO-3 CLO-6
Machine Learning II	Neural Networks, Back-propagation, Regression and Multi-class Classification, Training of Neural Networks	3	CLO-3 CLO-6
Probabilistic Reasoning	Bayes Networks, Inference and learning, Decision making under uncertainty	3	CLO-5 CLO-6
#Intro to RL	Markov Decision Process, Q-learning, TD-Learning	3	CLO-5 CLO-6

#if time permits.

Instructional Strategies: Lectures (board and multimedia presentation), assignments, and tutorials, group discussion, online video resources

Additional platforms and tools to be familiarized for project:

1. scikit-learn (sklearn) - a popular and well document framework for ML work.
   https://scikit-learn.org/stable/
2. https://docs.python.org/3/library/idle.html

Assessment

Assignments	TBD
Quiz	TBD
Mid Term Exam	TBD
Final Exam	TBD

Course Policies

1. Late submission of assignments will be penalized
2. Some of the programming assignments can be done in groups of two.