

425 Course Syllabus

Course Syllabus: SI 425 - Introduction to User Modeling

Instructor: Tanya Rosenblat

GSI: Zhewei Song (zheweis@umich.edu)

Meets: Tue and Thu 10:30am - 12:00pm, 1060 Biological Sciences Building

Office Hours: Thu 1-2pm, 4322 North Quad, or by appointment

GSI Office hours: Tuesdays 3-5pm, 1274 North Quad, or by appointment

(Note: in the week of 12/3, Zhewei will have his office hours on 12/3 (Monday) 5-7pm in 1274 NQ, because 1274 NQ will be used for exams on Tuesday.)

Course Overview:

This course provides an integrated overview of techniques to model user behavior from economic theory, behavioral economics and computer science. We start the class with a “micro perspective” on how individual consumers makes choices.

1. Basic concepts such as *consumer preferences* and the rational model of *consumer demand* provide us with a concise framework of how rational individuals with limited resources choose among a set of alternatives. Firms use pricing and other strategies to *price discriminate* between different customer segments. For many products such as communication products there are strong *network effects* which requires us to look at consumer expectations of how other consumers behave.
2. We then delve into a number of topics where we augment the basic framework with insights from psychology and behavioral economics.
3. *Behavioral economists* and *psychologists* have looked at deviations from the rational model in certain circumstances. For example, consumers sometimes are less likely to make purchases if products are added to the choice set (choice overload) or they select a more expensive alternative on a website if a seemingly inferior product is added to the choice set (context effects).
4. We discuss how consumers search for products and how firms advertise their products.
5. We discuss how firms can convince customers to pay for their services (Freemium etc.).

In the second part of the course, we adopt a “macro perspective” and try to infer preferences from the decisions of millions of consumers (which can inform firms, for example, on how to adequately price products). The spread of e-commerce has made “big data” sets available to analysts. We introduce “big data” techniques from economics and machine learning (we will use R for a number of assignments).

1. Measuring the demand for products and in particular identifying the impact of prices on consumer choice is empirically challenging because prices are *endogenous*.
2. Machine learning techniques such as Lasso can condense high-dimensional choice data into a smaller set of relevant right-hand side variables in a regression analysis.
3. *Recommender systems* can learn from a consumer’s previous choices as well as the choices of other consumers by applying *collaborative filtering*. Intuitively, if two consumers like movie A but not movie B and the first consumer also likes movie C then it can be useful to recommend movie C also to the second consumer. Recommender systems are widely used by Amazon and other online retailers.

The course has a midterm and a final and the assignments are a mixture between traditional problem sets and *case studies* on the challenges faced by particular companies and their customers. You will form groups to complete these case-study assignments and for every assignment one of the groups will be asked to present.

Learning Objectives: The course is intended to give students an integrated overview of techniques to model user behavior from economics, psychology and CS. The rational model of consumer choice is concise and provides a useful benchmark. Behavioral economics discusses under which conditions the rational model holds. Finally, students will learn basic “big data” techniques to infer preferences from high-dimensional choice data..

Prerequisite: SI 301 and at least one undergraduate statistics class at the level of Stats 250.

Course Format: This course is presented in a lecture/discussion format. This is a quantitative course which tries to present the basic concepts as intuitively as possible. The course is designed to be accessible to all students who enjoy combining conceptual thinking and practical understanding. The course combines analytical (lectures), experiential (exercises), interactive (discussion), peer (group assignments) and individual (textbook reading and papers) learning.

Assignments and Grading: There will be weekly problem sets, two exams (midterm and final) and at least one group presentation.

Your final grade will consist of five weighted components:

Course Participation and Attendance	15%
Assignments	20%
Group Presentation	15%
Exam 1 (October 18)	25%
Exam 2 (December 11)	25%

Giving and Receiving Assistance: The first time you learn technical material it is often challenging. We are going to cover a wide range of topics in the course and we will move quickly between topics. Because it is my goal for you to succeed in the course, I encourage you to get help from anyone you like. You are encouraged to collaborate but you should attempt to solve the problem sets first by yourself before discussing them in a group. This will ensure that you are well prepared for the exams. You also have to hand in your own solutions for each assignment. You are responsible for learning the material, and you should make sure that all of the assistance you are getting is focused on gaining knowledge, not just on getting through the assignments. If you receive assistance on an assignment, please indicate the nature and the amount of assistance you received. If you are a more advanced student and are willing to help other students, please feel free to do so. Just remember that your goal is to help teach the material to the student receiving the help. It is always appropriate to ask for and provide help on an assignment via the course-wide mailing list. It is never appropriate to hand in someone

else's work and represent it as your own. The safest approach is to clearly acknowledge the sources and nature where someone has helped you create your work in a significant way.

Plagiarism: At the University of Michigan and in professional settings generally, plagiarism is an extremely serious matter. All individual written submissions must be your own, original work, written entirely in your own words. You may incorporate excerpts from publications by other authors, but they must be clearly marked as quotations and properly attributed. You may obtain copy editing assistance, and you may discuss your ideas with others, but all substantive writing and ideas must be your own or else be explicitly attributed to another, using a citation sufficiently detailed for someone else to easily locate your source.

All cases of plagiarism will be officially reported and dealt with according to the policy based on your enrollment/major. There will be no warnings, no second chances, no opportunity to rewrite; all plagiarism cases will be immediately reported as described by the policy. For LSA Undergraduates, the following web site describes the policy:

<http://www.lsa.umich.edu/academicintegrity/> ([Links to an external site.](#)). ([Links to an external site.](#))[Links to an external site.](#)

Consequences can range from failing the assignment (a grade of zero) or failing the course to expulsion from the University. If you have any doubts about whether you are using the words or ideas of others appropriately, please discuss them with the instructional staff of the course.

Course Mailing List: Much of the communication for the course will be done via email. Students are expected to read the email that comes to them from the course. The mailing list is also a place to get help in the class. It is completely acceptable for a student in the course to attempt to help another student over the mailing list. The Instructor will read all mail and correct any incorrect advice that one student gives another. All students have permission to post to the class-wide mailing list.

Disabilities statement: It is University of Michigan policy to help students with disabilities. If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of the course, the assignments, the in-class activities, and the way we teach may be modified to facilitate your participation and progress. As soon as you make me aware of your needs by handing in the recommendation from your consultation with the Office of Services for Students with Disabilities (SSD), we can determine appropriate accommodations. If you do not hand in this form, I cannot make accommodations for you. SSD (734-763-3000; <http://www.umich.edu/sswd/>) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. I will treat any information you provide as private and confidential.

Rules about Collaboration: You are encouraged to collaborate but you should solve the problem sets first by yourself before discussing them in a group. This will ensure that you are well prepared for the exams. You also have to hand in your own solutions to each assignment.

Readings: You are required to purchase the coursepack with the case studies from Harvard Business Publishing. Please use the following link to receive the educational discount:

<https://hbsp.harvard.edu/import/566380> (Links to an external site.)Links to an external site.

Instructions on how to setup an account are here: <https://hbpacademichelppcenter.zendesk.com/hc/en-us/articles/360001262588-Students-Accessing-Course-Material-a-Coursepack-Assigned-to-You> (Links to an external site.)Links to an external site.

The following textbooks are optional and helpful for parts of the course:

[Principles of Economics](#) (Links to an external site.) (Links to an external site.)Links to an external site., by Greg Mankiw

[Thinking, Fast and Slow](#) (Links to an external site.) (Links to an external site.)Links to an external site., by Daniel Kahnemann

[Recommender Systems: An Introduction](#) (Links to an external site.) (Links to an external site.)Links to an external site., by Dietmar Jannach, Markus Zanker, Alexander Felfernig and Gerhard Friedrich

[Mostly Harmless Econometrics](#) (Links to an external site.) (Links to an external site.)Links to an external site., by Josh Angrist and Jorn-Steffen Pischke

Tentative Schedule (**This schedule will be updated throughout the semester, so please check it regularly for updates.**)

Introduction

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History of Uber:

[Uber: Revolutionary but Controversial - \(The Story of Uber\)](#) (Links to an external

Week 1
9/4-9/6



[site.\)Links to an external site.](#)

Case Study - Uber: Changing the Way the World Moves

Consumer preferences; consumer demand

Consumer Theory

Assignment 1 (due Thu. Sept. 13 in class)

Basics: Consumer Demand, Price Discrimination and Network Effects

Consumer Theory (continued)

Consumer Demand

Week 2
9/11-9/13

Supplementary readings (optional):

Popular Press Summary 1: "Computing the Social Value of Uber"

Popular Press Summary 2: "Uber's Pricing Formula Has Allowed Economists to Map Out a Real Demand Curve - WSJ"

Research Paper: "Using Big Data to Estimate Consumer Surplus: the Case of Uber"

Assignment 2 (due Thu. Sep. 20 in class)

Prices and price discrimination (additional numerical examples of elasticity, competitive and monopoly pricing discussed on the board)

Supplementary Readings (optional):

Research

Summary: <http://personalization.ccs.neu.edu/Projects/PriceDiscrimination/> (*Links to an external site.*)[Links to an external site.](#)

Week 3

9/18-9/20

Research Paper: [Price Discrimination on e-commerce web sites](#)

Assignment 3 (due Thu. Sep. 27 in class)

HubSpot case study

Network effects

Networks, Crowds, and Markets: Reasoning about a Highly Connected World (Links to an external site.), by David Easley and John Kleinberg, chapter 17

Week 4

9/25-9/27

Case Study: AirBnb, Etsy, Uber: acquiring the first thousand customers

Case Study: AirBnb, Etsy, Uber: growing from one thousand to one million customers

Supplementary reading: Google Allo

Assignment 4 and Tripadvisor case study

Topics: Insights from Behavioral Economics and Psychology

Anchors and context effects

Week 5

10/2-10/4

Dan Ariely's Website: <http://danariely.com/>

Assignment 5

Attention and shrouded attributes

Week 6

10/9-

10/11

Guest Lecture by Merve Sariisik: "Identity Discrimination in the Sharing Economy"

Practice Midterm

Week 6

10/18

Midterm

Week 7

10/23-

10/25

Guest Lecture by David Jurgens: Online Groups and Behavior Change

Price Dispersion and Consumer Search - part 1

Price Dispersion and Consumer Search - part 2

Air France Case Study Introduction

Problem Set 6

- Week 8 Online and Offline Advertising
10/30-11/1 Supplementary Reading: News: Digital Advertising.pdf
Supplementary Reading: Research: Measuring Returns to Advertising
Problem Set 7: Star Digital and Big Skinny case studies
- Week 9 "Freemium and Monetization" Part 1 and Part 2
11/6-11/8 <https://techcrunch.com/2011/09/04/complete-guide-freemium/>
Problem Set 8: Dropbox and NYT paywall case studies
Social Networks and Social Media
<http://www.economist.com/news/business/21662543-people-spend-more-time-social-media-advertisers-are-following-them-brand-new-game>
- Week 10 <http://www.adweek.com/news/technology/instagram-letting-brands-test-taggable-buyable-products-photos-174365>
11/13-11/15 DARPA Balloons search in social networks.
Problem Set 9: Dove, American Express, United Breaks Guitar and Facebook case studies

“Big Data”: How to Infer Preferences from Large-scale Choice Data

- Measuring demand with endogenous prices
- Week 11 R Tutorial and Regression Primer
11/20
- Week 12 "User Modeling and Privacy Management" Guest Lecture by Florian Schaub
11/27-11/29
“Too many variables”: over-fitting; regularization (LASSO) to reduce dimensionality of data
Supplementary Reading (optional): Prediction Policy Problems (Links to an external site.). Kleinberg, Ludwig, Mullainathan and Obermeyer
- Week 13 *“Too few variables”*: extracting features from unstructured text data
12/4-12/6 Collaborative filtering and recommender systems
Problem Set 10(turn in for extra credit)
- Exam 2
- Week 14
12/11