CS 4320: Machine Learning

Spring 2020 Syllabus

Course Description

For students pursuing degrees in Computer Science or related fields, with an interest in the theory and practice of machine learning. Covers an introduction to supervised and unsupervised learning, including decision trees, neural networks, naive Bayes classifiers and support vector machines. Students will be required to implement machine learning systems.

Prerequisites

CS 2420, CS 2810 and CS 3005 all with a C- or better.

Course fees

Course fee: $20, used to assist in maintaining department infrastructure.

Disability Statement

If you suspect or are aware that you have a disability that may affect your success in the course you are strongly encouraged to contact the Disability Resource Center (DRC) located in the North Plaza Building. The disability will be evaluated and eligible students will receive assistance in obtaining reasonable accommodations. Phone # 435-652-7516.

Sections

1. TR 1:00 - 2:15 pm in Smith 116
   Final exam Apr 30 at 1:00 - 2:50 pm

Instructor

Curtis Larsen

Student Learning Outcomes

The student will be able to discuss the principles of:

- supervised learning,
- unsupervised learning,
- decision trees,
- artificial neural networks,
- genetic algorithms,
- Bayesian learning,
- support vector machines.

The student will be able to:

- use supervised and unsupervised learning techniques,
- implement software learning systems,
- evaluate quality of learned systems,
- implement software utilizing the results of learning systems.

Resources

Textbook

There is no required textbook for this course. The following book is offered as an optional resource.


The following texts may be of interest as well.
1. **Online References**
   - NumPy
   - Matplotlib
   - Matplotlib Tutorials
   - Pandas
   - Pandas Tutorials
   - scikit-learn
   - TensorFlow
   - Keras

   (optional)

   (optional)

4. *Machine Learning* by Tom M. Mitchell
   (optional)

5. *Artificial Intelligence Subsequent Edition* by Elaine Rich and Kevin Knight
   (optional)

6. *Foundations of Machine Learning* by Mohri, Rostamizadeh, Talwalkar
   (optional)

   Read Online
   (optional)

   (optional)

   (optional)

10. *Bayesian Reasoning and Machine Learning* by David Barber
    (optional)

### Other Resources

- You will need access to one or more computer systems with Python3, numpy, matplotlib, pandas, and tensorflow installed.

### Computer Labs

You may use the computers and software in the Smith Computer Center. Some lab assistants may be able to help with assignments and pass off homework assignments for introductory courses.

### Course Web Site

Assignment submissions and grades will be managed in the Canvas System.

### Assignments and Exams

#### Reading

While there is no required text book. Students are expected to find and read relevant references.

#### Assignments

A series of programming assignments will be required. These assignments are due on the date and time listed in the schedule, or as stated by the instructor during class. It cannot be over emphasized that it is important to start early and get all of your assignments done before their due dates. Programs that do not run correctly will receive no credit.

#### Participation

You will be expected to give positive contributions to class discussions.

#### Exams

There will be a written midterm and a written final. The exam questions will be based on the principles of the algorithms and data structures discussed in class and used in projects.

### Grading

Letter grades will be assigned based on the percentage of total possible points attained. The point totals will be approximately: assignments 150, midterm exam 50 and final exam 50. The following chart will be used for letter grades.
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**Course Policies**

**Attendance**

Students are responsible for material covered and announcements made in class. School-related absences may be made up only if prior arrangements are made. The class schedule presented is approximate. The instructor reserves the right to modify the schedule according to class needs. Changes will be announced in class and posted to the website. Exams and quizzes cannot be made up unless arrangements are made prior to the scheduled time.

Occasional absences are acceptable as long as the student keeps up with assignment work. Students who miss more than two consecutive weeks of class or who miss more than 20% of scheduled classes during the semester without making prior arrangements will receive a failing grade. Students who miss any scheduled exam (including midterm exams and the final exam) or fail to complete a final project without making prior arrangements will receive a failing grade.

**Time Commitment**

Courses should require about 45 hours of work per credit hour of class. This class will require about 135 hours of work on the part of the student to achieve a passing grade, which is approximately 9 hours per week. If you do not have the time to spend on this course, you should probably rethink your schedule.

**Late Policy**

Each assignment has two due dates. The earliest due date is the required date. The second date is the absolute latest date to submit the assignment. Late work will not be accepted after the second date.

**Collaboration**

Limited collaboration with other students in the course is permitted. Students may seek help learning concepts and developing programming skills from whatever sources they have available, and are encouraged to do so. Collaboration on assignments, however, must be confined to course instructors, lab assistants, and other students in the course. Students are free to discuss strategies for solving programming assignments with each other, but this must not extend to the level of programming code. Each student must code his/her own solution to each assignment. See the section on cheating.

**Cheating**

Cheating will not be tolerated, and will result in a failing grade for the students involved as well as possible disciplinary action from the college. Cheating includes, but is not limited to, turning in homework assignments that are not the student’s own work. It is okay to seek help from others and from reference materials, but only if you learn the material. As a general rule, if you cannot delete your assignment, start over, and re-create it successfully without further help, then your homework is not considered your own work.

You are encouraged to work in groups while studying for tests, discussing class lectures, discussing algorithms for homework solutions, and helping each other identify errors in your homework solutions. If you are unsure if collaboration is appropriate, contact the instructor. Also, note exactly what you did. If your actions are determined to be inappropriate, the response will be much more favorable if you are honest and complete in your disclosure.

Where collaboration is permitted, each student must still create and type in his/her own solution. Any kind of copying and pasting is not okay. If you need help understanding concepts, get it from the instructor or fellow classmates, but never copy another’s code or written work, either electronically or visually. The line between collaborating and cheating is generally one of language: talking about solutions in English or other natural languages is usually okay, while discussions that take place in programming languages are usually not okay. It is a good idea to wait at least 30 minutes after any discussion to start your independent write-up. This will help you commit what you have learned to long-term memory as well as help to avoid crossing the line to cheating.
College Policies

Click on this link: https://academics.dixie.edu/syllabus/ for comprehensive information on the Semester Dates, the Final Exam Schedule, University resources such as the library, Disability Resource Center, IT Student Help Desk, Online Writing Lab, Testing Center, Tutoring Center, Wellness Center and Writing Center. In addition, please review DSU policies and statements with regards to Academic Integrity, Disruptive Behavior and Absences related to university functions.

If you are a student with a medical, psychological, or learning disability or think you might have a disability and would like accommodations, contact the Disability Resource Center (652-7516) in the North Plaza. The Disability Resource Center (http://dixie.edu/drcenter/) will determine eligibility of the student requesting special services and determine the appropriate accommodations related to their disability.