RUTGERS
Rutgers Business School
Newark and New Brunswick

Business Analytics and Information Technology
Course Number: 33:136:487
Course Title: Large-Scale Business Data Analysis

COURSE DESCRIPTION

This course introduces students to fundamental statistical techniques for analyzing large-scale business data. The main goal is to provide systematic training in statistical models for massive datasets as well as programming and exploratory data analysis in real-world settings. The course equips students to develop context-sensitive models and perform model checking and diagnosis. For each topic, the course covers enough theoretical background so students can understand how to apply and interpret each class of models, and then illustrates how it's used via hands-on exploratory analysis using R.

Below is a list of topics to be covered. Topics with a star (*) will be covered if there is enough time.

Topic 1: Review of Probability, basic Bayes classification, and regression; Introduction to R

Topic 2: Overview of simple classification methods: Naive Bayes method and k-Nearest Neighbor

Topic 3: Controlling model complexity and Bias-Variance Tradeoff

Topic 4: Classification by trees

Topic 5: Maximum Likelihood (ML) and Maximum a Posteriori (MAP)

Topic 6: Review of Linear Regression

Topic 7: Classification with logistic regression

Topic 8: Nonparametric regression and classification

Topic 9: Neural networks and deep learning (*)

Topic 10: Unsupervised learning and clustering (*)

COURSE MATERIALS

Textbooks:

– G. James, D. Witten, T. Hastie and R. Tibshirani "An Introduction to Statistical
   Learning with Applications in R", Springer 2015

– N. Matloff "The Art of R Programming", No Starch Press, 2011 - I will also post
  extra course notes on Canvas - **Software:** R.

I will use Canvas (https://canvas.rutgers.edu) to manage all aspects of the course including posting
course material and grades, assigning homework, and sending important announcements. The system
is linked to your official Rutgers email address. **It is your responsibility to check regularly emails
that go to this address.**

LEARNING GOALS AND OBJECTIVES

1. To approach problems data-analytically: to think carefully and systematically about whether and how
   data can improve performance;
2. To be able to interact competently on the topic of data mining analytics: to know the basics of data
   mining processes, techniques, and concepts; and
3. To receive hands-on experience mining data. Throughout the curriculum, special emphasis is placed on
   techniques that are relevant to large volumes of data.

PREREQUISITES

- Knowledge of basic statistics as taught in 136:385 course. You especially need to be up to date on
  regression.

- Knowledge of some programming language. We will use the R as our main programming platform, but
  if you don't know R, it will be easy to learn it if you already know some programming language.

ACADEMIC INTEGRITY
I do NOT *tolerate cheating*. Students are responsible for understanding the RU Academic Integrity Policy

(http://academicintegrity.rutgers.edu/).

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments,
students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given
any unauthorized assistance on this examination or assignment." I will screen all written assignments
through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large
database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See
business.rutgers.edu/ai for more details.

ATTENDANCE AND PREPARATION POLICY

- Class attendance is essential for your success in this course. Therefore, I will take attendance each class,
  and attendance will have some effect on your final course grade. My goal is to discourage poor

attendance, not to reward perfect attendance, therefore your grade will be affected negatively if your attendance is poor.

- **How it works:** If you miss five classes or less, your final grade will not be affected. If you miss six classes or more, I will subtract an amount (to be decided later) per missed class (beyond the five allowed) from your final course grade.
- **It is not necessary to inform me if you will be missing a class unless you are missing an exam**.
- **An absence is always counted as absence even if it is because of illness, job interviews, family emergencies, etc. The five absences are meant to cover these kind of "excused" situations.**
- Exceptional situations in which you have to be absent for a long period of time, e.g. long medical conditions or surgeries, will be treated separately on a case-by-case basis.
- If you miss an exam due to illness, please contact me to see whether any accommodation is possible. Severe illness or personal emergency is typically the only reason I make accommodations, and there must be written, verifiable documentation. Otherwise, you will receive a zero score on the missed exam.
- Severe weather and other cancellations: Your primary source of information for whether the campus is open. I will also send an announcement as soon as possible if classes are cancelled.

ASSIGNMENTS

- I am planning to give 5 to 6 homework assignments.
- Assignments policies will be announced when the assignment is posted.
- All assignments will be submitted via Canvas. I will not accept assignments sent by email. - Due to the logistics of tracking large number of students, there is no credit for late assignments.

CLASSROOM CONDUCT

- Behaviors that interfere with the learning process of the class will not be tolerated, especially side conversations.
- All cellphones should be in silence mode.

EXAMS

First midterm:
Final Exam: Please check http://finalexams.rutgers.edu.

- The topics covered and the exam format, as well as other policies, will be announced on Canvas in advance.
- See above in "Attendance" the policy on missing an exam.
- If I detect any violation of exam policies, I will prosecute them as a violation of the university academic integrity policy. Students are responsible for understanding the RU Academic Integrity Policy:

http://academicintegrity.rutgers.edu. I will strongly enforce this Policy and pursue all violations. Also, check business.rutgers.edu/ai.

GRADING POLICY

- Your course grade will be based on an aggregate score:
  - 30% Homework average score
  - 35% Midterm
  - 35% Final exam

- I reserve the right to make changes to the above grade calculation schemes.
- Students with particularly poor attendance or performance after the midterm will be issued warning grades.
- If you miss six or more classes, some points will be deducted from your final grade (See class attendance above).
- I assign letter grades based on your overall aggregate score. I do not use fixed cutoff values, but instead use my judgment to select cutoffs that make sense for each particular course. The cutoffs will never be higher than the "regular" cutoffs, that is, an "A" will never start above 90, and so on.
- I do not offer extra credit work to improve grades after they have been issued. Such a policy is not fair to other students: If I were to offer extra credit to a student, I would have to do so to every student whose grade was below "A".
- All grades will be communicated on Canvas. No grade related information will be provided by email. All grade related information will be provided in person via appointments. It is expected that you are respectful when you review your grade with me and accept the grade you have earned. Please do not use abusive language in email or in person. Any instances of that will be reported according to university guidelines.
- Your final grade is not subject to negotiation. If you believe I have made an error, submit your written argument within one week of the date when grades were posted clarifying precisely the error I made. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I will not adjust grades based on lost scholarships, lost tuition reimbursement, lost job opportunities, etc. Please do not ask me to do so. It is dishonest to attempt to influence faculty in an effort to obtain a grade that you did not earn, and it will not work.

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at ods.rutgers.edu.

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email dsoffice@echo.rutgers.edu]

[Rutgers University-Newark ODS phone (973)353-5375 or email ods@newark.rutgers.edu]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email jackie.moran@rutgers.edu]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email TitleIX@newark.rutgers.edu]

If you seek *religious accommodations*, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email deanofstudents@echo.rutgers.edu]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email DeanofStudents@newark.rutgers.edu]

If you have experienced any form of *gender or sex-based discrimination or harassment*, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at http://vpva.rutgers.edu/.

[Rutgers University-New Brunswick incident report link: http://studentconduct.rutgers.edu/concern/. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link: https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7 . You may also contact the Office of Title IX and ADA Compliance at (973)353-1906 or email at TitleIX@newark.rutgers.edu. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email run.vpva@rutgers.edu]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via https://temporaryconditions.rutgers.edu .

If you are a military *veteran* or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. http://veterans.rutgers.edu/

If you are in need of *mental health* services, please use our readily available services.

[Rutgers University-Newark Counseling Center: http://counseling.newark.rutgers.edu/]

[Rutgers Counseling and Psychological Services–New Brunswick: http://rhscaps.rutgers.edu/]

If you are in need of *physical health* services, please use our readily available services.

[Rutgers Health Services – Newark: http://health.newark.rutgers.edu/]

[Rutgers Health Services – New Brunswick: http://health.rutgers.edu/]

If you are in need of *legal* services, please use our readily available services: http://rusls.rutgers.edu/

Students experiencing difficulty in courses due to *English as a second language (ESL)* should contact the Program in American Language Studies for supports.

[Rutgers–Newark: PALS@newark.rutgers.edu]

[Rutgers–New Brunswick: eslpals@english.rutgers.edu]

If you are in need of additional *academic assistance*, please use our readily available services.

[Rutgers University-Newark Learning Center: http://www.ncas.rutgers.edu/rlc

[Rutgers University-Newark Writing Center: http://www.ncas.rutgers.edu/writingcenter]

[Rutgers University-New Brunswick Learning Center: https://rlc.rutgers.edu/]

[Optional items that many faculty include:

 - Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

 - Students must sign, date, and return a statement declaring that they understand this syllabus.]