KRISHNA MURTHY GURUMURTHY

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EDUCATION

The University of Texas at Austin, USA ***expected* December 2020**
Doctor of Philosophy in Civil Engineering (*Transportation Engineering*) GPA: 3.91 / 4.00

Dissertation Shared Autonomous Vehicle System Designs for Major Metro Areas: An Examination of Geofencing, Road-Pricing, Drivetrain, Dynamic Ride-Sharing, and Stop-Location Decisions

The University of Texas at Austin, USA **May 2020**
Master of Science in Statistics and Data Sciences GPA: 3.96 / 4.00

Courses Statistical Modeling II, Consulting Seminar, Maximum Likelihood Statistics, Graduate Research in Statistics, Design and Analysis of Experiments, Mathematical Statistics I & II, Bayesian Statistical Methods, Dynamic Traffic Assignment and Public Transportation.

The University of Texas at Austin, USA **December 2017**
Master of Science in Civil Engineering (*Transportation Engineering*) GPA: 3.81 / 4.00

Thesis Perceptions and Preferences of Autonomous and Shared Autonomous Vehicles: A Focus on Dynamic Ride-Sharing

Courses Statistical Modeling I, Advanced Theory of Traffic Flow, Optimization I, Design and Evaluation of Ground-based Transportation Systems, Sensors and Signal Interpretation, Transportation Network Analysis, Urban Transportation Planning and Linear Regression and Discrete Choice Methods.

National Institute of Technology Karnataka (NITK), India **May 2016**
Bachelor of Technology in Civil Engineering GPA: 8.92 / 10.00

Project Report Framework for Various Traffic Models under Mixed Traffic Conditions

Courses Highway and Traffic Engineering, Railways, Tunnels, Harbors and Airports and Traffic Engineering and Management.

RESEARCH EXPERIENCE

Graduate Research Assistant **Fall 2016 – Present**
Supervisor: Dr. Kara Kockelman *UT Austin*

- Worked on two projects sponsored by the Texas Department of Transportation (0-6847 & 0-6838) from 2016-18, both focusing on autonomous and shared autonomous vehicles (S/AVs).
  - Deliverables included (1) creating and disseminating a U.S. survey on AV & SAV preferences, model estimations, and reporting, (2) an agent-based simulation of Austin, Texas using MATSim to capture travel behavior and future mode forecasts, that lead to two pricing-related journal papers, and (3) an AirSage-data supported simulation to estimate dynamic ride-sharing potential, that also lead to a journal paper.
- Mentored a graduate student on an NSF-funded SRN project to simulate and forecast SAV travel behavior for the Minneapolis-St Paul region using MATSim.
- Currently charged with an ANL project focusing on transportation planning/forecasting for SAVs
  - Completed SAV integration within POLARIS, along with a heuristic-based dynamic ride-sharing algorithm.
  - Provided recommendations on use of pickup-dropoff stop locations by showing how useful it is in improving average vehicle occupancy and lowering congestion when dedicated infrastructure is available.
  - Incorporated an electric SAV module in POLARIS that keeps track of charging stations and available charge.
  - A road-pricing module integrated into the available router is in the works.

Research Aide – Technical **Summer 2018**
Supervisor: Dr. Joshua Auld *Argonne National Laboratory*

- Tasked with developing algorithms for the control of shared-automated vehicle fleets and implementing the control & optimization algorithms in ANL's POLARIS.
- This 3-month internship involved understanding POLARIS, refreshing C++ syntax, developing an SAV module that integrates into the existing simulator to preserve feedback, and verifying SAV behavior through both code logic and visual tracing.

Project Research Intern **Spring 2016 – Summer 2016**
Supervisors: Drs. Tom V Mathew & Gowri Asaithambi *Indian Institute of Technology Bombay*

- Implemented a bi-directional traffic flow heuristic and mid-block pedestrian crossing models into a simulator developed in MATLAB. Tested robustness and ensured both components worked well together, and reported brief simulator results to confirm functionality.

Summer Research Intern **Summer 2015**
Supervisor: Dr. Tom V Mathew *Indian Institute of Technology Bombay*

- An innovative traffic flow model, the spring-mass-damper, was implemented in MATLAB to test the impact and sensitivities of model parameters, and was consequently presented at TRB.

PUBLICATIONS

1. **Gurumurthy, K.M.**, Kockelman, K.M., and Zuniga-Garcia, N. 2020. First-Mile-Last-Mile Collector-Distributor System using Shared Autonomous Mobility. *Transportation Research Record*.
2. **Gurumurthy, K.M.**, de Souza, F., Enam, A., and Auld, J. 2020. Integrating the Supply and Demand Perspectives for a Large-Scale Simulation of Shared Autonomous Vehicles. *Transportation Research Record* 2674 (7): 181-192.
3. Becker, H., Becker, F., Abe, R., Bekhor, S., Belgiawan, P.F., Compostella, J., Frazzoli, E., Fulton, L.M., Garrick, N., Bicuda, D.G., **Gurumurthy, K.M.**, Hensher, D.A., Joubert, J.W., Kockelman, K.M., Kroger, L., Kuhnimhof, T., Vine, S.L., Malik, J., Marczuk, K., Nasution, R.A., Rich, J., Carrone, A.P., Shen, D., Shiftan, Y., Tirachini, A., Verdis, D., Wong, Y.Z., Zhang, M., Bosch, P.M. and Axhausen, K.W. 2020. Impact of Vehicle Automation and Electric Propulsion on Production Costs for Mobility Services Worldwide. *Transportation Research Part A* 138: 105-126.
4. de Souza, F., **Gurumurthy, K.M.**, Auld, J., and Kockelman, K.M. 2020. A Repositioning Method for Shared Autonomous Vehicles Operation. *Procedia Computer Science* 170: 791-798.
5. **Gurumurthy, K.M.** and Kockelman, K. 2020. Modeling Americans' Autonomous Vehicle Preferences: A Focus on Dynamic Ride-Sharing, Privacy & Long-Distance Mode Choices. *Technological Forecasting and Social Change* 150 (119792).
6. **Gurumurthy, K.M.**, Kockelman, K. and Simoni, M.D. 2019. Benefits & Costs of Ride-Sharing in Shared Automated Vehicles across Austin, Texas: Opportunities for Congestion Pricing. *Transportation Research Record* 2673 (6): 548-556.
7. Simoni, Michele D., Kockelman, K., **Gurumurthy, K.M.** and Bischoff, J. 2019. Congestion Pricing in a World of Self-Driving Vehicles: An Analysis of Different Strategies in Alternative Future Scenarios. *Transportation Research Part C: Emerging Technologies* 98: 167-185.
8. **Gurumurthy, K.M.** and Kockelman, K. 2018. Analyzing the Dynamic Ride-Sharing Potential for Shared Autonomous Vehicle Fleets using Cellphone Data from Orlando, Florida. *Computers, Environment and Urban Systems* 71: 177-185.

MENTORING EXPERIENCE

Graduate students: Matt Dean (UT) • Ty Wellik (at General Motors) • Haonan Yan (at China's HiRain Technologies) • Adam Nodjomian (at Alliance Transportation Group)

Undergraduate students: Hyungseung (Jeffrey) Hahm • Evelyn Reyes (GLUE)

CONFERENCE PAPERS

1. **Gurumurthy, K.M.**, and Kockelman, K.M. How Much Does Greater Trip Demand and Aggregation at Stops Improve Dynamic Ride-Sharing in Shared Autonomous Vehicle Systems? Presented at the 2nd Bridging Transportation Researchers Online Conference.
2. Yan, H., Kockelman, K.M., and **Gurumurthy, K.M.** Shared Autonomous Vehicle Fleet Performance: Impacts of Parking Limitations and Trip Densities. Presented online at the 2020 Automated Vehicles Symposium's Energy and Environment Implications breakout session.
3. de Souza, F., **Gurumurthy, K.M.**, Auld, J., and Kockelman, K.M. An Optimization-Based Strategy for Shared Autonomous Vehicle Fleet Repositioning. Presented online at the 6th International Conference on Vehicle Technology and Intelligent Transport Systems.
4. de Souza, F., **Gurumurthy, K.M.**, Auld, J., and Kockelman, K.M. 2020. A Repositioning Method for Shared Autonomous Vehicles Operation. Presented online at the 9th International Workshop on Agent-based Mobility, Traffic and Transportation Models, Methodologies and Applications (ABMTRANS).

5. **Gurumurthy, K.M.**, de Souza, F., Enam, A., and Auld, J. 2020. Large-Scale Simulation of Shared Autonomous Vehicles: Integrating the Supply and Demand Perspectives. Presented at the 99th Annual Meeting of the Transportation Research Board, Washington, D.C.
6. **Gurumurthy, K.M.**, and Kockelman, K.M. 2020. Impacts of Shared Automated Vehicles on Airport Access & Operations, With Opportunities for Revenue Recovery: Case Study of Austin, Texas. Presented at the 99th Annual Meeting of the Transportation Research Board, Washington, D.C.
7. **Gurumurthy, K.M.**, Kockelman, K.M., and Zuniga-Garcia, N. 2020. First-Mile-Last-Mile Collector-Distributor System using Shared Autonomous Mobility. Presented at the 99th Annual Meeting of the Transportation Research Board, Washington, D.C.
8. Becker, H., Becker, F., Abe, R., Bekhor, S., Belgiawan, P.F., Compostella, J., Frazzoli, E., Fulton, L.M., Garrick, N., Bicuda, D.G., **Gurumurthy, K.M.**, Hensher, D.A., Joubert, J.W., Kockelman, K.M., Kroger, L., Kuhnimhof, T., Vine, S.L., Malik, J., Marczuk, K., Nasution, R.A., Rich, J., Carrone, A.P., Shen, D., Shiftan, Y., Tirachini, A., Verdis, D., Wong, Y.Z., Zhang, M., Bosch, P.M. and Axhausen, K.W. 2020. Impact of Vehicle Automation and Electric Propulsion on Production Costs for Mobility Services Worldwide. Presented at the 99th Annual Meeting of the Transportation Research Board, Washington, D.C.
9. **Gurumurthy, K.M.** and Kockelman, K. 2019. Modeling Americans' Autonomous Vehicle Preferences: A Focus on Dynamic Ride-Sharing, Privacy & Long-Distance Mode Choices. Presented at the 98th Annual Meeting of the Transportation Research Board, Washington, D.C.
10. **Gurumurthy, K.M.**, Kockelman, K. and Simoni, M.D. 2019. Benefits & Costs of Ride-Sharing in Shared Automated Vehicles across Austin, Texas: Opportunities for Congestion Pricing. Presented at the 98th Annual Meeting of the Transportation Research Board, Washington, D.C.
11. Simoni, Michele D., Kockelman, K., **Gurumurthy, K.M.** and Bischoff, J. 2019. Congestion Pricing in a World of Self-Driving Vehicles: An Analysis of Different Strategies in Alternative Future Scenarios. Presented at the 98th Annual Meeting of the Transportation Research Board, Washington, D.C.
12. Mahmoud, J., Auld, J., and **Gurumurthy, K.M.** 2019. Intra-Household Fully Automated Vehicles Assignment Problem: Model Development and Case Study. Presented at the 98th Annual Meeting of the Transportation Research Board, Washington, D.C.
13. **Gurumurthy, K.M.** and Kockelman, K. 2018. Analyzing the Dynamic Ride-Sharing Potential for Shared Autonomous Vehicle Fleets using Cellphone Data from Orlando, Florida. Presented at the 97th Annual Meeting of the Transportation Research Board, Washington, D.C.
14. Kotagi, P., Asaithambi, G. and **Gurumurthy, K.M**. 2018. Development of Microscopic Simulation Model for Bidirectional Mixed Traffic on Urban Roads. Presented at the 97th Annual Meeting of the Transportation Research Board, Washington, D.C.
15. **Gurumurthy, K.M.**, Munigety, C.R., Peeta, S., Mathew, T.V. and Asaithambi, G. 2017. An Integrated Pedestrian Crossing Behavioural Model Using Spring-mass-damper Dynamics. Presented at the 96th Annual Meeting of the Transportation Research Board, Washington, D.C.
16. **Gurumurthy, K.M.,** Singh, V. and Asaithambi, G. 2016. Microscopic Analysis of Lateral and Longitudinal Gaps in Mixed Traffic Conditions with Weak Lane Discipline. Presented at the 12th International Conference on Transportation Planning and Implementation Methodologies for Developing Countries, Mumbai, India.
17. Munigety, C.R., Gupta, P.A., **Gurumurthy, K.M**., Peeta, S. and Mathew, T.V. 2016. Vehicle-type Dependent Car following Model Using Spring-mass-damper Dynamics for Heterogeneous Traffic. Presented at the 95th Annual Meeting of the Transportation Research Board, Washington, D.C.

INVITED PRESENTATIONS

1. Invited Speaker, at the SESYNC Pursuit: People, Land, Water and Fish - Integrating Social and Environmental Models in the Chesapeake Watershed held in Annapolis, Maryland, presentation titled "Modeling Emerging Modes and Advanced Policies in MATSim", 21-22 February 2019.
2. Selected Speaker, at the TRB Workshop on Doctoral Research in Transportation Modeling and Travel Behavior held in Washington, D.C., presentation titled "A System of Shared Autonomous Vehicles for Chicago: Anticipating Impacts at Multiple Stages of Adoption", 13 January, 2019.
3. Invited Speaker, at the Machine Intelligence in Autonomous Vehicles Summit held in San Francisco, presentation titled "Anticipating a World of Shared Fully-Automated Vehicles" on behalf of Dr. Kara Kockelman, 23-24 March, 2017.

BOOK CHAPTERS

1. **Gurumurthy, K.M.**, Kockelman, K.M., and Loeb, B.J. 2019. Sharing Vehicles & Sharing Rides in Real Time: Opportunities for Self-Driving Fleets. Chapter Four in *Advances in Transport Policy and Planning: The Sharing Economy and the Relevance for Transport*, 4: 59-85 (Ed. Elliot Fishman).
2. Co-author of Chapter 18 in *Smart Transport for Cities & Nations: The Rise of Self-Driving & Connected Vehicles*. 2018. Kara Kockelman and Stephen Boyles (Eds). Published by CreateSpace on Amazon.com, August 2018. ISBN-10:0692121501, ISBN-13: 978-0692121504.

PAPERS UNDER REVIEW

1. **Gurumurthy, K.M.**, and Kockelman, K.M. Impacts of Shared Automated Vehicles on Airport Access & Operations, With Opportunities for Revenue Recovery: Case Study of Austin, Texas. Under review for publication in *Transportation Research Part A: Policy and Practice.*
2. **Gurumurthy, K.M.**, Auld, J., and Kockelman, K.M. A System of Shared Autonomous Vehicles for Chicago: Understanding the Effect of Geofencing the Service. Under review for publication in *Journal of Transport and Land Use.*
3. Yan, H., Kockelman, K.M., and **Gurumurthy, K.M.** Shared Autonomous Vehicle Fleet Performance: Impacts of Parking Limitations and Trip Densities. Under second-round review for publication in *Transportation Research Part D.*
4. Rahman, M., **Gurumurthy, K.M.**, and Kockelman, K.M. Impacts of Flextime on Departure Time Choice for Home-Based Commuting Trips in Austin, Texas. Under review for presentation at the 100th Annual Meeting of the Transportation Research Board to be held virtually in January, 20201.
5. **Gurumurthy, K.M.**, Dean, M., and Kockelman, K.M. Strategic Charging of Shared Fully-Automated Electric Vehicle (SAEV) Fleets. Under review for presentation at the 100th Annual Meeting of the Transportation Research Board to be held in January, 2021.
6. **Gurumurthy, K.M.**, and Kockelman, K.M. Dynamic Ride-Sharing Impacts of Greater Trip Demand and Aggregation at Stops in Shared Autonomous Vehicle Systems. Under review for presentation at the 100th Annual Meeting of the Transportation Research Board to be held virtually in January, 2021, and for publication in *Transportation Research Part A's* special issue: The Curb Lane.

TECHNICAL REPORTS

1. Kockelman, K., Boyles, S., Sturgeon, P., Claudel, C., ... **Gurumurthy, K.M.**, He, D., ... and Yarmohammadisatri, S. "Phase 2 - Bringing Smart Transport to Texans: Ensuring the Benefits of a Connected and Autonomous Transport System in Texas - Final Report". Technical Report FHWA/TX-18/0-6838-3, TxDOT, CTR, UT Austin, TX, July 2018.
2. Kockelman, K., Loftus-Otway, L., Stewart, D., Nichols, A., Wagner, W., Boyles, S., Levin, M., Liu, J., Perrine, K., Kilgore, S., and **Gurumurthy, K.M.** "Best Practices for Modifying Transportation Design, Planning, and Project Evaluation in Texas." Report 0-6847-P1, TxDOT, CTR, UT Austin, TX, March 2017.

TEACHING EXPERIENCE

Teaching Assistant **Course Instructor: Dr. Kara Kockelman** **Spring '20**
CE392T: Transportation Economics (Graduate Course) *UT Austin*

- Tasked with creating solutions to and grading assignments and exams as needed on the topics of firm behavior, consumer behavior and statistical modeling of transportation economics data.
- Responsible for students' project reports undertaken for half the semester through timely feedback, with some leading to conference submissions.
- Delivered tutorials on the use of STATA and R for statistical estimation, along with pointers on model inference.
- Created an assignment on exploring data, creating summary statistics, and fitting OLS models.
- Held office hours to improve students' understanding of STATA so that they can apply it in class projects.

Teaching Assistant **Course Instructor: Dr. Kara Kockelman** **Spring '19**
CE392E: Acquisition and Analysis of Transport Data (Graduate Course) *UT Austin*

- Responsible for students' performance in designing, implementing, collecting and modeling survey data focused on transportation engineering and policy.

- Created an assignment to educate students on data scraping opportunities using APIs to enhance the value of survey-collected data.
- Introduced Bayesian-approaches to data analysis by modifying existing assignments to encourage learning non-traditional approaches.
- Held office hours to improve students' understanding of STATA so that they can apply it on class projects.

Teaching Assistant **Course Instructor: Dr. Kara Kockelman & Ms. Heidi Ross*** **Spring '17, '18* & '19**
CE367G: Design & Evaluation of Ground-Based Transportation Systems (Undergraduate Course) *UT Austin*

- Responsible for students' understanding of highway-design terminology and curve design.
- Introduced the use of Excel for benefit-cost analysis, rule-of-half to include induced demand, and the solver for basic optimization.
- Helped students navigate the use of MicroStation and GEOPAK for highway design on their final design-project for this capstone course in transportation engineering.

PEER REVIEWER – JOURNALS

- *Transportation Research – Part A, Part B, Part C, Part D*
- *Computers, Environment and Urban Systems*
- *Transport Policy*
- *Transportation*
- *Transportation Research Record: Journal of the Transportation Research Board*
- *Accident Analysis and Prevention*
- *Journal of Transport and Land Use*
- *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations*

PROGRAMMING LANGUAGES

C++ • MATLAB • Java • R • Python

SOFTWARE SKILLS

TransCAD • Microsoft Office • ArcGIS, QGIS • STATA, SPSS, SAS • Mathematica • MicroStation & GEOPAK

CO-CURRICULARS

Friend, TRB's AHB30 Standing Committee on Vehicle-Highway Automation	2019 – Present
Friend, TRB's ABJ40 Standing Committee on Travel Survey Methods	2018 – Present
Friend, TRB's ABE50 Standing Committee on Transportation Demand Management	2018 – Present
Friend, TRB's ADB40 Standing Committee on Transportation Demand Forecasting	2017 – Present
Friend, TRB's ADE90 Standing Committee on Transportation in the Developing Countries	2017 – Present
Member & Ex-Officer, Women's Transportation Seminars, UT Austin Student Chapter	Fall 2017 – Present
Member & Past President, Institute of Transportation Engineers, UT Austin Student Chapter	Fall 2016 – Present
Member & Ex-Officer, Intelligent Transportation Society of America, UT Austin Student Chapter	Fall 2016 – Present
Eno Fellow, Eno Center for Transportation	Class of 2019
Core Team Member, UT Austin Traffic Bowl Team	2017 & 2019
Mentor, Graduates Linked with Undergraduates in Engineering (GLUE)	Fall 2017
Lead Event Organizer, Texas Student Leadership Summit	Fall 2017
Member, ASCE UT Austin Chapter	Spring 2017 – Fall 2017
Executive Member, ASCE NITK Students' Chapter	Spring 2014 – Spring 2016
Executive Member, Institution of Engineers – NITK Chapter	Fall 2013 – Spring 2016

VOLUNTEERING

Marketing Coordinator, UT Apartment's Tenant Advisory Board	Spring 2019 - Present

Selection Committee, UT Graduate Student Assembly's Travel Awards — Spring 2019
Volunteer, Clean-up drive organized by Capital Area Section – ITE — Spring 2017, Spring 2018
Volunteer, Women's Transportation Seminars – Heart of Texas' Annual Gala — Spring 2018
Joint Convener, Civil Events Committee in NITK's university-wide technical event — Fall 2015

AWARDS & ACHIEVEMENTS

- Member of UT Austin Traffic Bowl Team that won the international championship in 2019 and the Texas district championship in 2017. We were runners-up in the 2017 international championships.
- Received the Conference of Minority Transportation Officials (COMTO) scholarship to attend the 2019 Eno Transportation Center's Future Leaders (weeklong) Development Conference in Washington, D.C.
- Graduate Research Award by TRB's Airport Cooperative Research Program (2018-2019).
- Outstanding Student Award at TexITE (Texas Institute of Transportation Engineers) Spring Meeting, 2018.
- Awarded the CAS-ITE (2017) and ITS Texas (2017, 2018) scholarships, and Texas ITE district fellowship (2017).
- Best Paper Award at IIT Bombay's AAKAAR symposium, for paper titled "Quantitative Determination of Vehicle Influence in Mixed Traffic Conditions".