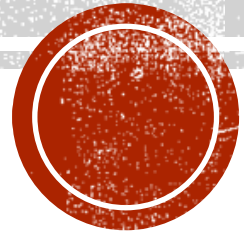
Global Initiative of Academic Networks (GIAN)

UNDERSTANDING THE INCREASING RELEVANCE OF CHOICE MODELS FOR ADVANCING TRANSPORTATION MODELLING IN SMART CITIES

MAY 22 -26, NAGPUR, INDIA



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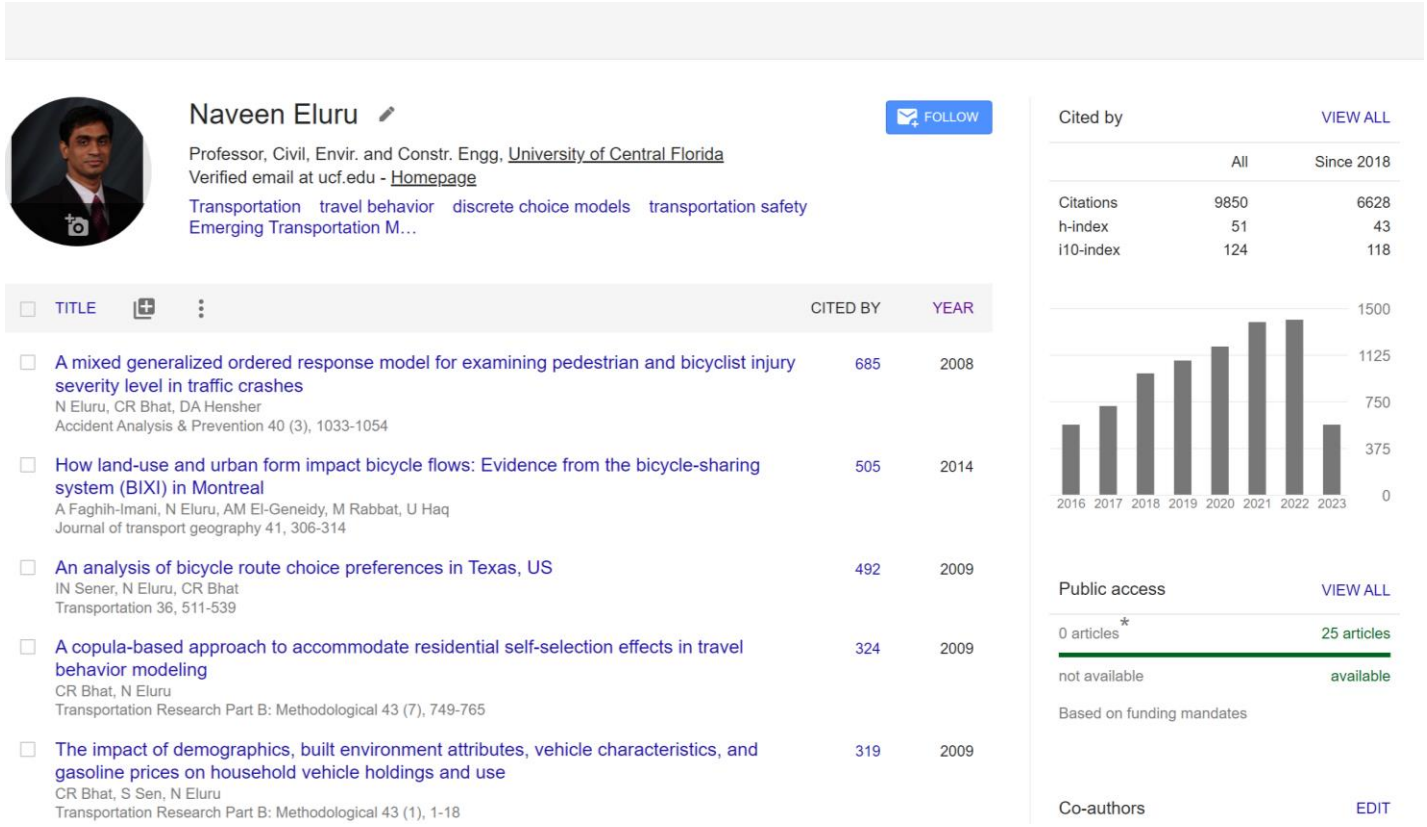
- Introductions
- Course Objectives
- Course Schedule
- Course Logistics

INTRODUCTIONS

- Faculty
- Students

NAVEEN ELURU



Naveen Eluru

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Transportation travel behavior discrete choice models transportation safety Emerging Transportation M…

TITLE	CITED BY	YEAR
A mixed generalized ordered response model for examining pedestrian and bicyclist injury severity level in traffic crashes N Eluru, CR Bhat, DA Hensher Accident Analysis & Prevention 40 (3), 1033-1054	685	2008
How land-use and urban form impact bicycle flows: Evidence from the bicycle-sharing system (BIXI) in Montreal A Faghih-Imani, N Eluru, AM El-Geneidy, M Rabbat, U Haq Journal of transport geography 41, 306-314	505	2014
An analysis of bicycle route choice preferences in Texas, US IN Sener, N Eluru, CR Bhat Transportation 36, 511-539	492	2009
A copula-based approach to accommodate residential self-selection effects in travel behavior modeling CR Bhat, N Eluru Transportation Research Part B: Methodological 43 (7), 749-765	324	2009
The impact of demographics, built environment attributes, vehicle characteristics, and gasoline prices on household vehicle holdings and use CR Bhat, S Sen, N Eluru Transportation Research Part B: Methodological 43 (1), 1-18	319	2009

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Co-authors EDIT

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https://people.cecs.ucf.edu/neluru/publications/

RESEARCH OVERVIEW

- Build choice/econometric models for understanding behavioral processes
- Draw on expertise in econometrics, data analytics, optimization and micro-simulation
- Focus on explainable data analysis approaches to predict the decision processes into the future
- Incorporate these advances within quantitative frameworks to study the influence of individuals, households, firms, and communities
- The quantitative frameworks have application in transportation and multiple inter-disciplinary areas

RESEARCH OVERVIEW

Transport Modeling	• Adoption of new mobility options (CAVs, TNCs, shared mobility) • Regional demand models with emerging Post-Covid travel behavior (remote work, shopping and freight)
Energy	• Spatiotemporal energy grid demand with increased EVs • EV adoption behavior and policies to address inequities
Health	• Transportation associated air pollution impact on health • Roadway crash frequency and severity • Activity time-use decision impacts on individual health

RESEARCH OVERVIEW

Climate Change	• Contribution of transportation sector to climate change • Role of Electric Vehicle technology and energy mix on transportation emissions
Resilience	• Improving transportation infrastructure resilience for disasters (floods and hurricanes) • Decision making during disasters and community recovery post-disasters
Sustainability	• Land-Use Transportation Interactions • Equitable access to employment and opportunities

I will introduce emerging opportunities and challenges for transportation modeling in smart cities. Then provide exposure to quantitative approaches useful for tackling these challenges

PHILOSOPHY

- I want the course to be interactive
- I encourage you to be open and discuss any questions
- My objective is not to cover syllabus but to "uncover" material so you learn [quote attributed to Dr. Chandra Bhat]
  - I am ok repeating the material as needed so all of you understand
- The slides and course material are online at https://people.cecs.ucf.edu/neluru/courses/gian-course/
- If typing, try https://rb.gy/1tk13
- I will use Mentimeter to seek feedback

STUDENT BACKGROUND

- Connect to Mentimeter
  - Course expectation Survey
  - Student Background

COURSE OBJECTIVES

- Provide an introduction to emerging Smart City Infrastructure
- Introduce stated preference (SP) approaches to examine decision maker adoption of new technology
- Providing an in-depth discussion of methods relevant for transportation data in smart cities
- Describe basic choice models and provide an introduction to advanced choice models
- Provide a background in current transportation planning paradigm and identify future directions for customization

COURSE MODULES

Introduction	• Introduction to Smart City Technologies, their impact on Transportation
Stated Preference Module	• Background on Data Collection Approaches • Stated Preference Design and application
Traditional Discrete Choice Models	• Binary logit, multinomial logit, ordered logit, and count models
Advanced Discrete Choice Models	• Nested logit, mixed logit, maximum simulated likelihood estimation, regret minimization, discrete continuous models
Transportation Planning	• Current state of the art and recent advances

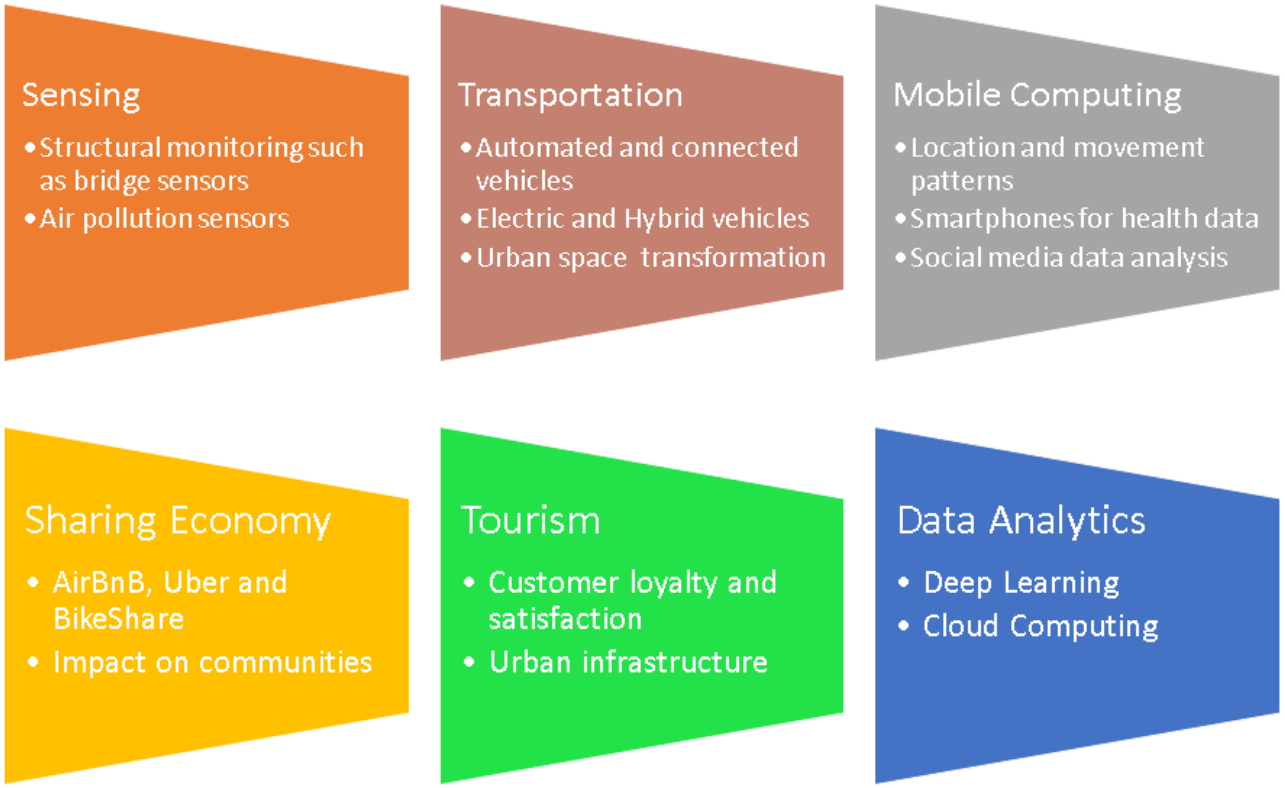
INTRODUCTION MODULE

SMART CITY

- Cities and Urban Areas
  - 1913: 10% of world's population lived in cities
  - 2013: 50% and 2050: 70% of world's population in cities
- Urban areas and metropolitan regions account for 76% of all economic activity and 85% of all scientific innovation
- By 2045 or so, Indian urban population will overtake rural population (UN)

URBAN DEVELOPMENT, NEEDS AND OPPORTUNITIES

- Improve safety – address road safety public health challenges
- Opportunity to integrate technological advances
- Improve quality of life and economic vitality
- Strengthen relationship between technology development and policy formulation



VEHICLE OWNERSHIP IN AUTONOMOUS WORLD

- The possibility of a completely connected autonomous vehicle fleet on the roadways is not far away.
  - The household owned vehicles are currently operated for a very small portion of the day
- With autonomous vehicles, it is likely that the traditional vehicle ownership model would be replaced by a vehicle fleet owned by private (or even public) agencies.
  - Individuals could potentially order cars based on their daily needs while paying usage charges
  - The transformation, would occur very slowly as the public considers vehicle fleet replacement and signing up for such schemes

VEHICLE OWNERSHIP IN AUTONOMOUS WORLD

- The success of these schemes will heavily depend on the pricing models (for fare) and optimization algorithms for resource allocation (at a system level)
  - We can conduct simulation experiments to evaluate the appropriate fleet size and pricing schemes from a vehicle fleet company perspective
  - The pricing schemes need to consider the transfer of costs such as insurance, gas, vehicle maintenance and parking from the consumer to the vehicle operating company
  - The fleet size decisions will be based on spatial and temporal resource allocation needs

TRAVEL BEHAVIOR IN AN AUTONOMOUS VEHICLE WORLD

- Travel behavior choices observed are in response to the need to minimize travel, accessibility to opportunities, safety and crime perceptions, individual and household socio-demographics.
- With connected and autonomous vehicles equipped with amenities (such as wi-fi, television), the paradigm for travel behavior decisions is completely altered.
- Household residential choices are no longer constrained by the household members' work or school location
- The prevalence of autonomous vehicles might also improve the adoption of non-motorized modes
- The specific dimensions of interest include residential location, activity location choice, land use pattern evolution in an autonomous vehicle world and adoption of non-motorized modes

CHOICE MODELING

- Choice modeling and econometric models provide an important analytical tool to study the emergence of Smart Cities
- Human interaction with technology will determine the level of success of technological innovation
- Choice modeling can contribute to two major directions of research analysis
  - Stated preference design and data analysis
    - Design, deploy and analyze data on technology not in the market (or too expensive to deploy) – Module 2
  - Statistical model development and estimation
    - Discrete choice models to analyze streams of data from smart devices to identify explainable patterns – Module 3-5