Data Science for Engineers

ORI 360 / ME 379M   Spring 2020

Instructor: Dr. Ilyas Iyoob

Office: ETC 5.128A

Office Hours: By appointment on Skype (ID: iyoob_utexas)

Email: iyoob@utexas.edu

Classroom: ETC 4.150

Meeting Time: 11:00 – 12:30pm on Tuesdays and Thursdays

Prerequisites: Engineering Statistics (ME 335 or equivalent)
                      Computers and Programming (ME 205 or equivalent)

Text (optional): Getting Started with Data Science: Making Sense of Data with Analytics
                      (Murtaza Haider); The Field Guide to Data Science (Booz Allen Hamilton)

Tools: Python; pandas, scikit-learn, bokeh

Grading Policy

Attendance	5%
Assignments	20%
Exam – I	20%
Exam – II	20%
Final Project	35%

- The exams will consist of data analysis questions designed to test individual improvement on select skills, tasks, and the utilization of data-driven reasoning.
- Make-up exams will not be given.
- Students are encouraged to work together in their project groups in order to solve the tasks at hand.
- Each student is required to learn as well as comprehend the individual tasks of each group member while attaining an in-depth knowledge of their respective goals with the ability to apply this knowledge directly to industry.

Outline: This course provides students with the knowledge to analyze and interpret data sets using industry-standard methodology. Key skills include learning how to clean, visualize, and perform industry-specific analysis on large data sets. Using predictive analysis and machine learning, students will build models to make defensible connections in the data. Upon finishing this model, students will verify/validate their hypothesis and conclusions. The course culminates in the creation of an interactive dashboard presenting the given correlations. By "telling the story" of their journey through the data, students will relay the skills they learned to their peers.

Topics

Descriptive Data Science

- Exploratory data analysis
- Data validation and cross-validation

Predictive Data Science

- Decision trees
- Random forest
- Boosted trees
- K-means clustering
- Hierarchical clustering
- Outlier detection
- Logistic regression
- Naive bayes classification
- Support vector machines
- Neural networks
- Recommender systems

Prescriptive Data Science

- Mathematical optimization

Outcomes: Students will learn how to identify, formulate, and model complex systems using statistics and software tools learned in the course to achieve economic, social, and environmental goals. Using predictive analysis, students will build models and apply validation techniques. Projects will be done as teams and be presented in the form of a seminar to the class at the end of the course. This also meets requirements outlined by ABET program outcomes.

Additional Administrative Notes

- The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, http://www.utexas.edu/diversity/ddce/ssd/

- See http://www.utexas.edu/ogs/student_services/academic_policies/add_drop.html for the policy on adding and dropping a course.

- A Course-Instructor Survey will be administered near the end of the semester.

- Honor Code: The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community. See http://registrar.utexas.edu/archived/catalogs/gi09-10//ch01/

- Plagiarism is a serious offense and is cause for dismissal from the University. Please see http://deanofstudents.utexas.edu/sjs/scholdis_plagiarism.php and http://www.lib.utexas.edu/services/instruction/learningmodules/plagiarism/index.html

- By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.