Dynamic Traffic Assignment (CE 392D)
Spring 2018

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Course Meeting Time and Place: Tuesday and Thursday, 3:30–5:00, ECJ 1.322
Office Hours: Tuesday and Thursday, 1:30–2:30 and by appointment, please email if you are coming by
Course Website: http://tinyurl.com/ut-ce392d

Welcome to CE 392D! This course will expose you to the basic concepts of dynamic transportation network analysis, as well as explore some applications. These models are used to model traffic flows at the scale of a city or metropolitan region, and are useful for predicting the impact of changes to the transportation system (added capacity, signal retiming, multimodal). In particular, dynamic models are contrasted with static models: rather than assuming the transportation system exists in a "steady state" (as in static modeling), dynamic models aim to represent the changes in demand, capacity, and congestion that occur over time. In this sense they are more realistic. However, as we will see in the course, they can be trickier to use and generally require more time to run. In contrast to the mathematically nice world of static assignment, dynamic assignment is better viewed as a broad concept which has many different specific implementations in different contexts. The objectives of this course are to introduce you to the essential ideas of dynamic traffic assignment and some current models which are being used in practice. Dynamic traffic assignment (DTA) is a broad field and a rapidly evolving one, I make no pretentions that the course is comprehensive — the intent is to teach you enough of the general theory to understand DTA, along with some of the most important specific implementations today.

Prerequisites

The only prerequisite for CE 392D is graduate standing. Please speak to me if you have concerns about your preparation for the course.

Course Materials

DTA is a young field, and there is currently no textbook on the subject. I am currently writing a textbook along with Avinash Unnikrishnan from Portland State University and Nicholas Lownes from the University of Connecticut. A draft of this book will be the main source of readings for the course.

Grading

Category	Weight
Reading responses	5%
Homeworks	30%
Exam	30%
Project	35%

These components are designed to work together: the exam focuses on concepts, while the course project involves application and skills involved in engineering practice. The homeworks and lectures give you a chance to learn these skills and practice them throughout the semester. There are two types of assignments. Some are shorter, simpler assignments which are used to give you practice and basic familiarity with the course material. Others are longer and require you to synthesize concepts in a more complex way. The longer assignments will include problems requiring you to write simple Python code. You will be provided with an autograding script which will help you improve and debug your code. You are encouraged to work together — the longer assignments can be submitted either alone or in a group of two; shorter assignments

must be submitted individually. Any late assignment will receive an automatic grade penalty of 10% per day (starting immediately after the posted deadline on Canvas).

The exam will take place before the end of the semester, and is comprehensive. No final exam is scheduled during finals week. This exam will be open to *handwritten* notes, and no calculators will be needed.

The project will culminate in oral presentations and a written report, both due in the last week of class. Potential project topics include application of one or more DTA models to a real-world scenario, presenting one or more important journal papers (please discuss with me beforehand), comparison of different traffic flow models or algorithms for the same problem, development of a computer tool to automate a DTA algorithm, or another related topic of interest. Please send your project topic to me for approval no later than the end of March, but you are strongly encouraged to start earlier. At the end of the semester, you will be required to present your project to the rest of the class, and complete a written report documenting all of your work.

Most weeks in this course have an associated reading from the textbook or another resource. You are required to compose a short response (250–500 words) to these readings and email them to me at the start of the week. These responses are free-form and can include questions about things in the reading which are unclear; commentary about related issues in your research or experience; Critique of modeling assumptions made or suggestions of alternative assumptions and models; citique of notation, presentation format, and explanations; typos in the text; or anything else which demonstrates that you have read the assigned sections and thought about them. Please email me your response by **9 AM on Monday** of each week. I will use these to prepare for class and answer questions you have. Send them in **plain text** (no attachments or fancy formatting) with the subject line `392D reading response`.

If you need to miss class for conferences, research project meetings, religious holy days, etc. please let me know in advance.

Miscellanea

An evaluation of the course and instructor will be conducted at the end of the semester using the approved UT Course/Instructor evaluation forms.

From the 1st through the 4th class day, graduate students can drop a course via the web and receive a refund. During the 5th through 12th class day, graduate students must initiate drops in the department that offers the course and receive a refund. After the 12th class day, no refund is given. No class can be added after the 12th class day. From the 13th through the 20th class day, an automatic Q is assigned with approval from the Graduate Advisor and the Graduate Dean. From the 21st class day through the last class day, graduate students can drop a class with permission from the instructor, Graduate Advisor, and the Graduate Dean. Students with 20-hr/week GRA/TA appointment or a fellowship may not drop below 9 hours.

The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512–471–6259 (voice), 512–410–6644 (video phone), or `http://ddce.utexas.edu/disability/`.

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information, please visit the Student Judicial Services website at `www.utexas.edu/depts/dos/sjs/`.

Schedule

A tentative class schedule is shown below. All dates and topics are subject to change.

Tuesday	Thursday
Jan 16th **1** Course orientation and overview	18th **2** What is DTA?
23rd **3** Network loading basics	25th **4** Point queue and spatial queues
30th **5** Simple node models	Feb 1st **6** Elementary traffic flow theory
6th **7** LWR model and shockwaves	8th **8** Newell-Daganzo method
13th **9** Cell transmission model	15th **10** Link transmission model
20th **11** General intersections	22nd **12** General intersections
27th **13** Network loading problem	Mar 1st **14** Time-dependent shortest path concepts
6th **15** Time-dependent shortest path algorithms	8th **16** Departure time choice
13th **No class: Spring break**	15th **No class: Spring break**
20th **17** Combining network loading and behavior	22nd **18** Dynamic user equilibrium
27th **19** Convex combination algorithms	29th **20** Simplicial decomposition algorithms
Apr 3rd **21** Gradient-based algorithms	5th **22** Existence and uniqueness of equilibria
10th **23** Daganzo paradox	12th **24** OD matrix estimation
17th **25** Multiscale modeling	19th **26** Applications of dynamic traffic assignment
24th **27** **Semester Exam**	26th **28** Frontiers of dynamic traffic assignment
May 1st **29** Project presentations	3rd **30** Project presentations