EEE 4774:
Data Analytics
CRN: 25933, Section 001, 3 Credit Hours

COURSE SYLLABUS

Semester: Spring 2023
Class Meeting Days: Tu, Th
Class Meeting Time: 12:30 – 1:45 pm
Class Meeting Location: CIS 1016
Instructor: Yasin Yilmaz
Office Location: ENB 251
Office Hours: Tu, 11:00 am – 12:00 pm; Th, 2:00 – 3:00 pm
Email: yasiny@usf.edu
TA: Salman Sadiq Shuvo
Office Location: ENB 237
Office Hours: M & F 1:00 – 2:00 pm
Email: salmansadiq@usf.edu

I. Welcome!

Facilitated by the advancements in machine learning, in particular deep neural networks, data science is an emerging field with a broad range of applications. Understanding the basics of neural networks and how machine learning algorithms work is crucial in developing data analytics solutions. This introductory course will focus on fundamentals of supervised and unsupervised learning methods.

II. University Course Description

This course aims to teach the fundamentals of Machine Learning and Statistical Data Analysis. It will cover the related theory in statistical inference and learning, as well as several applications in various fields.

III. Course Prerequisites

- EEE 6542 Random Processes in Electrical Engineering with a minimum grade of B.
- Good knowledge in programming basics in a popular language such as Python, Matlab, and R.

IV. Course Purpose

This course aims to teach the fundamentals and applications of Machine Learning and Statistical Data Analysis. It will cover the related theory in statistical inference and learning, such as Bayesian learning, regression, classification, clustering, and regularization. Through homework assignments and a final project based on hands-on data analytics, it will also demonstrate applications in various fields.

V. Course Format

This is an in-class course. The lecture slides and assignments will be posted on Canvas.

VI. Student Learning Outcomes

Students will demonstrate the ability to perform statistical data analysis tasks such as regression, classification, clustering, hypothesis testing, and parameter estimation. They will be able to explain how state-of-the-art machine learning techniques work, and what their advantages and disadvantages are. Furthermore, they will be able to implement and use such techniques for their analysis. They will also learn how to develop a comprehensive data analysis project and present it orally and in a written report.

VII. Course Objectives

The expectations for students taking this course are that at the end of the course they should:

1. Be able to perform standard data analysis tasks such as regression, classification, clustering, and parameter estimation using Python.
2. Be familiar with the state-of-the-art machine learning techniques and will understand their theoretical underpinnings.
3. Be able to develop a comprehensive data analysis project and present it orally and in a written report.

VIII. Required Texts and/or Readings and Course Materials

- *Pattern Recognition and Machine Learning,* Christopher Bishop, Springer, 2006, ISBN 978-0387310732 **(Recommended)**
- Python (publicly available)

IX. How to Succeed in this Course

Successful students in this class attend the lectures, follow the lecture slides carefully, complete the quizzes and assignments on time, and stay up to date with course content and announcements on Canvas. Additional reading from the recommended textbook will also be quite helpful. Review of probability, statistics, and programming skills is encouraged if needed. For homework assignments, Python knowledge is needed, which will be covered up to an extent in the lecture content.

X. Communication

The main mode of communication will be through Canvas. Course announcements will be posted at Announcements on Canvas. The instructor may send individual or group Canvas messages. Students may contact the instructor through Canvas mail or directly through email.

XI. Grading Scale

Grading Scale (%)	
90-100	A
80 - 89	B
70 - 79	C
60 - 69	D
0 - 59	F

XII. Grade Categories and Weights

Quizzes are typically writing based and shorter than homework assignments, which include hands-on Python programming tasks. Final project is both programming and writing based. Its programming task will be much more involved than the homework assignments. While homework questions require the use of a specific method, in the final project you will need to compare several different methods. Also, the datasets in the final project are significantly larger and more complex than the ones in homework assignments. Final project includes a preliminary 1-page report, presentation, and a final report with codes (5-10 pages).

Assessment	Percent of Final Grade
Final Project • Preliminary report • Presentation • Final report	30% • 5% • 10% • 15%
Homework	35%
Quizzes	35%

XIII. Grade Dissemination

Graded tests and materials in this course will be returned individually only by request. You can access your scores at any time using "Grades" in Canvas.

XIV. Course Schedule

Week of	Lecture Topic	Lecture Content	Assignment
1/9	Fundamentals	Introduction to Data Science and Machine Learning, Python Tutorial	
1/16	Fundamentals	Frequentist vs. Bayesian Probability, Parameter Estimation and Model Selection	Quiz 1
1/23	Fundamentals	Parameter Estimation and Model Selection, Probability Distributions	Quiz 2
1/30	Unsupervised Learning	Principal Component Analysis, K-means Clustering	HW 1
2/6	Unsupervised Learning, Classification	Gaussian Mixture Model, Expectation-Maximization, Generative Models, Logistic Regression	Quiz 3
2/13	Classification	k-Nearest-Neighbor, Support Vector Machine, Decision Tree	HW 2
2/20	Classification	Ensemble Methods, Boosting, Bagging, Random Forest, Anomaly Detection	Quiz 4
2/27	Classification	Perceptron, Multilayer Perceptron, Stochastic Gradient Descent, Backpropagation	HW 3

3/6	Classification	Deep Neural Networks, Convolutional Neural Networks	Project Preliminary Report
3/13	**No class**	**Spring Break**	
3/20	Regression	Linear Regression, Maximum Likelihood and Least Squares	Quiz 5
3/27	Regression	Decision Tree, Recurrent Neural Networks, LSTM	HW 4
4/3	Generative Models	Generative Adversarial Network, Autoencoder	HW 5
4/10	Final Project Presentations		
4/17	Final Project Presentations		
4/24	Final Project Presentations		Final Project Report

* Note: The Schedule is subject to revision

XV. Standard University Policies

USF has a set of central policies related to student recording class sessions, academic integrity and grievances, student accessibility services, academic disruption, religious observances, academic continuity, food insecurity, and sexual harassment that **apply to all courses at USF**. Be sure to review these online at: https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx

XVI. Course Policies: Grades

Late Work Policy: All assignments turned in late will be assessed a penalty: 20% if it is one day late, or 50% for 2-3 days late. Assignments will not be accepted if overdue by more than three days.

Extra Credit Policy: There may be some extra credit up to 10% of course grade depending on the use of innovative methods.

Grades of "Incomplete": The current university policy concerning incomplete grades will be followed in this course. An Incomplete grade ("I") is exceptional and granted at the instructor's discretion only when students are unable to complete course requirements due to illness or other circumstances beyond their control. The course instructor and student must complete and sign the "I" Grade Contract Form that describes the work to be completed, the date it is due, and the grade the student would earn factoring in a zero for all incomplete assignments. The due date can be negotiated and extended by student/instructor as long as it does not exceed two semesters for undergraduate courses and one semester for graduate courses from the original date grades were due for that course. An "I" grade not cleared within the two semesters for undergraduate courses and one semester for graduate courses (including summer semester) will revert to the grade noted on the contract.

Make-up Exams Policy: There are no make-ups for quizzes, assignments, or the project. With valid medical excuse form, the weight of missed graded items will be distributed to the other items.

XVII. Course Policies: Technology and Media (as applicable)

Canvas: This course will be offered via USF's learning management system (LMS), Canvas. If you need help learning how to perform various tasks related to this course or other courses being offered in Canvas, please view the following videos or consult the Canvas help guides. You may also contact USF's IT department at (813) 974-1222 or help@usf.edu.

Recordings: *In this class, software will be used to record live class lectures and discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor.*

Online Exam Proctoring: *All students must review the syllabus and the requirements, including the online terms and video testing requirements, to determine if they wish to remain in the course. Enrollment in the course is an agreement to abide by and accept all terms. Any student may elect to drop or withdraw from this course before the end of the drop/add period.*

Online exams and quizzes within this course may require online proctoring. Therefore, students will be required to have a webcam (USB or internal) with a microphone when taking an exam or quiz. Students understand that this remote recording device is purchased and controlled by the student and that recordings from any private residence must be done with the permission of any person residing in the residence.

To avoid any concerns in this regard, students should select private spaces for the testing. The University library and other academic sites at the University offer secure private settings for recordings and students with concerns may discuss location of an appropriate space for the recordings with their instructor or advisor.

*Students must ensure that any recordings do not invade any third-party privacy rights and accept all responsibility and liability for violations of any third-party privacy concerns. Students are strictly responsible for ensuring that they take all exams using a reliable computer and high-speed internet connection. Setup information will be provided prior to taking the proctored exam. To use Honorlock, students are required to download and install the **Honorlock Google Chrome extension**. For additional information please visit the **USF online proctoring student FAQ** and **Honorlock student resources**.*

WhatsApp, GroupMe, and Student-to-Student Communication: While students may use digital communication tools (WhatsApp, GroupMe, etc.) to communicate with fellow students, it is important to remember that academic integrity policies still apply in these environments. Informing others about the contents of tests is prohibited by the official regulation, as is receiving unauthorized information about an examination. Students are expected and required to immediately report instances of such violations to the instructor.

XVIII. Course Policies: Student Expectations

Title IX Policy: Title IX provides federal protections for discrimination based on sex, which includes discrimination based on pregnancy, sexual harassment, and interpersonal violence. In an effort to provide support and equal access, USF has designated all faculty (TA, Adjunct, etc.) as Responsible Employees, **who are required to report any disclosures of sexual harassment, sexual violence, relationship violence or stalking**. The Title IX Office makes every effort, when safe to do so, to reach out and provide resources and accommodations, and to discuss possible options for resolution. Anyone wishing to make a Title IX report or seeking accommodations may do so online, in person, via phone, or email to the Title IX Office. For information about Title IX or for a full list of resources please visit: https://www.usf.edu/title-ix/gethelp/resources.aspx. *If you are unsure what to do, please contact Victim Advocacy – a confidential resource that can review all your options – at 813-974-5756 or va@admin.usf.edu.*

Course Hero / Chegg Policy: The USF Policy on Academic Integrity specifies that students may not use websites that enable cheating, such as by uploading or downloading material for this purpose. This does apply specifically to Chegg.com and CourseHero.com – almost any use of these websites (including uploading proprietary materials) constitutes a violation of the academic integrity policy.

Professionalism Policy: Per university policy and classroom etiquette; mobile phones, iPods, etc. **must be silenced** during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

End of Semester Student Evaluations: All classes at USF make use of an online system for students to provide feedback to the University regarding the course. These surveys will be made available at the end of the semester, and the University will notify you by email when the response window opens. Your participation is highly encouraged and valued.

Food and Drink Policy: Please adhere to the firm policy of no beverages (other than bottled/capped water), food, tobacco products, or like items in the classroom. Your understanding of the necessity for this policy and cooperation will be greatly appreciated. This policy will be strictly enforced.

Netiquette Guidelines

1. Act professionally in the way you communicate. Treat your instructors and peers with respect, the same way you would do in a face-to-face environment. Respect other people's ideas and be constructive when explaining your views about points you may not agree with.
2. Be sensitive. Be respectful and sensitive when sharing your ideas and opinions. There will be people in your class with different linguistic backgrounds, political and religious beliefs or other general differences.
3. Proofread and check spelling. Doing this before sending an email or posting a thread on a discussion board will allow you to make sure your message is clear and thoughtful. Avoid the use of all capital letters, it can be perceived as if you are shouting, and it is more difficult to read.
4. Keep your communications focused and stay on topic. Complete your ideas before changing the subject. By keeping the message on focus you allow the readers to easily get your idea or answers they are looking for.

5. Be clear with your message. Avoid using humor or sarcasm. Since people can't see your expressions or hear your tone of voice, meaning can be misinterpreted.

XIX. Learning Support and Campus Offices

Academic Accommodations

Students with disabilities are responsible for registering with Student Accessibility Services (SAS) in order to receive academic accommodations. For additional information about academic accommodations and resources, you can visit the SAS website.
SAS website for the Tampa and Sarasota-Manatee campuses.
SAS website for the St. Pete campus.

Academic Support Services

The USF Office of Student Success coordinates and promotes university-wide efforts to enhance undergraduate and graduate student success. For a comprehensive list of academic support services available to all USF students, please visit the Office of Student Success website.

Canvas Technical Support

If you have technical difficulties in Canvas, you can find access to the Canvas guides and video resources in the "Canvas Help" page on the homepage of your Canvas course. You can also contact the help desk by calling 813-974-1222 in Tampa or emailing help@usf.edu.
IT website for the Tampa campus.
IT website for the St. Pete campus.
IT website for the Sarasota-Manatee campus.

Center for Victim Advocacy

The Center for Victim Advocacy empowers survivors of crime, violence, or abuse by promoting the restoration of decision making, by advocating for their rights, and by offering support and resources. Contact information is available online.

Counseling Center

The Counseling Center promotes the wellbeing of the campus community by providing culturally sensitive counseling, consultation, prevention, and training that enhances student academic and personal success. Contact information is available online.
Counseling Center website for the Tampa campus.
Counseling Center website for the St. Pete campus.
Counseling Center website for the Sarasota-Manatee campus.

Tutoring

The Tutoring Hub offers free tutoring in several subjects to USF undergraduates. Appointments are recommended, but not required. For more information, email asctampa@usf.edu.
Tutoring website for the Tampa campus.
Tutoring website for the St. Pete campus.
Tutoring website for the Sarasota-Manatee campus.

Writing Studio

The Writing Studio is a free resource for USF undergraduate and graduate students. At the Writing Studio, a trained writing consultant will work individually with

you, at any point in the writing process from brainstorming to editing. Appointments are recommended, but not required. For more information or to make an appointment, email: writingstudio@usf.edu.
Writing studio website for the Tampa campus.
Writing studio website for the St. Pete campus.
Writing studio website for the Sarasota-Manatee campus.

XX. Academic Integrity

The faculty of the Electrical Engineering Department is committed to maintaining a learning environment which promotes academic integrity and the professional obligations recognized in the IEEE Code of Ethics (http://www.ieee.org/about/corporate/governance/p7-8.html). Accordingly, the department adheres to a common Academic Integrity Policy in all of its courses. This policy is to be applied uniformly in a fair and unbiased manner.

University rules regarding academic integrity will be strictly enforced. It is not acceptable to copy, plagiarize or otherwise make use of the work of others in completing homework, project, laboratory report, exam or other course assignments. Likewise, it is not acceptable to knowingly facilitate the copying or plagiarizing of one's own work by others in completing homework, project, laboratory report, exam or other course assignments. It is only acceptable to give or receive assistance from others when expressly permitted by the instructor. Unless specified otherwise, as in the case of all take-home exams, scholarly exchange regarding out-of-class assignments is encouraged. A more complete explanation of behaviors that violate academic integrity is provided at:
http://ugs.usf.edu/pdf/cat1314/08ACADEMICPOL.pdf

The minimum penalty for violation of the academic integrity policy stated in the preceding paragraph is the greater of an automatic zero on the assignment or a letter grade reduction in the overall course grade. Student(s) found in violation of the policy on an exam will receive an F or FF in the course. Violations of the policy will be recorded in a letter from the instructor that is kept in the student files held by the department. A second violation of the policy, irrespective of whether it was related to an exam or any other course assignment, will result in expulsion from the Electrical Engineering Department.

XXI. Important Dates to Remember

All the dates and assignments are tentative and can be changed at the discretion of the professor. For important USF dates, see the Academic Calendar at http://www.usf.edu/registrar/calendars/