Machine Learning
CAP 6610   Section 212D
Class Periods: M,W,F, Period 4 (10:40 AM – 11:30 AM)
Location: CSE E222
Academic Term: Fall 2019

Instructor:
Arunava Banerjee
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(352)294-6641
Office Hours: Tuesdays 2:00 PM – 4:00 PM

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website
- Name, email address, office location, office hours
- Name, email address, office location, office hours

Course Description
Concepts in developing computer programs that learn and improve with experience. Emphasis on methods based on probability, statistics, and optimization.

Course Pre-Requisites / Co-Requisites
Mathematics for Intelligent Systems (COT 5615)

Course Objectives
Understanding the formal and technical aspects underlying current Machine learning techniques, including Supervised and Unsupervised learning, Deep networks, support vector machines, expectation maximization, hidden markov models, etc.

Materials and Supply Fees
None

Required Textbooks and Software
- None

Recommended Materials
- *Machine Learning: A Probabilistic Perspective*, Murphy, ISBN-10: 0262018020
- *Pattern Recognition and Machine Learning*, Bishop, ISBN 0-38-731073-8
- *Pattern Classification, 2nd Edition*, Duda, Hart and Stork, John Wiley, ISBN 0-471-05669-3.

Course Schedule
Week 1:   Introduction; Supervised, Unsupervised, Reinforcement Learning; Labeled and Unlabeled data; training/testing; Generalization; Over-fitting.
Week 2:   Basic Mathematical Probability Theory; RV and Probability Distribution
Week 3:   Probabilistic bounds, Information Theory, Probability Metrics
Week 4:   The Risk functional Approach; Empirical risk minimization principle.
Week 5:   Decision Trees
Week 6:   Multivariate Regression
Week 7:   Perceptron Learning rule and Error BackPropagation
Week 8:   Convolutional Neural Networks, Recurrent Neural Networks, ReLU, Softmax, Dropout, LSTM
Week 9:   Lagrange multipliers, Convex optimization
Week 10:   Support Vector Machines

Week 11:   The Kernel trick. Polynomial kernel, GRBF kernel
Week 12:   Unsupervised Learning, Principal Component Analysis
Week 13:   Mixture of Gaussians, Expectation Maximization
Week 14:   Hidden Markov Model
Week 15:   Reinforcement Learning

Attendance Policy, Class Expectations, and Make-Up Policy
Attendance is not mandatory. However, it is your responsibility to stay abreast with the material being covered in class: Excused absences must be in compliance with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (3)	100 each	10%
Midterm Exam (3)	50 each	75%
Project	100	15%
		100%

Grading Policy

On the curve.

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

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.aa.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.aa.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:

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/.

E-learning technical suppor*t*, 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.