Fall 2019

CS 785-005: ST: Matching Algorithm in e-Commerce

Pan Xu

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Syllabus

Title. CS 786--ST: Matching Algorithm in E-Commerce.

Prerequisite. CS 610.

Location and time: 3 to 5:50 PM on Thursday in FMH 305.

Instructor. Pan Xu, Assistant Professor of CS at NJIT. Here is the webpage: https://sites.google.com/site/panxupi/about-me--1?authuser=0

Office hour. Please email to pxu@njit.edu with the subject line of Scheduling a meeting for CS 786 to arrange a meeting with the instructor.

Course plan. First, the instructor will discuss and present classical approximation and randomized algorithms for several well-studied combinatorial optimization problems (most of them are NP-hard). Then we will give special attention to two fundamental matching models: (offline) stochastic matching and online matching. The course will mainly focus on the algorithm design and analysis but NOT implementation. Last, we will discuss how matching algorithms are utilized in several real-world applications, including ridesharing and crowdsourcing. You will expect this course is really theory flavored though most of the topics are highly motivated from real-world applications. The course will be primarily delivered via blackboard though PPT will be occasionally used when needed.

Course goal. This course aims to offer students fundamental techniques of algorithms design and analysis for a wide range of classical combinatorial optimization problems such as Minimum Vertex Cover, Maximum Cut, Matching, and Set Packing. Additionally, we will show how to leverage the powerful kit of algorithm design tools to attack challenging issues arising in real-world matching markets such as ridesharing, online dating, and crowdsourcing.

Textbook. There is no required textbook for this course. The following is a list of suggested books for references.

· Motwani, Rajeev, and Prabhakar Raghavan. *Randomized algorithms*. Cambridge university press, 1995.

· Kleinberg, Jon, and Eva Tardos. *Algorithm design*. Pearson Education, India, 2006.

· Williamson, David P., and David B. Shmoys. *The design of approximation algorithms*. Cambridge university press, 2011.

· Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). *Introduction to algorithms*. MIT press.

· Mitzenmacher, Michael, and Eli Upfal. *Probability and computing: randomization and probabilistic techniques in algorithms and data analysis*. Cambridge university press, 2017.

Grading policy. This is a highly research-oriented course. Students are strongly encouraged to apply techniques learned from the course to their own research. There will be no exam. The final score consists of three parts, as described as follows.

Class attendance (20%). Students are expected to attend all classes and actively get involved in the offline (in the classroom) and online (through Canvas) discussions. The instructor will give a score of the class attendance for each student based on that. The instructor highly encourages students to ask questions during classes.

Scribing notes (30%). Each student is expected to write down the materials covered by one class formally. For this assignment, students are NOT allowed to consult any textbooks or online materials. Submission guidelines: (1) The note should be typed by using either Word or LaTeX (highly recommended), and no hand-writing script will be accepted. (2) After each class, students can bid the assignment by emailing to pxu@njit.edu with the subject of Bidding the scribe assignment of CS 786. The instructor will assign to the student who bids first. (3) Submission is due by the start of the class in two weeks. Please email the submission to pxu@njit.edu with the subject of CS 786 Scribing Assignment. I will try to announce the topic one or two days before each class. Students can start bidding the scribing assignment even before the class begins.

Presentation (50%). Each student is expected to give a presentation: 30 mins (presentation) + 5 mins (questions). The presentation session will start on the week of Oct. 24 or 31 (depending on the final enrollment of the class). Each class then will host four presentations. The instructor will upload to canvas a list of reading papers by the middle of Oct. Students can choose a topic either from the reading list or her/his own research areas. For the latter choice, students should email to pxu@njit.edu with the subject of Presentation topics of CS 786 requesting the confirmation from the instructor. Overall, presentation topics should be highly relevant to algorithm design and analysis.

Statement on academic integrity:

*"**Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your**"*

educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*