

# Course Syllabus

Course Syllabus

**Advanced Business Analytics (95-866 Z2, Fall 2024)**

Instructor

Ronald Stone

Contact: [rs6c@cmu.edu](mailto:rs6c@cmu.edu)

Course Description:

In this course, we will be studying useful probability/statistical models that can be applied in business practice to perform consumer behavior analysis. In particular, we will focus on two key aspects of user (or product) behavior: timing process and counting process. The former will focus on the timing of a user doing something (when will a user churn from a firm, when will a product drop out of bestseller list, when will a user adopt a new product, and so on). The latter will focus on how many items are purchased or how many users are adopting and so on. Time permitting, we will also introduce choice process (out of a number of choices, which product is chosen). We will also examine issues of sales concentration and models of long tail using these processes.

With each lecture, we will be using real world datasets to apply the learning in lectures to a practical problem facing a manager. Students will store datasets and retrieve the relevant information before any analysis can be performed.

By the end of course, students are expected to be able to

1. identify the appropriate mathematical model for the consumer behavior under study (survival model, count model, etc.)
2. build the model of consumer behavior,
3. apply the model to data to test the accuracy and perform necessary tweaks, and
4. based on the model constructed, predict outcome change in response to firm strategy

**Textbook:** No required textbook for this course. Lecture slides and reading materials will be posted along the line.

**Course Website:** We will be using Canvas to post lecture videos, slides, reading materials, assignments, and grades. Please check the update on Canvas periodically.

Lecture Format:

We will be using a flipped class model for this class.

**Part I:** First, we will post lecturer videos and slides beforehand. Lecture videos are usually uploaded by the end of Sundays and Wednesdays. Video links will be posted under each lecture module.

You will need your Andrew ID and Password to log onto the system to watch the videos. Along with each video, I will also provide a short documentation to help you better catch the key points of the lecture. You are required to watch the lecture videos before each recitation.

**Part II:** I will conduct weekly recitations to review the important points covered in the lecture videos, go through practice problems, and answer your questions. The focus will be on the application. It is required that you watch the lecture videos and read the lecture slides beforehand. I highly encourage you to send any of your questions/suggestions before the recitation so that I can tailor the recitation better to your needs. Attendance and participation of recitation are highly encouraged.

**Software:** We will rely mostly on the Python programming language with the Numpy and Pandas packages for model estimation in this course. The analyses will be performed in Jupyter notebooks.

**Prerequisites:** Basic probability and statistics. (Familiarity with joint probabilities and Bayes Rule is beneficial.) Knowledges of regression analysis (especially maximum likelihood estimation) is preferred, but not required. Familiarity with Jupyter notebooks and Python (including the Numpy and Pandas packages).

Course Outline:

- Basic regressions model and beyond . . . . . Week 1-2
- Modeling “timing” or “when” decision . . . . . Week 3-4
- Modeling “how many” decision . . . . . Week 5-6
- Modeling “choice” decision . . . . . Week 7-8

**Grading:** Grades will be based entirely on three deliverables:

1. Homework - 45 points
2. Quizzes - 10 points

### 3. Final exam - 45 points

Homework- We will have three assignments in total. Each assignment will carry the same weight. A lot of the problem solving will be performed in Jupyter notebooks using Python. You are required to submit your answer along with your Jupyter notebooks for your homework. You will be graded based on the accuracy of your answer and completeness of your steps.

Quizzes- We will have three quizzes in total. Quizzes will usually be conducted during the weekend. You can choose your time to finish the quiz, and the quiz will be timed once you start. Quiz will be posted on Canvas. All your quizzes will be graded, but only highest two will be counted towards your final grade.

Final Exam- More details of the exams will be announced later.

The instructor will apply a curve when deciding on the final assignment of letter grades based on the numeric grades, in order to meet Heinz College standards for mean student GPA in advanced/concentration courses.

**Late Homework:** Each student has 48 hours total of leeway in late homework submission. You may choose to allocate them as you wish among the three homework assignments. Once the 48 hours are used up, no late assignments will further be accepted.

**Regrading Policy:** If there is any question regarding the grading of homework, please contact the instructor within **seven** days after receiving your grades and comments. Since I will be posting solution to the homework, you are expected to compare the solution with your own write-up before sending the request.

**Academic Integrity:** Group study is encouraged. However, the homework assignments MUST entirely be your own work. The derivations, estimation results, and descriptions cannot be copied from another person or from any other source. Submissions where these details are identical or nearly identical, either among peers or with another source, will be regarded as cheating. The minimum sanction for copying or other forms of cheating on a homework assignment is the loss of credit equal to two assignments, and sanctions may range up to the termination of your enrollment at CMU. All suspected incidents will be recorded with Heinz College administration at the same time the student is notified.

**Accommodations:** Carnegie Mellon University is dedicated to providing accessible resources for all students. The Office of Disability Resources website may be found via the following link: [Carnegie Mellon Office of Disability Resources](https://www.cmu.edu/disability-resources/index.html)[Links to an external site.](https://www.cmu.edu/disability-resources/index.html) (https://www.cmu.edu/disability-resources/index.html)

**Statement of Support for Students' Health & Well-being:** Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit [http://www.cmu.edu/counseling/Links to an external site.](http://www.cmu.edu/counseling/Links%20to%20an%20external%20site) Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

*If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:*

CaPS: 412-268-2922

Re:solve Crisis Network: 888-796-8226

*If the situation is life threatening, call the police*

On campus: CMU Police: 412-268-2323

Off campus: 911

**Diversity: We must treat every individual with respect.** We are diverse in many ways, and this diversity is fundamental to building and maintaining an equitable and inclusive campus community. Diversity can refer to multiple ways that we identify ourselves, including but not limited to race, color, national origin, language, sex, disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Each of these diverse identities, along with many others not mentioned here, shape the perspectives our students, faculty, and staff bring to our campus. We, at CMU, will work to promote diversity, equity and inclusion not only because diversity fuels excellence and innovation, but because we want to pursue justice. We acknowledge our imperfections while we also fully commit to the work, inside and outside of our classrooms, of building and sustaining a campus community that increasingly embraces these core values.

Each of us is responsible for creating a safer, more inclusive environment.

Unfortunately, incidents of bias or discrimination do occur, whether intentional or unintentional. They contribute to creating an unwelcoming environment for individuals and groups at the university. Therefore, the university encourages anyone who experiences or observes unfair or hostile treatment on the basis of identity to speak out for justice and support, within the moment of the incident or after the incident has passed. Anyone can share these experiences using the following resources:

- **Center for Student Diversity and Inclusion:** [csdi@andrew.cmu.edu](mailto:csdi@andrew.cmu.edu), (412) 268-2150
- **Report-It (Links to an external site.) online anonymous reporting platform:** [reportit.net \(Links to an external site.\)](http://reportit.net) username: *tartans* password: *plaid*

All reports will be documented and deliberated to determine if there should be any following actions. Regardless of incident type, the university will use all shared experiences to transform our campus climate to be more equitable and just.