Data Analytics and Machine Learning (MIS-637)

School of Business
Fall 2022

Instructor: Foad Mahdavi Pajouh, Ph.D.
Canvas Course Address: https://sit.instructure.com/courses/60326
Course Schedule: Thursdays, 6:30 pm – 9:00 pm
Contact Info: fmahdav1@stevens.edu
Virtual Office Hours: Wednesdays, 9:00 am – 12:00 pm (Appointments only via email)
Virtual session URL: N/A
Prerequisite(s): N/A
Corequisite(s): N/A
Cross-listed with: N/A

COURSE DESCRIPTION

Introduces the student to the concepts and techniques used by organizations to support their fundamental task of producing goods and services. This course includes a balanced view of the manufacture of tangible goods and the production of less-tangible services. Topics covered include product and process strategy, quality management, production planning for manufacturing and for service organizations, and inventory management. The course also includes an examination of the interactions of operations management, quantitative decision-making techniques, and information technology. Students use management science techniques and software to examine a wide variety of operations management problems.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to:
- Formulate the objectives of Knowledge Discovery using Data Analytics and Machine Learning algorithms and identify profound questions to be answered.
- Identify relevant data and corresponding databases, data warehouses, and data sources from which Knowledge can be extracted.
- Preprocess the data (Clean, Integrate, and Transform).
- Determine proper algorithms, discovery models, and technologies to use for Knowledge Discovery
- Execute and discover patterns and dependencies to make predictions

- Extract and apply Nuggets of knowledge to make intelligent scientific, business, and operations decisions.
- Present and document results
- Input the extracted knowledge to the next iterative step

COURSE FORMAT AND STRUCTURE

This course is on-campus. To access the course, please visit stevens.edu/canvas . For more information about course access or support, contact the Technology Resource and Assistance Center (TRAC) by calling 201-216-5500.

Course Logistics
- Course website:
  - o We use Canvas as the course website: https://sit.instructure.com/courses/60326
  - o It is your responsibility to acquire the username and password for logging into your account on Canvas. If you need help with Canvas access, please contact information Technology Support: https://www.stevens.edu/directory/information-technology/support
  - o All the course materials, announcements, and homework assignments will be posted on Canvas. Therefore, it is each student's responsibility to check the course website on Canvas regularly.
  - o In addition to course materials, announcements, and homework assignments, there are many other important resources on Canvas that you need for this course, including:
    - Solutions to assignments
    - Questions posted by the students and the answers (by other students or the instructor)
    - Virtual office hours
  - o You need to bring your own computer to class throughout the semester and use it during class hands-on practices. Your inability to bring your computer to class or submit your assignments from your computer is not an acceptable excuse.

Instructor's Online Hours

I will be available via email and respond as soon as possible (generally within 12 hours). For the online discussions, I will check in at least three times per week. Keep in mind that it is not possible for me to respond to every single posting every week (nor is it pedagogically appropriate), but I will be sure to respond to various postings and students each week and attempt to assure equality in terms of responses to students. When emailing me, please place in the subject line the course number/section and the topic of the email (i.e., XXX 240 – Assignment 2 Question). This will help me tremendously in locating your emails quicker when I scan the hundreds of emails that seem to make it into my box each day.

You are encouraged to post your questions on "Course Q&A Discussion" board under "Discussions" on Canvas. This way other classmates who might have the same question will benefit from your post. If you know how to answer a classmate's question, feel free to leave a reply. I will be checking this forum regularly and monitor the answers. Note: If you have something that you want to discuss privately with me, don't post it in this forum.

Virtual Office Hours
Wednesdays, 9:00 am – 12:00 pm (Appointments only via email)

TENTATIVE COURSE SCHEDULE

Class, Date	Topics (Chapters)
1. September 1	Course Overview
2. September 8	Introduction to Data Mining and Knowledge Discovery (Ch. 1)
3. September 15	Understanding and Preparing Data (Ch. 2)
4. September 22	Supervised Learning: k-Nearest Neighbor Algorithm (Ch. 6,7)
5. September 29	Supervised Learning: Decision Trees I (Ch. 8)
6. October 6	Supervised Learning: Decision Trees II (Ch. 8)
7. October 13	Supervised Learning: Neural Networks I (Ch. 9)
8. October 20	Conference travel (No Class)
9. October 27	Midterm exam 1
10. November 3	Supervised Learning: Neural Networks II (Ch. 9)
11. November 10	Supervised Learning: Neural Networks III (Ch. 9)
12. November 17	Project Review and Discussion
13. November 24	Thanksgiving Recess (No Class)
14. December 1	Unsupervised Learning: k-Mean Clustering Algorithm (Ch. 10)
15. December 8	Midterm Exam 2

COURSE MATERIALS

Textbook(s): (Required) *Discovering Knowledge in Data: An introduction to Data Mining*, Daniel T. Larose, Chantal D. Larose, John Wiley, 2014 (2nd Edition). ISBN: 978-1-118-87357-1

COURSE REQUIREMENTS

- Case reports and homework assignments:
    - There will be almost weekly homework assignments.
    - Students may consult in groups of two or three on individual homework assignments, however every student must write up his/her own assignments.
    - I expect that you put in a reasonable amount of effort. You really cannot learn the material without doing the homework.
    - Homework assignments will be graded based on your efforts to solve the problem.
    - Case reports are due in groups. The class should form groups and each group should submit a report for each case study.
    - All case reports and homework assignments should be submitted online through Canvas.
- Participation in class discussions: There will be class discussions from the materials discussed in the course or from the assigned readings. The students who initiate these discussions and participate in them can earn extra points.
- Case presentations: There will be case write-ups due during the semester. Each case write-up is due in groups. The class should form groups and these groups might present their write-ups.
- Midterm Exams: There are two midterm exams. These exams are closed books/notes and consists of multi-choice questions.
- Final Team Project: There is a practical final project that provides an opportunity to apply and demonstrate knowledge you acquired throughout the course.

- Peer Evaluations: These are required submissions with each team assignment and will be graded. These support collaboration and will be used to adjust grades based on individual contribution.
- Students are expected to read the assigned chapters from the textbook each week. It will help you in class discussions and will affect your participation in class discussions grade.
- Incompletes will be given rarely, and only in circumstances that are acute and could not have been foreseen.
- Make-up tests will be given only in very exceptional circumstances and must be arranged in advance. Test dates will not change except under unusual circumstances, and any such change will be announced at least a week in advance. It is the student's responsibility to know when and how the tests will be held.

TECHNOLOGY REQUIREMENTS

Baseline technical skills necessary for online courses
- Basic computer and web-browsing skills
- Navigating Canvas

Technology skills necessary for this specific course
- Live web conferencing using Zoom
- Recording a slide presentation with audio narration

Required Equipment
- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- You need to use your own computer in class and to do the homework assignments, it is your responsibility to have the necessary software properly installed on your computer.

Required Software
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

GRADING PROCEDURES

Grades will be based on:

Case reports and homework assignments	25%
Participation in class discussions	10%
Case presentations	15%
Midterm exam 1	20%
Midterm exam 2	20%
Final project	15%

Late Policy
Partial grades will be considered for late submissions when submitted no later than two days from the original due date.

Academic Integrity
Graduate Student Code of Academic Integrity
All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

LEARNING ACCOMODATIONS
Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/office-disability-services. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Disability Services Confidentiality Policy
Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY
Name and Pronoun Usage
As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement
Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all

races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES
Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments are can be made by phone (201-216-5177).

EMERGENCY INFORMATION
In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text "Home" to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.