**University of Oklahoma**
**Management Information Systems**
**MIT 5032-200/936/938: Advanced Analytics Programming: Python 2**
**Spring 2023**

**Course Meeting Time and Location (Norman campus)**

Format: In Person
Location: Michael F. Price Hall 3010
Course Meeting Time:
Wednesday, 6:00 PM – 9:30 PM, March 20 - May 5, 2023,
Friday, 6:00 PM – 9:30 PM, April 21, 2023

**Instructor:** Xinglong Ju
**E-mail:** xinglong.ju@ou.edu (start your subject line with [MIT5032] or [5032])
**Office:** Adams Hall **5** (Adams Hall Ground Floor (Basement))

**Microsoft Teams: (Text message or ask questions)**

Chat with Instructor on MS Teams
https://teams.microsoft.com/l/chat/0/0?users=xinglong.ju@ou.edu

**Instructor Office Hours**

Monday/Wednesday, 10:00 AM – 12:00 PM or by appointment at Adams Hall 5

**Teaching Assistant:** Weiyu Wang
**TA E-mail:** weiyuwang-1@ou.edu
**TA Office Hours:** Friday 12:00 PM – 4:00 PM, Adams Hall 3225A

**Learning Management System/website:** https://canvas.ou.edu/courses/288106

**Course Prerequisite**

MIT 5032 Analytics Programming: Python 1.

**Texts and Materials**

**Textbook** (**optional, not required**): Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 3rd Edition, by Aurélien Géron, Publisher: O'Reilly Media; 3rd edition (November 15, 2022), 850 pages, ISBN-10: 1098125975, ISBN-13: 978-1098125974
**Other Optional Materials**:
Two resources for learning Python basics
1. Al Sweigart, Automate the Boring Stuff with Python, 2015, No Starch Press, ISBN-10: 1593275994. A free online edition of the textbook is available under a Creative Commons license: https://automatetheboringstuff.com
2. Python Tutorials. https://pythonspot.com/

Note: There may be other materials including cases and readings. These will be provided to you via the course website.

**Technical Requirement**

You need (1) **a laptop** and (2) a wireless Internet connection in class. We will use laptops regularly in the classroom. Given the nature of this course, you should bring a well-functioning laptop with the following software potentially needed in this class. Other mobile platforms (Android, iPad, or Chrome book, etc.) do NOT work.

- **Python**
- PyCharm
- Zoom
- Microsoft Office Suite (Microsoft Teams)

**Course Overview and Objectives**

Students who successful complete this course should be able to:

1. demonstrate solid Python programming skills.
2. demonstrate good understanding of machine learning process and how to train, validate, and test models.
3. compose Python data wrangling and analysis programs by combining custom developed code with modules from Python's built-in libraries and from modules maintained by third parties.
4. import and work with popular Python libraries for specific business analytics topics.

**Course Description**

OFFICIAL CATALOG DESCRIPTION: Prerequisite: graduate standing and MIT5032. Advanced Python programming used for data extraction and preparation of data for data analytics, data mining, predictive analytics, and data visualization. Can be repeated with change of content; maximum credit 6 hours.

Python is a popular object-oriented programming tool for business analytics. This course will help students develop skills of using Python tools for business analytics. Specifically, students will use Python to practice two sets of topics. The first set of topics are data mining related and include such topics as training set, validation set, and testing set, cross-validation, confusion matrix, other evaluation matrix such as root mean squared error, and feature selection, among others. The second set of topics are application-related and apply data mining topics in specific application areas such as decision trees, clustering such as K-means, and other classifications such as naive bayes and support vector machine. We will also practice practical topics such as data sharing and cloud computing. I assume that you have taken MIT5032 so that you are familiar with Python basics such as while/for loops, if/elif/else statements, functions, etc.. In addition, students are expected to have good understanding of statistics and feel comfortable working with data and numbers.

**Grading**

Students should keep track of their performance throughout the semester and seek guidance from available sources if their performance drops below satisfactory levels.

- Lecture Codes: Sample problems will be practiced during the lecture time.
- Homework: Sample problems are assigned to help you learn the course materials.

The course grade will be comprised of performance on lecture codes, and homework.

| Assignment Component | Percentage |
|---|---|
| Lecture Codes | 40% |
| Homework | 60% |
| Total | 100% |

Course grade: A >= 90%; B >= 80%; C >=70%; D >= 60%; F < 60%.

**Homework and Lecture Codes must be taken individually, with no help from other individuals.**

Grades will be determined objectively based solely on the student's performance. In other words, when grading the instructor do not consider factors such as whether you need a certain grade for admission into an academic program, how "close" you are to a different grade, how hard you worked, whether you have a full-time job, whether you're taking a heavy course load, etc. The instructor put forth significant effort in grading consistently and fairly. When partial credit is involved, the instructor will try to be

generous, but only change a score in the case of a true grading error. If you believe that you have discovered a grading or posting error, you must notify *within 48 hours of the discrepancy*. Late appeals will not be considered. You must provide a written explanation justifying the re-evaluation request. If a written appeal is not made within the period, no grade re-evaluation will take place.
Pursuant to the Family Educational Rights and Privacy Act (FERPA), the instructor will not discuss student grades or any other information with anyone other than the student.

**Course Schedule**

*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Xinglong Ju*

1. Python Basics Review
2. Regular Expression for text analysis
3. Numpy
4. Advanced topics in Pandas
5. Data visualization (Matplotlib, Seaborn)
6. Data mining topics using the library Scikit-learn:
    - Dataset preprocessing (outliers, missing values, categorical variables to numerical values)
    - Dataset scaling methods
    - Dataset splitting methods
    - Regression methods and metrics
    - Classification Methods
    - Training Models
    - Support Vector Machines
    - Decision Trees
    - Ensemble Learning and Random Forests
    - Dimensionality Reduction
    - Unsupervised Learning Techniques
7. Pytorch

| Date | Topics |
|---|---|
| 3/22 | Welcome, Course overview, Python Basics |
| 3/29 | Regular Expression for text analysis, Numpy |
| 4/5 | Advanced topics in Pandas, Data visualization (Matplotlib, Seaborn) |
| 4/12 | Machine learning procedure model training, validation, and testing<br>Data preparation, Classification performance assessment |
| 4/19 | Training models: linear/logistic regression; polynomial regression, etc. |
| 4/21 | Classification: decision trees, SVM |
| 4/26 | Unsupervised : cluster analysis |
| 5/3 | Deep neural network/deep learning |

**Incomplete Grade**

A grade of "I" (for incomplete) will NOT be given under normal circumstances. Not performing well in class, not being able to complete an assignment in time or being out of town during a test are inadequate reasons for requesting or granting an incomplete. Only circumstances beyond your control (such as a severe illness), which will need to be documented, may warrant a grade of "I".

**Homework Assignments**

Homework assignments for this course are designed to encourage students to work actively with the course material and thereby master course materials. Further, homework enables students and the professor to recognize any points that are not yet fully understood. Students are expected to complete each of the homework problems. If, after considerable effort, you encounter a problem, note (on the homework) the specific difficulty you are having and ask TA for help.

Students may discuss the homework problems and approaches with their classmates and TA. If so, the student MUST specify who you collaborated with as comment upon submission. Moreover, students are expected to work independently in the actual completion of their work. For instance, if two (or more) homework answers have the same typos, it will be assumed that work was not done independently and therefore represents an honor code violation. Solutions and codes copied from online references will be also considered a serious violation unless a source remark is provided with the full link. If a violation is observed, the professor will take appropriate action, ranging from a reduction in grade to reporting of the violation.

**Lecture Codes**

To provide incentive for students to come to class prepared, lecture codes are assigned that correspond with lectures. The lecture codes must be taken individually, with no help from other individuals.

**Course Conduct**

It is your responsibility to read all assigned materials and have the software application installed properly before coming to class. I do not wish to spend class time going over material which is already covered in the text or help you install software. I expect everyone to participate in class discussions.

Finally,

- Do not read the newspaper or other books in class.
- Do not do assignments for other courses in this class.
- Do not repeatedly talk or otherwise disturb the conduct of this class.
- Please silence your phones when you are in class.

**Copyright Syllabus Statement for In-Person or Online Courses**

Sessions of this course may be recorded or live-streamed. These recordings are the intellectual property of the individual faculty member and may not be shared or reproduced without the explicit, written consent of the faculty member. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course recordings with individuals not enrolled in the class or upload them to any other online environment.

**Academic Integrity**

Academic honesty is incredibly important within this course. Cheating is strictly prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community, it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the Student's Guide to Academic Integrity.

**Religious Observance**

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [See Faculty Handbook 3.15.2]

**Reasonable Accommodation Policy**

The Accessibility and Disability Resource Center is committed to supporting students with disabilities to ensure that they are able to enjoy equal access to all components of their education. This includes your academics, housing, and community events. If you are experiencing a disability, a mental/medical health condition that has a significant impact on one or more life functions, you can receive accommodations to provide equal access. Possible disabilities include, but are not limited to, learning disabilities, AD(H)D, mental health, and chronic health. Additionally, we support students with temporary medical conditions (broken wrist, shoulder surgery, etc.) and pregnancy. To discuss potential accommodations, please contact the ADRC at 730 College Avenue, (ph.) 405.325.3852, or adrc@ou.edu.

**Title IX Resources and Reporting Requirement**

Anyone who has been impacted by gender-based violence, including dating violence, domestic violence, stalking, harassment, and sexual assault, deserves access to resources so that they are supported personally and academically. The University of Oklahoma is committed to offering resources to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you would like to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or another confidential resource (see "Can I make an anonymous report?"). You may also choose to report gender-based violence and discrimination through other means, including by contacting the Institutional Equity Office (ieo@ou.edu, 405-325-3546) or police (911). Because the University of Oklahoma is committed to the safety of you and other students, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. For more information, please visit the Institutional Equity Office.

**Adjustments for Pregnancy/Childbirth Related Issues**

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact your professor or the Accessibility and Disability Resource Center at 405/325-3852 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

**Final Exam Preparation Period**

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy.

**Emergency Protocol**

During an emergency, there are official university procedures that will maximize your safety.
**Severe Weather:** If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances

2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional Weather Safety Information is available through the Department of Campus Safety.

**Armed Subject/Campus Intruder**

If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:
1. Avoid: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. 2. Deny: If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. 3. Defend: As a last resort fight to defend yourself.
For more information, visit OU's Emergency Preparedness site.
Shots Fired on Campus Procedure – Video

**Fire Alarm/General Emergency**

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: *1. LEAVE* the building. Do not use the elevators. *2. KNOW* at least two building exits *3. ASSIST* those that may need help *4. PROCEED* to the emergency assembly area *5. ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues. 6. WAIT* for official notice before attempting to re-enter the building.
*OU Fire Safety on Campus*

**Mental Health Support Services**

If you are experiencing any mental health issues that are impacting your academic performance, counseling is available at the University Counseling Center (UCC). The Center is located on the second floor of the Goddard Health Center, at 620 Elm Rm. 201, Norman, OK 73019. To schedule an appointment call (405) 325-2911. For more information, please visit University Counseling Center.

For more information, please visit http://www.ou.edu/ucc.