**IE517 Machine Learning in Finance (Fall 2023) – CRN: 74048**

<https://courses.illinois.edu/schedule/2023/fall/IE/517>

Instructors: Matthew Murphy (mdmurph@illinois.edu)

**Course Outline**

Machine Learning includes the design and the study of algorithms that can learn from experience, improve their performance, and make predictions. This course is designed specifically and exclusively for MSFE first semester students. It features rigorous coding exercises in python and acts as preparation for later courses. Students will learn the concepts behind different supervised machine learning algorithms and implement them in Python using advanced packages; pandas, NumPy, and scikit-learn. All the data for this course features unique real-world financial datasets produced through interactions with MSFE practicum students and sponsors.

**Course Objectives**

**Course Learning Outcomes**

Through the completion of this course students are expected to develop competencies in:

* Basic machine learning concepts and models. An intuitive, rather than mathematical understanding, and focus on real-world interpretation and applicability of models. Become conversant with machine learning.
* Data analytics project framework. How to begin, implement and complete a data analytics project using machine learning tools. Data acquisition and preprocessing, to feature extraction to model selection and feature engineering to model fitting/evaluation and improvement using ensemble techniques and hyperparameter tuning. Learn how to best ask questions of the data to derive meaningful insights.
* Python implementation environment. Ability to perform a complete data analytics project, including all phases, competently in python coding. Understanding of the Scikit Learn package of ML models and use SKLearn Documentation to answer basic technical/implementation questions.
* Exploratory data analysis and visualizations of datasets of a comparable scale to MSFE practicums.
* Thinking independently and experimentally. Proceeding without explicit directions to solve data and coding problems. Develop comfortability with an ad hoc, trial-and-error experimental approach.
* Working as part of a distributed team. Coordinating to utilize specialization, division of labor and economy of scale and to develop effective behind-the-scenes teamwork and communications skills. Foster creativity, collaboration, curiosity and innovative problem solving.

**Textbook and other materials**

Main (required) textbook:

* Raschka, Sebastian and Yuxi Hayden Liu and V. Mirjalili. 2022. *Machine Learning with PyTorch and Scikit-Learn*. Packt Publishing. Available free from Safari Books Online with your valid student email address: (https://www.safaribooksonline.com/library/view/python-machine-learning/9781787125933/ )



* A Github repository for the code and data provided in the text is available at: <https://github.com/rasbt/python-machine-learning-book-2nd-edition>
* <https://github.com/PacktPublishing/Python-Machine-Learning-Third-Edition>

Other course materials will be obtained from the following:

* Bowles, Michael. *Machine Learning in Python*. 2015. Wiley. Available free online from Wiley Online Library: (https://onlinelibrary.wiley.com/doi/book/10.1002/9781119183600 )
* Hackeling, Gavin. *Mastering Machine Learning with sci-kit learn*. 2017. Second Edition. Packt Publishing. Available free from Safari Books Online with your valid student email address: (https://www.safaribooksonline.com/library/view/mastering-machine-learning/9781788299879/ )
* Alpaydin, Ethem. *Introduction to Machine Learning*. 2014. The MIT Press. Available free online from IEEE Xplore: (<https://ieeexplore-ieee-org.proxy2.library.illinois.edu/xpl/bkabstractplus.jsp?bkn=6895440&SID=EBSCO:edseee>)
* Moncecchi, Guillermo and Raúl Garreta. 2013. *Learning scikit-learn: Machine Learning in Python*. Packt Publishing. Available online free from Safari Books Onlline: (<https://www.safaribooksonline.com/library/view/learning-scikit-learn-machine/9781783281930/> )
* Scikit-learn user guide. Release 0.22.2.dev0. Available at: (<http://scikit-learn.org/stable/documentation.html> )

Other assigned or optional readings will be made available via the course Compass site. Lecture notes, homework assignments, and other materials will be posted on the course Compass site.

**Course Topic Outline**



**Course requirements**

Grades will be determined as follows:

Weekly homework assignments (8 at 2.5% each) 20%

Weekly quizzes (8 at 2.5% each) 20%

Group project 25%

Participation 10%

Midterm Exam 25%

The maximum group size is four persons.

The midterm exam (which will be the “final” exam for this 8 week course) will be administered at a time to be announced later.

**DataCamp for the Classroom**DataCamp is a subscription, web-based learning platform for a variety of data and programming skillsets. As part of the DataCamp for the Classroom program, you will have free access to the entire DataCamp course library for the duration of this class, plus a free trial for six months. Ordinarily this is a monthly subscription cost. I will create an assignment list of chapters and courses that align with the modules as we cover them. Your may proceed at your own pace and feel free to explore beyond the confines of the assigned modules.

**Modality**

This course is offered in only a traditional physical classroom. week.} There are only 16 scheduled class meetings for this eight week course. Missing more than 2 sessions without an excused absence will result in the reduction of one letter grade.

**Course Management System**

Illinois Compass 2g is the communication and course material access system used in this class. You may access the course website using an Internet browser at <https://compass2g.illinois.edu/webapps/login/>

You will need to loginusing your NetID and your NetID password. Course information and materials, as well as course grades, will be available via the Illinois Compass 2g website. You are expected to access thesite regularly. If you are not familiar with Compass 2g, please view “Student Resources” at <https://online.illinois.edu/getting-started/learning-management-systems/illinois-compass-2g/illinois-compass-2g-student-resources-and-assistance>

Although IllinoisCompass 2g will open in virtually any browser, it is important to check your browser’s compatibility. To check if your browser is compatible, click on the Check Browser link in the upper right-hand corner of your screen when logged into your Illinois Compass 2g Homepage

**Attendance**

There is no specific attendance requirement, although it is assumed that regular attendance will improve your performance on the assignments. Because this course is only 8 weeks, missing one class meeting will put you at a disadvantage. You are expected to attend all 16 regularly scheduled class, but you will not be penalized if you are unable to attend due to technical or other issues.

**Office hours**

Monday/Wednesday from 12:00 to 2:00pm or by appt.

**Academic integrity**

Please be aware of the University’s policies regarding academic integrity. See

<http://admin.illinois.edu/policy/code/article1_part4_1-401.html>