CSE 352 Artificial Intelligence
Fall 2019
Professor Anita Wasilewska
http://www.cs.sunysb.edu/~cse352

Meets Tuesday, Thursday 2:30pm - 3:50pm

Place JAVITS 111

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Office phone number: 632 8458
Office location: New Computer Science Department building, office 208

Office Hours
Tuesday, Thursday 4:30 pm - 6:00 pm and by appointment

Place New Comp. Science Building, Room 208, telephone: 2-8458

Teaching Assistants

There will be multiple TAs
TAs are responsible for grading
All grades are listed on BLACKBOARD
TAs office hours and other responsibilities will be listed on the course webpage

Course General Description

Artificial Intelligence is a broad and well established field and AI textbooks seem to be getting longer
and longer and and often narrowly specialized. Our course attempts t to provide a concise and
accessible introduction to the field. It is designed to give a broad, yet in-depth overview of
different fields of AI. We will examine the most recognized techniques and algorithms in a rigorous
detail. We will also explore trends, areas, and developments of the field in form of lectures based
on newest research and applications.

Textbook There are two textbooks

Book 1

This is a short, not expensive, but not very technical book. We will cover in detail first 3 chapters and
Chapter 5 supplemented by the Lecture Notes for technical details.

The chapter 7 is supplemented by the Textbook 2 and extensive Lecture Notes.

Book 2
DATA MINING - Concepts and Techniques
Jiawei Han and Michelle Kamber
Morgan, Kauffman Publishers, 2011
Third Edition
Lecture Notes cover parts or all of CHAPTERS 6, 7 and CHAPTERS 8, 9 from 3rd edition

Do not need to buy the book. You can download detailed slides for Third Edition at

https : //hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm

Class attendance is the most important, as the Lectures and Lecture Notes serve also as an extra textbook for the course and are integral and as important part of the course design

GRADING

During the semester you have to complete the following.

1. Quizzes - (30pts)

There will be 2 Quizzes (25 minutes), 15 points each. Each quiz will consist of 1 - 3 questions.

NO make-up for quizzes.

2. Midterm - (65 pts)

3. Project (40pts);

4. Final( 65pts)

5. Extra Credit You can earn up to 10 extra points during the semester

Quizzes and Tests are closed book (and cell phones) examinations

None of the grades will be curved.

Homeworks I posted 4 Homework Assignments AND Homework Solutions. I encourage students to SOLVE homework problems first- and then to compare their solutions with those posted. Quizzes and TESTS will contain problems very similar to the Homework Problems.

Final grade computation

During the semester you can earn 200pts plus extra credit. The grade will be determined in the following way:   # of earned points divided by 2 = % grade.

The % grade is translated into a letter grade in a standard way i.e.

100 – 95 % is A, 94 – 90 is A–, 89 – 86% is B+, 85 – 83 % is B, 82 – 80 % is B–, 79 – 76 % is C+, 75 – 73 % is C, 72 – 70 % is C–, 69 – 60 % is D range and F is below 60%.

Tentative Quizzes and Tests schedule

Q1 Thursday, October 10

Fall Break October 14 - 15

MIDTERM Thursday, November 7 in class

Project Data - Preparation - 5 extra points

You submit it via Blackboard any day before Thursday, November 14
Thanksgiving Break  November 27 - December 1

PROJECT - submit it via Blackboard any day before Tuesday, November 21

Q2  Tuesday, December 3

Last Class (Review for Final)  Thursday, December 5

FINAL  December 11- 19 - exact time and place to be scheduled by University

Course Content

The TEXTBOOK 1: The Essence of ARTIFICIAL INTELLIGENCE is very thin but we use it as it contains short overview of major areas of AI.

We supplement it with Lecture Notes and Extra Material for detailed information.

We also supplement it with the TEXTBOOK 2: Data Mining - Concepts and Techniques for Machine Learning and Association Analysis.

In particular we cover the following Texbook 1 and Texbook 2 chapters and subjects supplemented by extra materials, not always in the order they are listed below.

The course will to cover in depth some of the following subjects.

Chapter 1  AI history and applications. Lecture Notes

Chapter 2  Knowledge Representation and Inference.

Propositional and Predicate Calculus is presented in detail in Lecture Notes are EXTRA Posted Materials

Chapter 2- Logic Details for Chapter 2: Overview of Propositional and Predicate Logic; Predicate languages and basic Laws of Quantifiers; Predicate Logic Arguments. Lecture Notes and EXTRA Materials

Automated theorem proving  DETAILS for Chapter 2: Propositional Resolution. Lecture Notes and EXTRA Materials


Lecture Notes and EXTRA Materials.

Chapter 5  Natural Language Processing. Lecture Notes and Posted Presentations

Chapter 7  Machine Learning

The Textbook 1 is not technical- we use it as an intuitive introduction

We w use the Textbook 2: Data Mining - Concepts and Techniques for technical details
**Lecture Notes** cover parts or all of CHAPTERS 6, 7 and CHAPTERS 8, 9 from 3rd edition.

In particular we cover the following techniques.

**Decision Trees** - intuitive introduction and detailed algorithms

**Neural Networks** - intuitive introduction and detailed algorithm

**Genetic Algorithms** - intuitive introduction and detailed algorithm and applications

**Association Analysis** - Apriori Algorithm - details and applications

**Classification by Association**

Chapter 8  Agent and Robots - readings

**New Advances**

**Deep Learning** - extra Lectures Slides for Reading

**Web Mining** - an overview of methods and problems

**Text Mining**: an overview of methods and problems

**Visualization** techniques

**Natural Language Processing** - extra Lectures Slides for Reading

**PROJECT DESCRIPTION**

**THE PROJECT GOAL** is to use Internet based Classification Tools to build two type classifiers: descriptive and non-descriptive. Discuss the results. Compare these two approaches on the basis of obtained results.

1. **Descriptive Classifier**

   Use a Decision Tree tool to generate sets of **discriminant rules** describing the content of the data.

   Use WEKA:  
   http://www.cs.waikato.ac.nz/~ml/weka/index.html

2. **Non-Descriptive Classifier**

   Use Neural Networks tool to build your Classifier

   Use WEKA or a tool of your choice. Describe specifics of your tool in a way that makes your report comprehensible for others.

   Here are some tools suggestions:
   
   
   http://www.simbrain.net/

**PROJECT DATA** is provided on the course web page.

This is a real life classification data with TYPE DE ROCHE (Rock Type) as a CLASS attribute. There are 98 records with 48 attributes and 6 classes.
Classes are:

C1: R. Carbonatees AND R. Carbonatees impures

C2: Pyrate

C3: Charcopyrite

C4: Galene

C5: Spahlerite

C6: Sediments terrigenes

Most important attributes (as determined by the expert) are: S, Zn, Pb, Cu, CaO+MgO, CaO, MgO, Fe2O3

This is a real life experimental data and it contains a lot of missing data (no value).

The project has to follow the following steps of Learning Process to build the classifiers.

S1: Data Preparation that includes attributes selection, cleaning the data, filling the missing values, etc... to build Project DATA - PD.

S2: Data preprocessing

1. For the Decision Trees Descriptive Classifier you use 2 methods of data discretization to the Project Data PD creating two data sets: PD1 and PD2. Describe which methods you used.

2. For the Neural Network Non -descriptive Classifier use the Project DATA - PD and your tool method of normalization of your choice. Specify which.

Building Classifiers

For each sets of data PD1, PD2 (for Decision Trees), and PD (for Neural Networks) perform the following Experiments 1- 3.

For each Experiment compare the resulting Descriptive Classifiers with each other and compare each Descriptive Classifier with the resulting Non-Descriptive Classifier.

Experiments 1- 3

Experiment 1: use all records to perform the full classification (learning), i.e. build a classifier for all classes C1- C6 simultaneously.

Experiment 2: use all records to perform the contrast classification (contrast learning), i.e. contrasting class C1 with a class notC1 that contains other classes.

Experiment 3: repeat Experiments 1, 2 for all records with the most important attributes as defined by the expert only.

Write a detailed Project Description explaining all methods used, motivations, experiments results and their comparison, and submit it via Blackboard.
ACADEMIC INTEGRITY STATEMENT  (Adopted by the Undergraduate Council September 12, 2006)

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

Stony Brook University Syllabus Statement  If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.sunysb.edu/ehs/fire/disabilities.shtml