Missouri University of Science & Technology
Department of Business and Information Technology

IST 5520 – Data Science and Machine Learning with Python
Course Syllabus - Fall 2022

Meetings: MWF, 2:00 pm – 2:50 pm, Butler-Carlton Hall 213 (In-person sessions only)

Department Mission:

"To serve the economic interests of industry and the evolving needs of society in a challenging, rapidly-changing, global environment, the Department of Business & Information Technology capitalizes on the strong technological emphasis of Missouri S&T to enable individuals to excel in a technology-centric business world. Recognizing this rapid evolution of the marketplace, we create and disseminate knowledge impacting the theory and practice of business."

INSTRUCTOR

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Department of Business & Information Technology — Phone: (573) 341-4418

Missouri University of Science & Technology — Office: Fulton Hall 106B

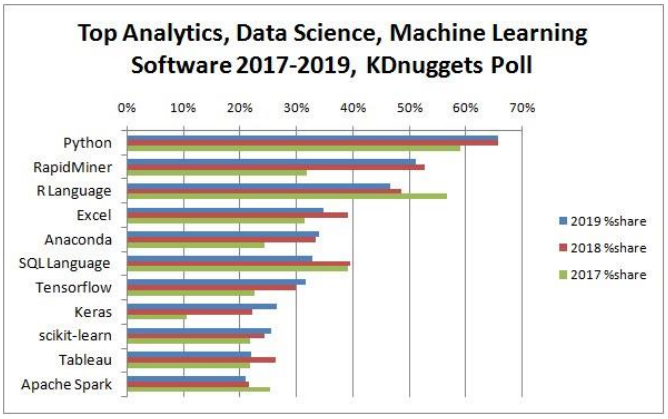
Office Hours: Fridays 9:00 am – 11:00 am or by appointment (suggest a date and time via email)

COURSE DESCRIPTION

Examines data science methodologies for scraping, manipulating, transforming, cleaning, visualizing, summarizing, and modeling large-scale data as well as supervised and unsupervised machine learning algorithms applied in various business analytics and data science scenarios. Python libraries such as Pandas, NumPy, Matplotlib, and Scikit-learn are utilized.

Prerequisites: One of Stat 3111, 3113, 3115, or 3117 and either IST 1552 or Comp Sci 1510; or graduate standing and knowledge of calculus, statistics, and programming.

Python is the most popular tool for analytics, data science, and machine learning.



Source: https://www.kdnuggets.com/2019/05/poll-top-data-science-machine-learning-platforms.html

LEARNING MANAGEMENT SYSTEM

Access Canvas (https://umsystem.instructure.com) for course materials, grades, course schedule, submission deadlines etc.

LEARNING OBJECTIVES

Course Objectives	**Program Learning Objectives**			
	Communication (Oral & Written)	**Critical Thinking**	**IT Impact Knowledge**	**Leadership**
To obtain an overview of business analytics, data science, and machine learning			X	
To learn Python programming language for data management and data analysis		X	X	
To obtain a set of basic methods and skills used to collect and manipulate data		X	X	
To develop a set of tools and skills to describe and visualize data, and reduce data dimension		X	X	
Be able to build and evaluate linear and nonlinear regression models for prediction		X	X	
Be able to build and evaluate regression and classification models		X	X	
Be able to apply various supervised and unsupervised machine learning methods to analyze data		X	X	
Be able to build and evaluate basic deep learning models		X	X	
Be able to build and evaluate time series forecasting methods		X	X	
Be able to apply various techniques and skills to solve real business problems	X	X	X	X

GRADING

Course grading is composed of evaluations of the following components:

Grading Component		***Weight***
Homework		35%
Participation		10%
Group Project		15%
Exam 1		20%
Exam 2		20%
	Total	100%

The weighted percentage students have earned for all components will be rounded to the nearest hundredth. For example, 79.49% would be 79%, and 89.51% would be 90%. Then the final letter grade will be assigned as follows:

Grade	***Percentage***
A	>= 90%
B	< 90%
C	< 80%
D (undergrad only)	< 70%
F	< 60%

I do NOT curve grades. Students must be fully prepared to earn points as many as possible throughout the semester.

TOOLS

1. Python 3, Jupyter Notebook, and More

Download and install Python JDK from https://www.python.org/. Please install the latest Python 3 64-bit version at https://www.python.org/downloads/release/. Then use pip to install Jupyter and other commonly used Python packages. Refer to the guide "Python Development Environment Setup for IST 5520" on Canvas for the detailed steps of setting the Python development environment for analytics programming.

READINGS

Reading materials provide a basis for understanding course content and participating in class discussions. Thus, assigned reading materials must be read prior to the class. Some in-class quizzes based on reading materials will also be given prior to lecturing. The instructor will provide reading materials (refer to the course website for detail).

GROUP PROJECTS

1. **Project Purpose**

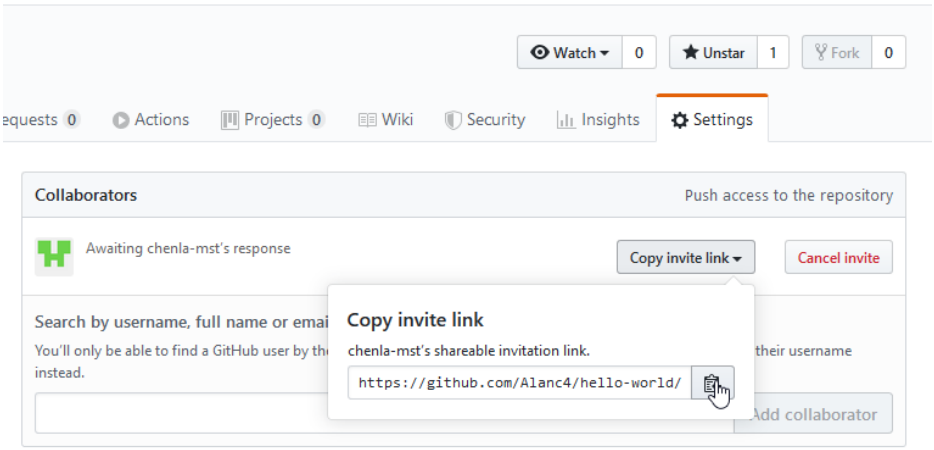
   The purpose of the group project is to encourage students to apply and extend the techniques and methods they learn in class to a real dataset and extract meaningful insights from the data. Students are encouraged to immerse deeply in the dataset and apply various analytical techniques to analyze the dataset. It's important to note that the class cannot cover everything that you may need for your project. Students are expected to search online resources and learn new methods.

2. **Datasets**

   Groups (5 students in each group; individual project is NOT allowed) shall specify and analyze a small data science project by using Python.
   Students can come up with their own datasets. If you don't have datasets at hand, you can choose datasets provided by the instructor.
   Each group, if using its own dataset, must send its dataset to the instructor for approval. It is recommended that each group discuss their dataset with the instructor during office hours.

3. **Project Repository**

   Each group needs to use github to host their project and support collaborative work. To learn how to use github, refer to https://guides.github.com/.
   - Each group member needs to register a github ID (if you don't have one) and work on the project repository.
   - Please add the instructor (github ID: chenla-mst) as a collaborator for your group project. After you add the instructor into your group project, please copy the invitation link and send it to my email (chenla@mst.edu). See below for an example.



4. Project Milestones

- ***Milestone 1: Project Proposal***
  Discuss with your classmates and form a project team with at most 4 members in total. Submit your project proposal. See the website for the detailed requirement on project proposal. If you need to discuss your project proposal with the instructor, please book a meeting with the instructor.
- ***Milestone 2: Data Analysis I***
  See the website.
- ***Milestone 3: Data Analysis II***
  See the website.
- ***Milestone 4: Project Presentation***
  See project presentation guideline below.

5. Project Presentation Guideline

Project presentations will take place at the end of the semester. Each presentation will last about 20 minutes (depending on the size of the class).
Note:

- This is a very short time, so be prepared to be concise.
- This is not the time to air complaints about the class, your classmates, or downplay the strengths of your work. This is the time to show the fruit of your semester's labor.

Your creative efforts should be realized within the following format:

- ***Teamwork*** (1 minute)
  Introduce your team members. Briefly describe their contributions.
- ***Background*** (2 minutes)
  Briefly explain the context and setting.
- ***Data Collection*** (2 minutes)

Briefly explain the context and your data collection procedure or methods.

- ***Data Analyses and Results*** (12 minutes)
  Briefly explain your data analysis methods and results. If you have many things, try to present the important methods and interesting findings.
- ***Conclusion*** (2 minute)
  Summarize your project: What insights you get from the data analysis? What limitations does the project have? Can the project be extended? What are the next phases of development for this project?
- ***Open Floor*** (1 minute)
  Finally, the presenting team will respond to questions from the class. Your instructor will moderate the time remaining.

6. Project Grading

- Your milestone submissions will be graded through the semester, with temporal grades at the whole group level assigned to all group members.
- At the end of the semester, you will evaluate your group members on contribution to the group project.
- Each student's final grade for the group project will be assigned according to both group performance (the cumulative points obtained from all milestones) and the level of his/her contribution to the group.

CLASS POLICIES

1. Attendance and Participation for In-Class Students

Participation and in-class activity points cannot be made up if the student is absent.

The instructor will check attendance during the semester. Four lowest participation points including missing classes (i.e., zero points) will be ignored in calculating your final grade at the end of the semester. Because students are given a leeway of four missing classes, doctor's notes and other excuses are not accepted for absences. Missing one more additional class will lower your final grade by 1%. For example, if you miss 6 classes in the semester for whatever reason, your final grade will be lowered by 2%.

Attendance is a prerequisite, not a substitute for class participation. Students should be fully prepared for each class. The instructor will ask students questions in the class. Your participation points obtained will reflect the quality of your answers and your motivation for class participation.

In-class activities such as assignments, exercises, and unannounced quizzes should be submitted before the class session ends if not specified otherwise. Late submissions will not be accepted.

If a student misses more than three classes during the semester without valid or documented reasons, an electronic alert will be issued. **After five absences, the student will be dropped from the course.**

2. Participation for Distance Students

Distance students attend the class asynchronously. Each student needs to submit a reflection report each week to earn participation points. Discussion tasks will also be assigned to distance students regularly.

3. Readings

Reading materials will be assigned for corresponding sessions. Readings provide the basis for lecture and class discussions. Thus, corresponding materials **must** be read prior each class.

Check the course website for reading assignments.

4. Exams and Proctoring

There will be three exams. No make-up exam is allowed unless you ask in advance (and the instructor agrees) that a significant life event prevents you from attending the exam. For distance students, exams may be provided on a different date.

For in-person students, this class has a proctored exam requirement and may use S&T's Testing Center, requiring a student-paid fee. Visit https://testcenter.mst.edu/ for more information.

For online students, this class has a proctored exam requirement and may use an online proctoring service requiring a student-paid fee. Visit this page to review testing tools: https://online.missouri.edu/courses/proctored-exams.

5. Assignment Submission Policy

Instruction for assignments (homework, project, reflection, etc.) will be posted on the course's website. Each assignment must be submitted by the due time. The assignment must be submitted through the course website unless the instructor requests another channel. Students who fail to submit an assignment before the deadline will be given additional 24 hours to submit the assignment to the instructor for legitimate reasons (e.g., documented illness). Late submissions will receive a penalty of 40% of the points assigned to that specific assignment. No credit will be given for assignments submitted more than 24 hours after their original due time. It is your responsibility to make sure that you properly submit the correct files.

Students with missed assignment submissions will be dropped from the course.

6. Cell Phones

Cell phones must be turned off when in the in-person and distance classroom.

Boilerplate: Missouri S&T Campus and UM System Policies

Statement about Copyright, FERPA, and Use of Video

It is vitally important that our classroom environment promote the respectful exchange of ideas. This entails being sensitive to the views and beliefs expressed during discussions whether in class or online. Please obtain instructor permission before recording any class activity. It is a violation of University of Missouri policy to distribute such recordings without authorization and the permission of all who are recorded. More information is provided online.

Accessibility and Accommodations

It is the university's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please contact Student Accessibility and Testing at (573) 341-6655, email dss@mst.edu, or visit https://saat.mst.edu/ for information.

Student Honor Code and Academic Integrity

- All students are expected to follow the Honor Code.
- Student Academic Regulations describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism and sabotage, any of which will be reported to the Vice Provost for Undergraduate Education.
- Other resources for students regarding academic integrity can be found online.

Student Well-Being

Student Well-Being provides counseling services, health promotion initiatives, and prevention programs to empower the S&T community to thrive and enhance personal, academic, and professional success. Department office hours are Monday-Friday, 8 a.m. - 4:30 p.m. On the website, you can find information related to individual and group counseling, wellness consultations and trainings, resources for many health and wellness topics, and help for mental health crisis situations.

Health and Well-Being Canvas Course

The Health and Well-Being Canvas Course features trainings, presentations, and other health and well-being resources for students. One feature of the course is the Miner Well-Being Certification Program, a semester-long certification where participants can engage with campus-wide services and initiatives and develop skills that contribute to personal well-being and student success. Students can enroll in the free, non-credit course at any time.

Student Support and Community Standards knows student life can be difficult. During your time at Missouri S&T, you may have a friend or peer who needs help navigating their student experience, facing a challenge, or experiencing distress and could benefit from support and connection to resources. You are not alone. We have a dedicated team of Care Managers, numerous resources and services to support you or your student, friend, or peer. This includes emergency funding support for unexpected emergency expenses. To learn more visit or apply online.

Nondiscrimination, Equity, and Title IX

Missouri S&T is committed to the safety and well-being of our campus community, and to creating an environment free from discrimination and harassment.

The University does not discriminate on the basis of race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, and any other status protected by applicable state or federal law. As used in this policy, the word "sex" is also inclusive of the term "gender."

Additionally, US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Sexual harassment violations of this law include quid pro quo, hostile environment, sexual assault, dating/domestic violence, and stalking. The U.S. Department of Education has stated the prohibition on discrimination on the basis of sex includes sexual orientation and gender identity.

Students who are experiencing pregnancy or pregnancy-related conditions, including the birthing parent and non-birthing parent, have rights protected under Title IX. Students should contact the Office of Equity and Title IX to learn more about their rights and pregnancy-related assistance/accommodations provided by the University to ensure equitable access to University educational programs and activities.

In accordance with the University of Missouri's Collected Rules and Regulations, all faculty and staff are required to report any information concerning discrimination disclosed through communication including, but not limited to, direct conversation, email, social media, classroom papers and homework exercises to the Equity Officer/Title IX Coordinator.

Office of Equity and Title IX
Equity Officer and Title IX Coordinator: Dr. Paul Hirtz
Phone: (573) 341-7734
Location: 900 Innovation Drive, Suite 500
E-mail: equity@mst.edu

Classroom Egress Maps
For all in-person instruction, faculty should explain where the classroom emergency exits are located. Classroom egress maps are posted at http://designconstruction.mst.edu/floorplan/.

Writing Center

The Writing Center's mission is to assist **all students** in their efforts to become better writers, communicators, and critical thinkers. The Writing Center's peer consultants provide free individualized one-on-one and small-group conversations to offer meaningful feedback and guidance to students across all disciplines. More information can be found on their website and through email: writing@mst.edu.

Student Success Center

The Student Success Center (SSC) provides additional assistance for students academically and

helps bolster non-academic life skills. The SCC offers individualized tutoring, peer-to-peer life skill coaching, and campus programming while providing free coffee and hot beverages! All student Miners are encouraged to utilize the SSC's free services to get timely support and to enhance their S&T Miner Experience. Visit the SSC at 198 Toomey Hall, contact us at success@mst.edu, or join us on social media @sandtssc. To see the course offerings and times for SSC Tutoring, visit studentsuccess.mst.edu/tutoring/.

Student Veterans Resource Center

The Student Veterans Resource Center (SVRC) is the nexus of resources and support for student veterans at S&T. The SVRC's veteran resource consuls provide one-on-one consultations to guide students to various resources on campus. Visit the SVRC at Harris Hall Room G10, contact us at svrc@mst.edu.