ORIE 3800: Information Systems and Analysis

Instructor: Krishnamurthy Iyer

Syllabus, Spring 2016

Course description:

Recent advances in computational and information technology have made it feasible and practical to collect, store and manage vast volumes of data about a wide range of activities. This explosion in information has amplified the need to understand the value of information, how to use available information to make better decisions, and how current decisions affect any future information we might obtain. For example, consider the following questions:

- How should a firm optimally experiment among different website designs before deciding on a single one, with the goal to maximize user traffic?
- How should a buyer interpret online feedback and ratings before deciding on which product to buy, or the seller to buy from?
- How should a doctor decide which medical tests to perform on a patient to deliver the most effective care?
- How is the price of an insurance product affected by the insurance provider's knowledge (or lack thereof) about its customers (pre-existing conditions, fitness habits, diet, etc.)?

The goal of the course is to develop mathematical models where such questions can be analyzed, and their implications on practical settings can be understood.

Learning outcomes

After taking this course, you should be able to achieve the following objectives:

1. Describe different frameworks to represent information, and model the learning behavior of an agent or a firm.
2. Analyze how the learning objectives interact with other objectives, such as maximizing reward, revenue or profit.
3. Recognize how the outcome of a multi-agent setting (e.g., trade between a buyer and seller) is affected by the presence (or absence) of information among the agents.

Instructor:

Prof. Krishnamurthy Iyer
225 Rhodes Hall
E-mail: kriyer@cornell.edu
Office hours: Wednesday 3:30pm–5:30pm

Teaching assistants:

Calvin Wylie
E-mail: cjw278@cornell.edu
Room no: 431 Rhodes Hall
Office hours: Thursday 9:30am–11:30am

Xiaofan Chen
E-mail: xc73@cornell.edu
Room no: 431 Rhodes Hall
Office hours: Tuesday 3:00pm-5:00pm

Course information:

Class time: T Th 1:25-2:40pm
Class location: Thurston 203
Recitation: Friday, 2:55-4:25pm
Recitation location: Thurston 203
Course Website: `https://blackboard.cornell.edu/` (search for ORIE 3800)
Piazza Link: `https://piazza.com/cornell/spring2016/12089_2016sp`

Class websites:

We will be using Blackboard for announcements and lecture materials. You should be enrolled automatically into Blackboard, but if not, please visit https://blackboard.cornell.edu/ and search for ORIE 3800. All announcements for the class will be through Blackboard, so it is your responsibility to ensure that you are enrolled and receiving the announcements. Please contact the instructor or the TAs if you have any issues.

We will also use Piazza for this class, where you should direct your questions related to homework, exams, project, or the course content. There will be a link to the Piazza forum in blackboard. The link is `https://piazza.com/cornell/spring2016/12089_2016sp`.

Text:

The main recommended text for the course is *Information Economics*, by Urs Birchler and Monika Bütler, published by Routledge. We will closely follow these chapters of Birchler & Bütler: 3, 4, 5, 10, 12, 13, 14. In addition to the material from Birchler & Bütler, we will discuss several models and applications not covered in the text.

Other recommended books include the following:

1. *Networks, Crowds, and Markets*, by David Easley & Jon Kleinberg, 2010 (available online at `http://www.cs.cornell.edu/home/kleinber/networks-book/`).

2. *Probability Theory: The Logic of Science*, by E. T. Jaynes, Cambridge University Press, 2003.

Homework:

Homework will be due on Friday at noon in the homework mailbox (Rhodes 2nd floor lobby). There will be weekly homework, with occasional breaks for prelim and during the period when students will be expected to work on the project. In all, there will be about 6-7 homework.

You may discuss the homework with other current students of the class, but showing each other written solutions is not acceptable. Each student must write their solutions independently and individually. (Sharing written solutions, or submitting copied solutions will be considered a violation of the Cornell code of academic integrity, and appropriate actions will be taken.)

If there is a dispute about grading, you may turn in the entire assignment for a regrade within a week of the work being returned, with a short explanation of the error. All of the work, not just the disputed question, will be regraded.

Late homework:

Late homework will incur 20% grade reduction per day, for up to 3 days late (latest by the subsequent Monday noon). Homework handed in after the subsequent Monday noon will receive no points and will not be graded.

If you plan to hand in your homework late, you must email the TA (Calvin Wylie) before handing it in to let him know that your homework will be in the mailbox.

Extensions will not be granted. Excuses for late homework will be evaluated on a case-by-case basis, with points deducted as described above except in very rare circumstances. Medical reasons, with documentation, are accepted as excuses for late homework.

Your lowest homework grade will be dropped, to accommodate non-medical reasons for missing or incomplete homework, conditional on you having filled the course evaluation form at the end of the semester (see the grading section below).

Project:

There will be a project toward the end of the semester. The project will involve working in groups of 2 or 3 students over a period of 3-4 weeks, and will require students to hand in a report detailing their approach and solutions. The project work will involve mathematical analysis using methods from the course, and computer programming.

Exams:

The prelim will be a 90min in-class exam, held during recitation (2:55-4:25pm) on Friday March 11, 2016. The location will be confirmed soon. The exam will be closed book and closed notes.

The final exam will be closed book and closed notes, and based on the material covered during the entire course. The date and the room for the final exam has not been determined yet, and will be announced on Tuesday, February 16, 2015. See `https://registrar.cornell.edu/Sched/exams.html` for more information.

Grading:

Your grade will be based on the homework (25%, approximately equally weighted), the prelim (25%), the final exam (35%), and the project (15%).

As an incentive for you to provide honest feedback on the course and my teaching, if you fill the course evaluation form during the evaluation period, your lowest homework score will be dropped from consideration towards your final grade.

Class schedule:

During the semester, the instructor may be out of town for some of the class dates. To make up for these, during some weeks, we will have lectures during the class recitation hours, and the recitation will be held during one of the regular class meeting times. You will be notified well ahead of time if/when such changes will be needed.

Academic integrity:

Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit must be the student's own work. Complete code is available at `http://cuinfo.cornell.edu/aic.cfm`