CSC 594: Topics in Computer Science
"Computational Advertising"

Fall 2014
Thursdays: 5:45 – 9:00 pm, Lewis 1515
Professor Robin Burke
Office hours: Mondays 1:00 – 2:30 pm (Lincoln Park, 990 W. Fullerton, Suite 3100),
Thursdays 3:30 – 5:00 pm (CDM 849) and by appointment.
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(Piazza – best) www.piazza.com

Description
Computational advertising is the problem of finding the best advertisement for a given user in a given on-line context. It is a complex and emerging area at the intersection of quantitative marketing, web search, data mining, recommendation, optimization, and algorithmic game theory. Students will read current scientific papers and explore a range of models both mathematically and empirically. Students can choose from three types of final course projects: implementation projects, research papers, or data analysis projects.

Learning Objectives
Students will be able to:
- identify the major players and roles in the computational advertising ecosystem.
- identify the technical issues related to sponsored search, contextual advertising, and behavioral targeting.
- analyze, discuss and present results from scientific literature.
- synthesize results of independent inquiry in a final project.

Prerequisite:
IS 567, CSC 478, or ECT 584

Readings
As assigned, available online on D2L

Tools
Piazza
We will be using Piazza for class discussion. The system is designed to get you help quickly and efficiently from your classmates and the instructor. Rather than emailing questions, I encourage you to post your questions on Piazza. Find our class page at: https://piazza.com/depaul/fall2014/csc594/home

Assignments
There are four graded components of this class:
- Homework (10%): 2 assignments due weeks 2 and 5
- Discussion leader (30%/DL 20%): responsible for 1 paper during weeks 6-10.
- Participation (20%/DL 30%): includes in-class and on-line participation.
- Final project (40%): including project proposal, progress report, final presentation, and final report.

See assignment handouts for details.

Late Assignments
Late assignments will be marked off by 10% per day, up to 3 days late. Work related to class discussions and project presentations will not be accepted late.

Schedule
Unit I: Background

9/11: Introduction / Overview
Course outline and expectations. Overview of computational advertising and research / application issues. Ethical issues.
Reading: Yuan, S. et al. "Internet Advertising: An Interplay among Advertisers, Online Publishers, Ad Exchanges and Web Users". Information Processing and Management, 2012.

9/18: Computational foundations
Text representation. Statistical language modeling. Entity recognition. Implementation and scalability issues. Regression and classification. Supervised and unsupervised techniques. Feature selection and feature engineering. Smoothing. Bias / variance tradeoff and overfitting.
Reading: Chapter 3 in Liu, B. Web Data Mining (note that the file contains chapters 2 and 4 as well); Chapters 1 and 6 in Manning, et al. Introduction to Information Retrieval.
Due: Homework #1

9/25: Recommender systems
Approaches to recommendation. Cold-start issues. Matrix factorization. Long-tail issues. Evaluation. Hybrid recommendation. Context-aware recommendation. Reciprocal recommendation. Guest speaker: Sean Naismith, LeapFrog Online.
Reading: Chapter 1 and Chapter 2 through 2.4.1 in Jannach, et al. Recommender Systems: An Introduction.

10/2: Game and auction theory
Closed form games. Nash equilibria. Optimality. Externalities. Actions as games. Second-price actions. Combinatorial auctions. Mechanism design. Google Adwords and other applications.
Reading: Edelman, et al. Internet advertising and the generalized second-price auction.

10/9: Proposal preparation
No class. Students work independently on project proposals
Due: Homework #2

Unit III: Current issues

10/16: Matching ads and pages
Reading: TBA
Due: Project proposal

10/23: Sponsored search 1 (Auctions)
Reading: TBA

10/30: Sponsored search 2 (Query processing)
Reading: TBA

11/6: Behavioral targeting
Reading: TBA
Due: Progress Report

11/13: Evaluation
Reading: TBA

11/20: Project Presentations
Due: Presentation

11/25: Final project due

Course Policies

Attendance
Students are expected to attend each class and to remain for the duration. Coming 15 minutes late or leaving 15 minutes early constitutes an absence for the student. Students are individually responsible for material they may have missed due to absence or tardiness.

Assignment Submission
All assignments will be submitted to D2L or in some cases, handed in during class.. Do not submit assignments by email.

Attitude
A professional and academic attitude is expected throughout this course. Measurable examples of non-academic or unprofessional attitude include but are not limited to: talking to others when the instructor is speaking, mocking another's opinion, cell phones ringing, emailing, texting or using the Internet whether on a phone or computer. If any issues arise a student may be asked to leave the classroom. The professor will work with the Dean of Students Office to navigate such student issues.

Civil Discourse
DePaul University is a community that thrives on open discourse that challenges students, both intellectually and personally, to be socially responsible leaders. It is the expectation that all dialogue in this course is civil and respectful of the dignity of each student. Any instances of disrespect or hostility can jeopardize a student's ability to be successful in the course. The professor will partner with the Dean of Students Office to assist in managing such issues.

Cell Phones/On Call
If you bring a cell phone to class, it must be off or set to a silent mode. Should you need to answer a call during class, students must leave the room in an undisruptive manner. Out of respect to fellow students and the professor, texting is never allowable in class. If you are required to be on call as part of your job, please advise me at the start of the course.

University Policies
Changes to Syllabus
This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L and sent via email.

Online Course Evaluations
Instructor and course evaluations provide valuable feedback that can improve teaching and learning. The greater the level of participation, the more useful the results. As students, you are in the unique position to view the instructor over time. Your comments about what works and what doesn't can help faculty build on the elements of the course that are strong and improve those that are weak. Isolated comments from students and instructors' peers may also be helpful, but evaluation results based on high response rates may be statistically reliable (believable). As you experience this course and material, think about how your learning is impacted. Your honest opinions about your experience in and commitment to the course and your learning may help improve some components of the course for the next group of students. Positive comments also show the department chairs and college deans the commitment of instructors to the university and teaching evaluation results are one component used in annual performance reviews (including salary raises and promotion/tenure). The evaluation of the instructor and course provides you an opportunity to make your voice heard on an important issue – the quality of teaching at DePaul. Don't miss this opportunity to provide feedback!

Academic Integrity and Plagiarism
This course will be subject to the academic integrity policy passed by faculty. More information can be found at http://academicintegrity.depaul.edu/.

The university and school policy on plagiarism can be summarized as follows: Students in this course should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work any assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails be sure to consult the instructor. While students are permitted to discuss assignments at the conceptual level, under no circumstances should students share specific answers (electronically or otherwise).

Withdrawal
Students who withdraw from the course do so by using the Campus Connection system (http://campusconnect.depaul.edu. Withdrawals processed via this system are effective the day on which they are made. Simply ceasing to attend, or notifying the instructor, or nonpayment of tuition, does not constitute an official withdrawal from class and will result in academic as well as financial penalty.

Retroactive Withdrawal
This policy exists to assist students for whom extenuating circumstances prevented them from meeting the withdrawal deadline. During their college career students may be allowed one medical/personal administrative withdrawal and one college office administrative withdrawal, each for one or more courses in a single term. Repeated requests will not be considered. Submitting an appeal for retroactive withdrawal does not guarantee approval. College office appeals for CDM students must be submitted online via MyCDM. The deadlines for submitting appeals for this quarter is the last day of the last final exam of Spring Quarter 2014.

Excused Absence
In order to petition for an excused absence, students who miss class due to illness or significant personal circumstances should complete the Absence Notification process through the Dean of Students office. The form can be accessed at http://studentaffairs.depaul.edu/dos/forms.html. Students must submit supporting documentation alongside the form. The professor reserves the sole right whether to offer an excused absence and/or academic accommodations for an excused absence.

Incomplete
An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. CDM policy
requires the student to initiate the request for incomplete grade before the end of the term in which the course is taken. Prior to submitting the incomplete request, the student must discuss the circumstances with the instructor. Students may initiate the incomplete request process in MyCDM.
- All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptional cases will receive such approval.
- If approved, students are required to complete all remaining course requirement independently in consultation with the instructor by the deadline indicated on the incomplete request form.
- By default, an incomplete grade will automatically change to a grade of F after two quarters have elapsed (excluding summer) unless another grade is recorded by the instructor.
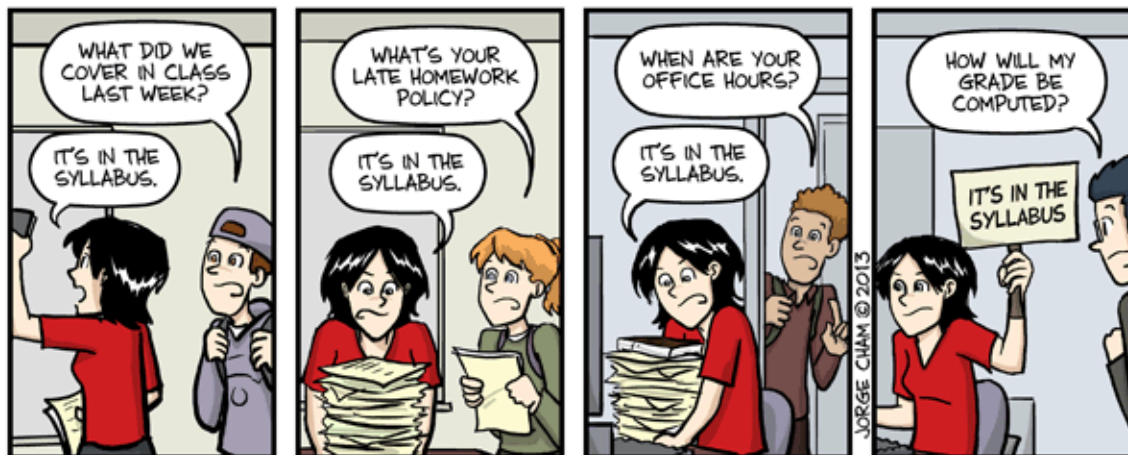- An incomplete grade does NOT grant the student permission to attend the same course in a future quarter.

Students with Disabilities
Students who feel they may need an accommodation based on the impact of a disability should contact the instructor privately to discuss their specific needs. All discussions will remain confidential.
To ensure that you receive the most appropriate accommodation based on your needs, contact the instructor as early as possible in the quarter (preferably within the first week of class), and make sure that you have contacted the Center for Students with Disabilities (CSD) at: Student Center, LPC, Suite #370 Phone number: (773)325.1677 Fax: (773)325.3720 TTY: (773)325.7296

Quarter at a Glance

Date	Topic	Assignments	Project
9/11	Introduction / Overview		
9/18	Computational foundations	Homework 1	
9/25	Recommender systems		
10/2	Game and auction theory		
10/9	Proposal preparation	Homework 2	
10/16	Contextual advertising		Proposal
10/23	Sponsored search 1		
10/30	Sponsored search 2		
11/6	Behavioral targeting		Progress report
11/13	Evaluation		
11/20	Project presentations		Presentation
11/25	Final project due		