**IS7033 - Artificial Intelligence and Machine Learning**

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<https://github.com/utsabigdata/>

## **Artificial Intelligence and Machine Learning “IS 7033”**

### Tools

The following cloud-based environment will be provided to each student: Jupyter, Cloud ML, Python, Python libraries for big data analytics. GitHub will be used for course content, projects, and assignments. Slack will be used for question and answer and class collaboration.

### Recommended Background

This course is for those new to data science. No prior programming experience is needed, although the ability to install applications and utilize a virtual machine is necessary to complete the hands-on assignments.

### About the Course

Artificial Intelligence (AI) is a field that has a long history but is still constantly and actively growing and changing. This course is about the theory and practice of Artificial Intelligence. This course will introduce you to the basics of AI. We will study modern techniques (i.e., satisficing or optimal) for computers to represent task-relevant information and make intelligent decisions towards the achievement of goals. The search and problem-solving methods are applicable throughout a large range of industrial, civil, medical, financial, robotic, and information systems. We will investigate questions about AI systems such as: how to represent knowledge, how to effectively generate appropriate sequences of actions and how to search among alternatives to find optimal or near-optimal solutions. We will also explore how to deal with uncertainty in the world and how to learn from experience. We will cover the aggregation of conflicting preferences and computational game theory. We expect that by the end of the course students will have a thorough understanding of the algorithmic foundations of AI, how probability and AI are closely interrelated, and how automated agents learn. We also expect students to acquire a strong appreciation of the big-picture aspects of developing fully autonomous intelligent agents. The goal of this course is to introduce you to some of the topics and techniques that are at the forefront of modern AI research: Search and continuous optimization, Dynamic programming Probabilistic modeling, Probabilistic Graph Model, Bayesian Network, MHM, and Reinforcement Learning.

### Syllabus

* Introduction to Artificial Intelligence
* Graph Search Algorithms
* Dynamic programming
* Probabilistic Graphical Models
* Bayesian Networks
* Hidden Markov Models
* Reinforcement Learning
* Logic

### Grading Criteria

**Homework assignments (60%)**

There will be 6 homework assignments: they will involve both written answers and programming assignments. Written questions will involve working through algorithms presented in the class, deriving and proving mathematical results, and critically analyzing the material presented in class. Programming assignments will involve writing code in Python to implement various algorithms presented in class. Please submit your assignments in your Cloud-ML-lab.

**Homework Policies**

* Homework is due on Cloud-ML by the posted deadline. No credit will be given for assignments submitted more than 1 week after the posted deadline.
* Each homework is worth 10% of your final grade.
* You can talk to other students about both the programming and the written portions, but all the final submitted programming and written portion has to be done on your own.

**Course project (40%)**

The course project is designed to help you practice, apply, and showcase the skills you’ve learned. The course project involves carrying out and presenting novel research in AI. Projects are carried out on an individual basis.

**Instructions**

* The project can be either theoretical, experimental or both.
* The best projects are original and innovative. Their qualities are more important than simply doing intensive technical work and coding.
* If you don't get positive results, don't worry; if you try an interesting approach and it doesn't work, it's all right. We're most concerned about your thoughts, your effort, and what you've learned during the project work.
* Projects should be directly related to topics covered in class
* If the project is related to your research, it's perfectly fine, but please don't copy-paste anything from your research or from another project.
* Deep learning is an acceptable subject, but as these projects are relatively simple and often involve little creativity, we will set a high bar for deep learning applications-focused projects.

### Textbooks:

[1] Russell, Stuart J., and Peter Norvig. Artificial intelligence: a modern approach. Malaysia; Pearson Education Limited,, 2016.

[2] Koller, D., & Friedman, N. (2009). *Probabilistic graphical models: principles and techniques*. MIT press.

We will not follow the books chapter-by-chapter, but rather use them as a reference. Slides will be uploaded into GitHub.

### Prerequisite: None

This course is for those new to data science. No prior programming experience is needed, although the ability to install applications and utilize a virtual machine is necessary to complete the hands-on assignments.

### Class Schedule

* Class Time: Tuesday 3:00 pm – 5:45 pm

### Office Hours:

* Tuesday 1:00 pm – 2:00 pm
* Thursday 1:00 pm – 2:00 pm

To schedule an appointment, please send an email with your availability, as well as the topics you would like to discuss (e.g., specific lectures or project content).

### Office Location:

* NPB 3.138E08 @ Open Cloud Institute (OCI) – Cell (210) 872.7259