Course Description

Enrolled Students


Week 0

Wed Sep 13
Introduction and Survey of Course
Elements of the transportation sector of the economy, the player, the technologies, the information sources

Reading: *Smart Driving Car, Street Smart* by Samuel Schwartz *Has Growth in Automobile Use Ended?*

2017 Motor Vehicle Crashes: 1st Half

FATALITY ANALYSIS REPORTING SYSTEM (FARS) ENCYCLOPEDIA National Transportation Statistics:

Basic background on Transportation in the US (Pocket Guide 2017)

Travel Monitoring

*Highway Statistics Publication Archive*

*Freight Facts & Figures 2017*

*Commodity Flow Survey*

*National Transportation Statistics 2017*


WTI Crude

Homework 1: The Last Drop or StreetSmarts or The coming of autonomous Taxis; Due Monday, Sep 18 Class Notes: [Week 0, Current News]

Week 1

Mon Sep 18
Evolution of Urban transportation Technology: From the Omnibus to PRT (Personal Rapid Transit, “Transport System of the Future???”) History of PRT; Historical evolution of National Transportation Policy leading to current National Transportation Policy.

Readings: Travel in London; PRT@LHR; Jerry Schneider’s Source Page; PRT@LHR10Conf; Podcar_Stockholm_2011;

2GetThere/Masdar; Animations: IndiaPRT; Bath; NJ PRT Academic Look,

Class Notes: History Slides, Current News

http://orfe.princeton.edu/~alaink/PRT/Movies/DelhiIndiaPRT_Animation.mp4

Mon Sep 18 Precept
Discussion of “Last Drop” and Big Picture view of Transportation in the next 20 years (be prepared to discuss this link!) Readings: Motor Fuel data and the Highway Trust Fund; State Gasoline Taxes
autonomous Taxis, Evolution of Crashless Cars

Readings: KPMG Report on Crashless Cars; Chunka Mui’s Series in Forbes; Todd Litman; state-wide autonomous Taxi; Transportation in 2038???, Smart Driving Car videos; Automation Workshop, 1st Princeton SmartDrivingCar Summit May 2016; PAVE_DARPA_Story

Class Notes: The Case for SmartDrivingCars;

Part 2. Planning and Analysis Tools of Transportation Demand and Investment

Week 2
Mon Sep 26
Class Discussion on the Future of Transportation Technology, given Transitions that have happened over the past 150 year. Come prepared having looked at HW 2 & Class Notes

Homework 2: How will the Mobility Environment Change by 2038? ; Due Tuesday, Sep 27
Class Notes: Slides: The Case for SmartDrivingCars, Adam Jonas Views of Future Mobility & Questions from HW2.

Precept Tue 27 7:30pm NOTE DAY Change from Monday
Discussion of MyCity homework objectives
Ref.: Class Notes MyCityTripGeneration

Background reference: NCHRP Synthesis 406 Advanced Practices in Travel Forecasting
Ed Weiner, Urban Transportation Planning in the US: An Historical Overview; 5th Edition ; Analytical Travel Forecasting NCHRP765
Homework #2a,b My City Also See: My City Trip Generation
Examples: MyCityEx1, MyCityEx2, CityOfEden, CofEReport La Ville Report LaVille Data
MyCitysummaryTableOrf467F16.xlsx Due: Mon. Oct 2 & Mon 3 Before Precept.

Wed Sep 27
Urban Travel & Transportation System Characteristics: Planning Studies and Methods: Travel Demand Surveys, Data Sources, Intro to Sequential Demand Forecasting Modeling Approaches; Relating the Travel Demand with Land Use; Trip generation; Activity-based demand models
Ref.: Cascetta, Ch. 4.1- 4.5 New York Met Area Study, (see Notes for links) Travel Modeling Demand Modeling Notes

Background & Data Reference: LincolnTravelDemandModel SCAG Modelling TCRP B-15 Characteristics of Urban Travel see especially: Overall Trip Rates; Travel Surveys: http://www.travelsurveymanual.org/
Class Notes Simple Demand Modeling, LincolnTripGen ;

Week 3
Mon Oct 2
Relating the Travel Demand with Land Use: Trip Distribution
Ref.: The Gravity Model, Example of Trip Distribution Mode Lincoln NEI SCAGTripDistribution
Class Notes: Notes Trip distribution Current News

Mon Oct 2 Precept
Presentation of MyCity Designs and Trip Generations
Wed Oct 4
Random Utility Theory and the modeling of Mode Choice
Ref.: Class Notes Cascetta, Ch. 3 Class Notes, ModeChoice, SCAG_ModeChoice LincolnModeChoice
Homework #4 Final Report for MyCity, Current News

Week 4
Mon Oct 9
Traffic Assignment and paths through networks; Network Analysis: Shortest Paths: Label Setting and Label Correcting, Shortest paths in Real Networks and Essentially Shortest Paths; Dijkstra’s Algorithm
Readings: DijkstraApplet; Another Dijkstra Visualization
http://www.princeton.edu/~alaink/Orf467F17/LincolnTrafficAssignment.pdf 5.1-5.3, Magnanti, Ch2, Ch4
(to be distributed)
Ref.: Class Notes SCAG_Networks, SCAG_TrafficAssignment LincolnTrafficAssignment
http://www.scag.ca.gov/modeling/pdf/MVS03/MVS03_Chap04.pdf Current News

Mon Oct 10 Precept
Oral Presentations of Progress on MyCity: Work Trip Distribution + …
Comparisons of Orf467F10 My Cities

Wed Oct 11
More on: Paths through networks; Network Analysis: Shortest Paths: Label Setting and Label Correcting, Shortest paths in Real Networks and Essentially Shortest Paths
Label Setting; Dial and Radix Heap Implementations of Dijkstra’s; Label Correcting; real world networks and stochastic issues
Network Flow (Transportation Problem); Wardrop’s 1st & 2nd Principles, Assignment Techniques and k-shortest paths
Ref.: Class Notes Magnanti Ch 4, especially 4.5 through 4.9; Readings on Networks, FlowMapExamples; Tharald Fongaard’15 Traffic Flow Display System
Transportation Network Design Hunt, Kornhauser, “Assigning Traffic Over Essentially-Least-Cost Paths” The transportation Problem
Assignment: Magnanti: 2.1, 2.2, 2.3, 2.4, 2.5, 2.30, 2.31, 2.43, 2.44, 2.45, 4.1, 4.14, 4.15 (These are straight forward. Do them with your partners; turn in one solution set per two person pair. Both work on all problems), Due Friday, Oct 20.

Week 5
Mon Oct 16
More on Networks and Princeton Trip Synthesizer
Ref.: NJ Trip Synthesizer; NationwideNetwork: Links, Nodes, ReadMe; NationwideSynthesizedPersonTrips Current News

Monday Oct 16 Precepts
Oral Presentations of Final Report of MyCity & Discussion about networks

Wed Oct 18
More on .Princeton Trip Synthesizer: Nationwide Synthesizer
Ref.: Current News, The transportation Problem Transportation Network Design, NJ Trip Synthesizer; Tharald’s Trip Display System,
Week 6
Mon Oct 23
More on NJ Trip Synthesizer. Modeling of the ride-sharing potential of aTaxis in NJ and the Nation
Reference: NJPRT04, NJPRT05, NJPRT07, NJPRT08, NJPRT09, NJPRTF10; SynthesizingIndividualTravelDemandInNJ & the Nation
A National Hybrid Activity/Agent-Based Demand Model to Characterize the Mobility of the United States, K. Marocchini, Jan 2017
Mufti: TripSynthesizer;
http://orfe.princeton.edu/~alaink/NJ_aTaxiOrf467F14/Orf467F14Disaggreagated_Pixels_View.pptx;
HillWyrough'14SeniorThesis; Brownell_TRB_2014Paper

Current News,

Tue Oct 24 Precept (Precept moved to Wednesday Oct 25 @ 4:30 in Friend 008)

Wed Oct 25
Special Seminar: Autonomous Vehicles: Good, Bad, Ugly, Samuel I. Schwartz, President & CEO, Sam Schwartz Transportation Consultants, Author “Street Smarts: The Rise of Cities and the Fall of Cars”
Comparisons of MyCity 2017

@ 4:30pm Friend 008 Special Seminar: Joshua Herbach’08, Waymo Full Self-driving Car Team “Update on Waymo’s Full Self-Driving Cars”

Term Break Oct 29 – Nov 5

Part 3 The Role of High Technology in Transportation

Week 7
Mon Nov 6
More on Modeling of Individual Person-trips in NJ and the Nation
SynthesizingDailyPersonTripsWithImpicationsOnRidesharing.pptx
Pdf version
Disaggregated_Pixel_Views in NJ
Orf467National_aTaxiPixelGrid
Examples_of_some_{Lat,Lon}_<->_PixelCoordinates
NationWide Trip Data
Visualization of USA Person Trips
Current News
Ref: Earth Point: Excel To Kml – Display Excel Files in Google Earth
Driverless: Intelligent Cars and the Road Ahead by Hod Lipson and Melba Kurma, MIT Press, 312 pp
Assignment: Homework 6: Ride-Sharing Potential in MyCounties Due Wednesday Nov 15, 2017

Mon Nov 6 7:30-9:00pm Precept
**Wed Nov 8 Lecture**
Synthesis of Nationwide Individual PersonTrips: Discuss Final Term Projects
Ref.: [List Final Projects Orf467F16](#); Final Project Teams and Task Assignment
Class Notes: [Current News](#)

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**Week 8**

**Mon Nov 13**
Analyzing the ride-sharing potential of aTaxis in NJ and the Nation,
Readings: [Interplay Between Fleet-size, LoS and EmptyRepositioning](#) S. Zhu & A. Kornhauser
*A Ridesharing Analysis with a Hitchhiking Modification Applied to Taxi Trips in New York* A. Schindele’16
*Quantifying the Potential for Dynamic Ride-Sharing of New York City’s Taxicabs* S. Bhat’16
*Analyzing 1.1 Billion NYC Taxi and Uber Trips, with a Vengeance* T. Schneider

Nationwide Person Trip DataBase: [http://orf467.princeton.edu/db](http://orf467.princeton.edu/db)
Class Notes: [AVO_Analysis_of_aTaxi_Trips_Throughout_NJ](#)
Current News

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**Mon Nov 13 Precept**
First impressions of Trips originating from you home county from Kyle’s [NationWideTrips’16 Directory](#)
Please work on your own. I’m unable to be there.

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**Wed Nov 15**
More on: Analyzing the ride-sharing potential of aTaxis in NJ and the Nation. Visitors (Dr. Stan Young & Dr. Venu Garikapati) from National Renewable Energy Lab to learn about what you are doing.
Readings: *Initial assessment and modeling framework development for automated mobility districts* & *Next Generation Integrated Mobility: Driving Smart Cities*
Class [Current News](#)

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**Week 9**

**Mon Nov 20**
In-vehicle Satellite Navigation: From TravTek to Navigation Based Services; Global Positioning Systems (GPS)
511 Traffic [http://www.trafficland.com/](http://www.trafficland.com/) Bay Area; South Florida; Virginia TampaBay; Minnesota Traffic.com; Real-time ATIS [http://www.photoenforced.com/us.html](http://www.photoenforced.com/us.html);
Class Notes [Current News](#)

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**Couple things for fun:**
[http://orfe.princeton.edu/~alaink/Presentations/DinkyFutureFinalAlainAndrew.ppt](http://orfe.princeton.edu/~alaink/Presentations/DinkyFutureFinalAlainAndrew.ppt)
[http://orfe.princeton.edu/~alaink/Presentations/OpenBelowGradeDinkyStationConcepts.pdf](http://orfe.princeton.edu/~alaink/Presentations/OpenBelowGradeDinkyStationConcepts.pdf)
[http://orfe.princeton.edu/~alaink/Presentations/RadicalImprovements3wPRT.pptx](http://orfe.princeton.edu/~alaink/Presentations/RadicalImprovements3wPRT.pptx)

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**Wed Nov 22**
NO CLASS (exam the previous evening);

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**Week 10**

**Mon Nov 27**
Dr. Chenyi Chen *16 DeepDriving: Application of Deep Learning to Automated Driving
Fundamentals of Machine Learning and specific approaches to Computer Vision for Collision Avoidance and Self-Driving & Introduction to ChenyiChen Automated Driving Simulator

Using GTAV to Learn Distances TRB Final A. Filipowicz & A. Kornhauser; Capsule Networks (CapsNets) - Tutorial; Computer Vision for Autonomous Vehicles: Problems, Datasets & State-of-the-Art

Class Notes: Fundamentals of Machine Learning & “Extracting Cognition out of Images”. Chenyi Chen *16

Tue Nov 28 Precept
USA aTaxi16 Empty Vehicle Management Work Session Progress report of Final Projects: Final Project Teams and Task Assignment

Wed Nov 29
Empty aTaxi repositioning in your USA County

Hold over: Look at version2 of OnePixelExample:
V2_OnePixelExample_FinalOriginPixel17031_17.xlsx

Class Notes: Management of Empty aTaxis
Assignment: HW7: Initial Investigation of Empty Vehicle Repositioning Needs for Shared aTaxis to serve your county’s intra-county trips.
Readings: Shirley Zhu’s Thesis (Zhu’16MakingTransportationGreat_Thesis.pdf) and “Interplay_Between_Fleet-size,_LoS_and_EmptyRepositioning” S. Zhu & A. Kornhauser

Week 11
Sunday Dec 3

Mon Dec 4
NJ aTaxi Work Session: Empty aTaxi Management
Readings: aTaxisFinalProject_Analysis_of_Demand for and Management of USA aTaxi System Current News

Mon Dec 4 Precept 7:30pm Review for exam

Wed Dec 6

Exam: Wednesday Dec 6 1:30- 2:50pm 101 Sherrerd
Exam covering weeks 1-10 Instructions

Week 12
Mon Dec 11
NJ aTaxi Work Session: Empty aTaxi Management
Class Notes: Management of Empty aTaxis
Assignment: HW7: Initial Investigation of Empty Vehicle Repositioning Needs for Shared aTaxis to serve your county’s intra-county trips.
Readings: Shirley Zhu’s Thesis (Zhu’16MakingTransportationGreat_Thesis.pdf) and “Interplay_Between_Fleet-size,_LoS_and_EmptyRepositioning” S. Zhu & A. Kornhauser
Assignment:

Mon Dec 11 Precept
NJ aTaxi Work Session: Homework 6 & HW7 work session
Assignment: Final Project; Assignment: Empty aTaxi Management
Readings: aTaxisFinalProject_Analysis_of_Demand for and Management of USA aTaxi System

Wed Dec 13
Final Project Planning Session
Assignment: Final Project; Assignment: Empty aTaxi Management
Readings: aTaxisFinalProject_Analysis_of_Demand for and Management of USA aTaxi System

Reading Period 10:00 am - 1:00pm Saturday Jan 13, Final Workshop on Term Project; Lunch will be served.
Schedule