FTA 4005– Introduction to Financial Data Analytics

Meeting Times/Location

Online

Contact Information

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Email: Please feel free to reach out to me at any time. You can expect a response within 24 hours during business hours.
Office Hours: TBD.

Email and Classroom Response Time:
Please contact me using **D2L Email** for all course related questions. I will check my D2L Email at least once a day, not including weekends or holidays. During the week, I generally respond to emails within 24 hours. Over the weekend (starting Friday at 4 p.m.) I will respond to emails the next following business day.

Description

This course provides the foundation for financial data analytics used in business and FinTech applications. The objective of this course is for students to gain experience in analyzing financial data using modern machine learning techniques, statistical methods, and prediction models. Students will develop computational skills to perform data analysis using a modern statistical programming environment, and apply these skills to address a range of problems encountered by business firms, including those in the FinTech industry. The topics discussed include an introduction to R language, visualization of financial data, cluster analysis, simple and multiple linear regression, classification models, high dimension data analysis using Lasso, tree regression, and model assessment and selection using cross validation. Students will have hands-on experience in the development of data analytics applications to analyze real world financial problems.

Credit Hours: 3
Prerequisites: None

Objectives

Students who complete this course successfully will be able to:

1. Develop data analytics models using computational programming techniques.
2. Apply the models to address questions arising in business and FinTech firms.
3. Perform model assessment and selection by comparing performance across models.
4. Analyze and interpret the results from the models and make business decisions

Materials/Textbooks

Textbook

- **An Introduction to Statistical Learning with Applications on R**, by Gareth James, Daniela Witten,Trevor Hastie, and Robert Tibshirani, Springer Texts in Statistics, URL: http://www-bcf.usc.edu/~gareth/ISL/
- **Introduction to R**, http://cran.r-project.org/doc/manuals/R-intro.pdf.

Course Website

iCollege : https://gastate.view.usg.edu/d2l/home/

- It's important to know how to use this learning management system for: following learning modules, submitting assignments, checking grades and feedback, downloading files, participating discussion boards, etc.
- Please check the course site regularly for important announcements and other issues.

Required Software/Hardware

- Code editor:
  - Visual Studio Code https://code.visualstudio.com (Recommended), or
  - Notepad++: http://notepad-plus-plus.org/
- Other software:
  - Software that can open and/or edit Word, PowerPoint, Excel, PDF, and ZIP files.

Evaluation

Weighted by Percentage:

Category	Weight
Assignment	30%
Quiz	40%
Final Exam	30%
Total	**100%**

Grade Conversion

A: (90-100), B: (80-89), C: (70-79), D: (60-69), F: (0-59)
*** Detailed grading criteria are available in D2L for how Discussions and Projects will be graded. ***

Class Attendance

This is an online-based class.
There will be weekly announcements and posts available in iCollege regarding what you need to cover on any given week. The syllabus also contains guidelines for each week. All students are responsible for any announcements or assignments in iCollege.

Exams

Final exam will be online. You have to take the exam under lock-down browser.
Your ability to construct models, analyze and interpret results, and perform R programs will

be tested in the exam. You are not allowed to collaborate with others, or take any outside help during taking the exam. You have to complete the exam before the submission date. There is a time limit on taking the exam and students are not permitted to make any changes after the time limit. No late submission is accepted. Only one attempt is allowed for the exam. If you miss the final exam, you'll be assigned a grade zero regardless of the reason for your inability to take the online exam within the permitted time frame.

Homework Assignments

Students will be assigned 4 homework assignments. The assignments pertain to the development of R programs related to topics discussed in the lectures and will involve analyzing financial data using various data analytics methods taught in class. The assignment submission due date will be provided with the assignment. No late submission is accepted and failure to submit the assignments on time will result a score of zero. For each assignment, each individual should submit the R codes and output of the program electronically in iCollege. For two of the assignments (2 and 3), students will take quiz in iCollege that will be related to the assignment solutions.

Note that homework are individually assigned. *You are not allowed to assist other student in providing explanations related to the conceptual development of models and/or providing clarifications related to the analysis or programs. Any student violating this policy will receive the appropriate University disciplinary action.*

Quiz

There will be several online quizzes. Quiz will be based on the topics covered in the class when the quiz is assigned. Students will take the quiz under lock down browser. You are not allowed to collaborate with others, or take any outside help during taking quiz. You have to complete the quiz before the submission date. There is a time limit on taking the quiz and students are not permitted to make any changes after the time limit. No late submission is accepted. Only one attempt is allowed for each quiz.

Data files:

Many of the assignments require downloading data from online financial websites. For other assignments data are provided at the GSU iCollege.

Course Outline

Below is an outline of the course content. Please refer to the D2L calendar for the due dates of assignments.

Week	Module	Deliverable
1	**Introduction to Data Analytics** • What is statistical learning? • Difference between prediction and inference • Parametric methods vs. Non-parametric methods. • Supervised versus unsupervised learning	
2	**Introduction to R** • Installation of R-Studio and Analytical Packages, • R Commands Functions • Objects, Scripts • Input – output Files	
3	**Working with the financial data in R:** • Simple manipulations; numbers and vectors, matrix, data frame, list, and objects • Logical statements • Working with functions	**QUIZ 1**
4	**Financial Data Visualization** Data Visualization • The Quantmod Package: downloading financial data directly from some open sources. • Time plots of financial data • Graphical representation of price and return series	**Homework 1**
5	Distributional Properties of Returns • Mean, Variance, Standard Deviation. • Histogram of daily simple returns • **Application:** Download daily prices of sample stocks from	•

	Yahoo for a sample period. Analyze and graphically represent the stock return series.	
6	**Linear Regression Part 1: Simple Regression** • Simple Linear Regression: Hypothesis testing, Estimating the coefficients, assessing the accuracy of the model	•
7	**Application:** The Marketing Plan: Predicting future sales. •	**QUIZ 2**
8	**Linear Regression Part 2: Multiple Regression** • Estimating the coefficients, assessing the accuracy of the model, qualitative predictors • **Application:** The Marketing Plan: Predicting future sales.	•
9	**Linear Regression Part 3: Multiple Regression** • Multiple Linear Regression: Deciding on important variables, model fit and predictions • Potential problems: non-linearity of the data, outliers, collinearity, and correlation of error terms. • **Application:** Analyze credit card balance based on customer history and attributes	**Homework 2 and QUIZ 2B**
10	**Classification Models** • An Overview of Classification models. • Logistic Regression • Model Accuracy **Application:** Fit a logistic regression model to predict default on credit card payment.	**QUIZ 3**
11	**Classification Models** • Model Accuracy • Model Fit and Testing: Training vs. Test Data **Application:** Fit a logistic regression model to predict market direction (up or down) using lag return data.	• **Homework 3 and QUIZ 3B**
12	• **Models for High Dimension Data** • Shrinkage methods – LASSO • **Application:** Predict a baseball player's salary on the basis of various statistics associated with performance in the previous year	
13	**Model Assessment and Selection** • Cross validation • Validation Set Approach • Leave-one-out Cross Validation • K-fold Cross Validation	
14	**Application:** Predict stock return using LASSO method	**Homework 4**
15	**Final Exam: online available 10:00 am – 10:00 pm (duration 2.5 hours once you start the exam)**	

Course Policies

Announcement

Important announcements will be made to the class electronically through the D2L Announcements tool. It is important that you check your D2L account regularly for announcements, assignments, and course updates.

Assignments, Quizzes, & Exams Policy

- All assignments MUST be submitted through D2L by the deadline. Email submissions are **NOT** accepted. Any assignment that is less than 24 hours late is subject to 10% penalty. Any assignment that is more than 24 hours late will **NOT** be accepted.
- All quizzes and/or exams MUST be completed on D2L website by the deadline. The quizzes and/or exams can't be opened/submitted after the deadline.
- If you must miss an exam due to illness, you must e-mail or call the instructor before the scheduled time. Failure to notify the instructor prior the scheduled time will produce an automatic zero for the exam. NO makeup test except for emergencies with proof (e.g. doctor's slip).

Discussions

People learn through interactions, to facilitate interactive learning this course will use the Discussions feature in D2L. Discussions will take place in an **asynchronous** manner.

Grading

Grades will be posted in D2L, generally within one week from the due date or submission date whichever is later. Significant assignments such as projects may take longer to grade. If you think there is an error, please make a re-grading request by e-mail within one week of grade posting. A request for reassessment will not be granted if more than two weeks have passed since the grade in question was posted. Please check your grades in D2L regularly.

No "extra credit" work will be given to improve one's grade. Copies of your class work and test will be kept for record.

Assignment Submission Guidelines

All work turned in for this class must meet the submission guidelines presented in the Start Here module. Work that does not meet the submission criteria will not be graded. Scoring rubric will be provided for each assignment.

Attendance

Attendance in classes, laboratories and lectures is important. All students are expected to attend these activities in accordance with their schedule of courses. The instructor determines the attendance policy for each course. All instructors will provide the students, at the beginning of each semester, a clear statement regarding their policies in handling absences. Instructors will also be responsible for advising their students regarding the academic consequences of absences. To view the complete student attendance policy, please visit http://catalog.kennesaw.edu/content.php?catoid=38&navoid=3019#attendancepolicy**.**

Enrollment Status Statement - Students are solely responsible for managing their enrollment status in a course; nonattendance does not constitute a withdrawal.

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies

Information contained in the links below constitutes the Federal, BOR, and KSU course syllabus policies and procedures. These policies are updated on the Academic Affairs Website annually.

Academic Affairs - Federal, BOR, & KSU Policies
(http://curriculum.kennesaw.edu/resources/federal_bor_ksu_student_policies.php)

Academic Affairs - KSU Student Resources
(http://curriculum.kennesaw.edu/resources/ksu_student_resources_for_course_syllabus.php)

Academic Integrity Statement

Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section 5c of the Student Code of Conduct addresses the university's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement. See also KSU Student Code of Conduct (https://web.kennesaw.edu/scai/content/ksu student-code-conduct).

Confidentiality and Privacy Statement (FERPA)

Kennesaw State University adheres to the Family Educational Rights & Privacy Act of 1974 – FERPA. See the following link for more information:
http://www.usg.edu/information_technology_handbook/section9/tech/9.5_privacy_and_security

University – Student Rights & Responsibilities

Students of Kennesaw State University are entitled to an environment that is conducive to learning and individual growth. To this end, students enrolling at Kennesaw State University assume a responsibility to abide by the policies and regulations expressed in this section. By doing so, students may fulfill their responsibilities and enjoy the exercise of their own rights while also respecting the rights of others.
See http://catalog.kennesaw.edu/content.php?catoid=27&navoid=2263

Ethics Statement

All students are responsible for knowing the information, policies and procedures outlined in the Kennesaw State University Codes of Conduct. The KSU Codes of Conduct include: the general Student Code of Conduct, the Residential Code of Conduct, and the Code of Academic Integrity. Kennesaw State University reserves the right to make changes to this code as necessary and once those changes are posted online, they are in effect. Students are encouraged to check online for the updated versions of all policies.
See https://scai.kennesaw.edu/codes.php

Sexual Misconduct Policy

Kennesaw State University is committed to providing programs, activities, and educational environment free from all forms of sex discrimination. For more information click here. KSU issues this statement of policy to inform the community of the University's comprehensive plan addressing sexual misconduct, educational programs, and procedures that address sexual assault, domestic violence, dating violence, and stalking, whether the incident occurs on or off campus. This policy generally covers faculty, students, and

staff of the University, as well as third-parties. Third parties include but are not limited to guests, vendors, contractors, retirees, and alumni.
Further information associated with this university policy can be found under sexual misconduct on the Policy Portal website located at: https://policy.kennesaw.edu/

Course Accessibility Statement (ADA statement)

Kennesaw State University provides program accessibility and reasonable accommodations for persons defined as disabled under Section 504 of the Rehabilitation Act of 1973 or the Americans with Disabilities Act of 1990 as amended. Students who require accommodation in facilities, services, programs or activities should contact the Assistant Director for Disabled Student Services to arrange an individual assistance plan. Accommodations may include classroom accessibility, modified computer equipment, disability-accessible parking, assistance with note-taking sign language interpreting or captioning services, class materials in alternate format, library and laboratory assistance, and other accommodations. Determination of appropriate accommodations to be provided will be based upon documentation of the disability. Members of the public who require specific accommodations in facilities, services, programs or activities should contact the office sponsoring the service, program or activity at least five days in advance to arrange individual accommodations. Eligible students deliver certification letters to faculty at the beginning of each semester identifying the accommodations approved for that student. Faculty members are also instructed that they must provide students with special needs appropriate accommodations in a timely manner. The Assistant Director for disAbled Student Support Services will work with faculty members to ensure that students receive appropriate accommodations. A student should notify Disabled Student Support Services in writing within two (2) days of any disagreement between the student and the faculty member if agreed upon academic adjustments are not provided in order to seek a resolution. A student who alleges discrimination on the basis of disability may file a grievance through the University's established grievance procedures. The following have been designated by the President of the University to provide assistance and ensure compliance with the ADA. Should a student require assistance or have further questions about the ADA, please contact either the ADA Compliance Officer for Students at 770-423-6443; the ADA Compliance Officer for Facilities at 470-578-6224; or the Director of Human Resources, ADA Compliance Officer for staff and faculty at 470-578-6030. For more information, go to kennesaw.edu/stu_dev/dsss.

Electronic Communication

The University provides all KSU students with an "official" email account with the address "students.kennesaw.edu" or "kennesaw.view.usg.edu" (in D2L). As a result of federal laws protecting educational information and other data, this is the sole email account you should use to communicate with your instructor or other University officials.

Web Accessibility

Kennesaw State University follows the guidelines of the Universal Design for Learning standard of web accessibility. Faculty use Word, PDF, and HTML formats when communicating electronic information to students whenever possible and appropriate in light of the goals of the course. Faculty are trained to use Web Accessibility Evaluation tools, e.g., WAVE (www.wave.webaim.org), and make adjustments as possible and appropriate in light of the goals of the course.

For free resources available to students on web accessibility, please visit the Web Accessibility Resources page at the Distance Learning Center: http://www.kennesaw.edu/dlc/facultyresources/index.php#

Copyright Law

Kennesaw State University adheres to USG's policy to respect the right of copyright. Holders and comply with copyright laws as set forth in the United States Copyright act. For more information, see the following link to USG's policy: http://www.usg.edu/copyright/

Electronic Recording and Social Media

Electronic recording performed without the consent of the people being recorded chills the free exchange of ideas. Academic freedom, free inquiry, and freedom of expression should not be limited by the fear that one's brainstorming, polemic discourse, speculative inquiry, or any other kind of expressed curiosity made within the space of a university classroom will be made public without one's consent. This fear is unacceptable regardless of whether one is in an online, hybrid, or face-to-face classroom setting. Accordingly, no person shall make public any electronically recorded class discussion without the written permission of the instructor. This policy is not intended to discourage electronic recording in the classroom or the use of social media when such actions are performed with the written consent of the instructor, and others as appropriate. Note: Faculty accommodate all reasonable requests to electronically record a class discussion; these requests must be documented by the Disabled Student Support Services available at: http://www.kennesaw.edu/stu_dev/dsss/prospect.shtml

Additional Items

Minimum Technology Requirements

- This class uses D2L as hosting site. Run a system check to ensure your computer work with D2L. Check out UITS D2L training: http://uits.kennesaw.edu/support/d2ltraining.php
- Internet Connection. A high-speed Internet connection such as DSL or cable Internet access is highly recommended. You can also computer labs on campus to complete the coursework.

Minimum Technical Skills Required

Students entering this course are expected to have following technical skills:

- General computer literacy. Students should be proficient with the basic functions of standard software packages (e.g., MS Word, Excel, PowerPoint, and Adobe Reader) and standard players (e.g., QuickTime, Windows Media Player). A list of primers on many of these technologies is available at https://apps.kennesaw.edu/portal/prod/app_uni_cdoc_publ/documents/
- A working knowledge of the D2L learning management system is required for participation in online courses.

Important Dates

- First Day of Classes:
- Breaks / Holidays:
- Last Day to Withdraw:
- Proctored Exam:
- Last Day of Classes:
- Graduation: