

Introduction to Machine Learning

Course Number: 3773

Class Periods: T 4, R 4-5

Location: Lar 310

Academic Term: Spring 2019

Instructor

- Name: Alina Zare
- Email Address: azare@ufl.edu
- Office Hours: By Appointment

Teaching Assistants

Please contact through the Canvas website

- Name: Kang Yang
- Email Address: yang.kang@ufl.edu
- Office Hours: TBD

Course Description

4 credits. This course will cover introductory topics in pattern recognition and machine learning and use of these methods towards a variety of real-world applications. The focus of this course is to be introduced to basic machine learning concepts and how to use associated state-of-the-art machine learning tools. Topics covered include: deep learning, linear and non-linear classifiers

Course Pre-Requisites / Co-Requisites

EEL 3135 Signals and Systems

Course Objectives

Understand and use the concepts of machine learning for data science. Focus on tools for application of deep learning and multivariate data analysis to real world data and problems.

These objectives will be accomplished through:

1. Semester-long group project that involves implementing a deep learning system
2. Discussion of pattern recognition and machine learning methods
3. Implementation of a variety of machine learning methods in code

Professional Component (ABET)

This course consists of 1.5 credits of Engineering Design and 1.5 credits of Engineering Science

Relation to Program Outcomes (ABET)

| Outcome | Coverage* |
|---|-----------|
| 1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. | High |
| 2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs. | High |
| 3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. | High |

Required Textbooks and Software

- Title: Python Machine Learning
- Author: S. Raschka
- ISBN number: 978-1-78355-513-0

- Title: Deep learning with Pytorch
- Author: Eli Stevens and Luca Antiga
- ISBN number: 978-1-61729-526-3

- Software: Python 3+, Git, Pytorch

Course Schedule

- **Weeks 1-3:** Introduction to Machine Learning and Evaluation of Methods: What is Machine Learning? Error and Accuracy Metrics, Machine Learning Terminology, Introduction to Git (Assignment 1-3 due)
- **Weeks 4-6:** Introduction to Supervised Classification: K-Nearest Neighbors, Decision Trees, Random Forests, and Linear Classifiers; Experimental Design and Hyperparameter Tuning Strategies (Assignments 4-6 due)
- **Weeks 7-9:** Introduction to Neural Networks: The Perceptron and Brief history of Neural Networks; Multi-layer Perceptron; Introduction to Pytorch (Assignments 7-8 due)
- **Mid-Term Exam:** During Week 9
- **Weeks 10-12:** Introduction to Deep Learning: Deep Learning Fundamentals and Applications; Introduction to Convolutional Neural Networks: Applications and Implementation in Pytorch (Assignment 10 due)
- **Weeks 13-15:** Project Focus, Project Presentations

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

This class will be presented online using Zoom and requires access to a working webcam and stable internet connection. I prefer that students keep their camera on during the class so that I can see you as I would during normal face-to-face classes. Studies show that if we can see each other's faces then we will have more engagement, more student success, and more faculty success. However, this is not a requirement. I understand if on certain days you can't have your camera on due to internet bandwidth limitations, other family members, health issues, or any other reasons.

Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Evaluation of Grades:

| Assignment | Percentage of Final Grade |
|-----------------------|---------------------------|
| Assignments | 40% |
| Midterm Exam | 20% |
| Semester-long Project | 20% |
| Final Exam | 20% |
| TOTAL | 100% |

Grading Policy:

| Percent | Grade | Grade Points |
|-------------|-------|--------------|
| 93.0 - 100 | A | 4.00 |
| 90.0 - 92.9 | A- | 3.67 |
| 87.0 - 89.9 | B+ | 3.33 |
| 83.0 - 86.9 | B | 3.00 |
| 80.0 - 82.9 | B- | 2.67 |
| 77.0 - 79.9 | C+ | 2.33 |
| 73.0 - 76.9 | C | 2.00 |
| 70.0 - 72.9 | C- | 1.67 |
| 67.0 - 69.9 | D+ | 1.33 |
| 63.0 - 66.9 | D | 1.00 |
| 60.0 - 62.9 | D- | 0.67 |
| 0 - 59.9 | E | 0.00 |

A “C-” will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A “C-” average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.