

# Natalia Zuniga-Garcia

## CURRICULUM VITAE

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## Education

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**Ph.D. in Civil Engineering | Transportation Engineering** 2018 - Present  
Department of Civil, Architectural and Environmental Engineering, University of Texas at Austin Austin, TX  
*Dissertation:* Characterizing emerging urban transportation modes: Models and methods. *Advisor:* Randy B. Machemehl.

**M.Sc. in Statistics and Data Sciences** May 2018  
Department of Statistics and Data Sciences, University of Texas at Austin Austin, TX  
*Thesis:* Spatial pricing evaluation of ride-sourcing trips using the graph-fused lasso. *Advisor:* James G. Scott.

**M.Sc. in Civil Engineering | Infrastructure Materials Engineering** May 2017  
Department of Civil, Architectural and Environmental Engineering, University of Texas at Austin Austin, TX  
*Thesis:* Predicting friction with improved texture characterization. *Advisor:* Jorge A. Prozzi.

**B.Sc. and Licentiate in Civil Engineering** December 2012  
School of Civil Engineering, University of Costa Rica San Jose, Costa Rica  
*Thesis:* Methodology to evaluate the performance of pavement surface treatments in laboratory. *Advisor:* Fabian Elizondo.

## Teaching Certifications

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**Graduate Certificate in Engineering Education** May 2020 (Expected)  
Cockrell School of Engineering, University of Texas at Austin Austin, TX  
*Graduate coursework:* Knowing and Learning in STEM Education, Supervised Teaching in Civil Engineering, Assessment and Curriculum Design in Engineering, Engineering Teaching Practicum, Teaching Portfolio Preparation.

**Advanced Teaching Preparation Certificate** Fall 2018  
Faculty Innovation Center, University of Texas at Austin Austin, TX

**Inclusive Classrooms Leadership Certificate** Nov. 2018  
Division of Diversity and Community Engagement, University of Texas at Austin Austin, TX

## Academic Appointments

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**Interim Professor** Aug. 2014 - Dec. 2014  
School of Civil Engineering, University of Costa Rica San Jose, Costa Rica

## Teaching Experience

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**INTERIM PROFESSOR**  
**School of Civil Engineering, University of Costa Rica**  
IC 0810 Geometric Design: Led weekly sessions for fourth-year civil engineering students. II Semester 2014

**TEACHING ASSISTANT**  
**Department of Civil Engineering, University of Texas at Austin**  
CE 392M Public Transportation Engineering (Instructor: Dr. Randy B. Machemehl) Fall 2018 / Fall 2019  
CE 367P Pavement Design and Performance (Instructor: Dr. Jorge A. Prozzi) Spring 2016 / Fall 2016

**MENTOR**  
**Women in Engineering Program (WEP), University of Texas at Austin**  
Graduates Linked with Undergraduates in Engineering (GLUE) Program Fall 2017 / Spring, Fall 2019  
**Department of Mathematics, University of Texas at Austin**  
Directed Reading Program (DRP) Fall 2018  
**Center for Transportation Research (CTR), University of Texas at Austin**  
University Transportation Center Undergraduate Internship (UTC-UI) Program Summer 2015 / Summer 2016

## Honors & Awards

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- 2020 **GLUE Mentor Award**, Women in Engineering Program (WEP), UT-Austin
- 2020 **Graduate Research Award**, Airport Cooperative Research Program (ACRP), Transportation Research Board (TRB)
- 2020 **Mary Kate Collins Memorial Endowed Presidential Scholarship in Civil Engineering**, UT-Austin
- 2019 **Study in Intelligent Transportation Systems (ITS) Scholarship**, Intelligent Transportation Society (ITS) Texas
- 2019 **Graduate Engineering Travel Grant**, Graduate Engineering Council (GEC), UT-Austin
- 2018 **Diane Woodend Jones Leadership Legacy Scholarship**, Women's Transportation Seminar (WTS), International
- 2018 **WTS Leadership Legacy Scholarship**, Women's Transportation Seminar, Heart of Texas (WTS-HOT) Chapter
- 2018 **Leadership Collaborative Leader Award**, Women in Engineering Program (WEP), UT-Austin
- 2016 **Professional Development Award**, Department of Civil, Architectural and Environmental Engineering, UT-Austin
- 2016 **Innovation and Human Capital Program for Competitiveness Scholarship**, Inter-American Development Bank (IDB) and Ministry of Science and Technology (Costa Rica)

## Research Experience

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### Graduate Research Assistant

2015 - Present

Center for Transportation Research (CTR), University of Texas at Austin

- Performed data analysis and statistical modeling for several transportation research projects.
- Authored and co-authored more than 20 research reports, journal publications, and conference proceedings.

### Research Engineer

2013 - 2014

Sustainable Urban Development Program (ProDUS), University of Costa Rica

- Collaborated in the preparation of research proposals and public bidding / Authored and co-authored technical reports.
- Led more than 50 undergraduate research assistants in the development of field data collection activities.

## Publications

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[Google Scholar page]

### REFEREED JOURNAL PUBLICATIONS

1. **Zuniga-Garcia, N.**, M. Tec, J.G. Scott, N. Ruiz-Juri, and R.B. Machemehl. (2020). Evaluation of ride-sourcing search frictions and driver productivity: A spatial denoising approach. *Transportation Research Part C: Emerging Technologies*, 110, 346–367. <https://doi.org/10.1016/j.trc.2019.11.021>.
2. **Zuniga-Garcia, N.** and J.A. Prozzi. (2019). High-definition field texture measurements for predicting pavement friction. *Transportation Research Record*, 2673(1), 246–260. <https://doi.org/10.1177/0361198118821598>.
3. **Zuniga-Garcia, N.**, H.W. Ross, and R.B. Machemehl. (2018). Multimodal level of service methodologies: Evaluation of the multimodal performance of arterial corridors. *Transportation Research Record*, 2672(15), 142–154. <https://doi.org/10.1177/0361198118776112>.
4. Kouchaki, S., H. Roshani, J.A. Prozzi, **N. Zuniga-Garcia**, and J.B. Hernandez. (2018). Field Investigation of relationship between pavement surface texture and friction. *Transportation Research Record*, 2672(40), 395–407. <https://doi.org/10.1177/0361198118777384>.
5. **Zuniga-Garcia, N.**, W. Martinez-Alonso, A. de Fortier Smit, F. Hong, and J.A. Prozzi. (2018). Economic analysis of pavement preservation techniques. *Transportation Research Record*, 2672(12), 10–19. <https://doi.org/10.1177/0361198118768515>.

### MAGAZINE PUBLICATIONS

1. **Zuniga-Garcia, N.** and J.A. Prozzi (2018, Sept.). Análisis probabilístico del costo del ciclo de vida de técnicas de preservación de pavimentos. *Revista Asfalto y Pavimentación*, VIII(30), 23–31. <https://www.asefma.es/wp-content/uploads/2018/10/Revista-Asfalto-y-Pavimentaci%C3%B3n-30.pdf>

### UNDER REVIEW

1. Tec, M., **N. Zuniga-Garcia**, R.B. Machemehl and J.G. Scott. Large-scale spatiotemporal density smoothing with the graph-fused elastic net: Application to ride-sourcing driver productivity. Under review for publication in *Journal of the American Statistical Association*. arXiv preprint arXiv:1911.08106. <https://arxiv.org/abs/1911.08106>.
2. Gurumurthy, K.M., K.M. Kockelman, and **N. Zuniga-Garcia**. First-mile-last-mile collector-distributor system using shared autonomous mobility. Under review for publication in *Transportation Research Record*.
3. **Zuniga-Garcia, N.**, R.B. Machemehl, N.A. Khwaja, K.D. Pruner, and M. Fu. Estimating road user costs in data-limited or time-constrained environments. Under review for publication in *Journal of Management in Engineering*.

## Conference Presentations

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1. **Zuniga-Garcia, N.**, R.B. Machemehl, N. Khwaja, K. Pruner, and M. Fu. (2020). Estimating road user costs in data-limited or time-constrained environments. *99th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2020.
2. **Zuniga-Garcia, N.** and R.B. Machemehl. (2020). Dockless electric scooters and transit use in an urban/university environment. *99th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2020.
3. Gurumurthy, K.M., K.M. Kockelman, and **N. Zuniga-Garcia**. (2020). First-mile-last-mile collector-distributor system using shared autonomous mobility. *99th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2020.
4. El Hachem, Y., **N. Zuniga-Garcia**, and J.A. Prozzi. (2019). Uso de Láser 3D para ajustar la dosis de ligante asfáltico en tratamientos superficiales. *XX Congreso Ibero Latinoamericano del Asfalto (CILA)*, Guadalajara, Mexico, November 2019.
5. Gurumurthy, K.M., K.M. Kockelman, and **N. Zuniga-Garcia**. (2019). First-mile-last-mile collector-distributor system using shared autonomous mobility. *Automated Vehicles Symposium*, Orlando, FL, July 2019.
6. **Zuniga-Garcia, N.**, H.W. Ross, and R.B. Machemehl. (2019). Evaluation of the multimodal performance of arterial corridors. *Transportation Planning Applications Conference (TRBAppcon)*, Portland, OR, June 2019.
7. **Zuniga-Garcia, N.**, M. Tec, J.G. Scott, N. Ruiz-Juri, and R.B. Machemehl. (2019). Evaluation of ride-Sourcing search frictions and driver productivity. *98th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2019.
8. **Zuniga-Garcia, N.** and J.A. Prozzi. (2019). High-definition field texture measurements for predicting pavement friction. (2019). *98th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2019.
9. **Zuniga-Garcia, N.**, M. Tec, J.G. Scott, N. Ruiz-Juri, and R.B. Machemehl. (2018). Evaluating spatial pricing in ride-sourcing systems: A graph fused lasso denoising approach. *2018 Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting*, Phoenix, AZ, November 2018.
10. **Zuniga-Garcia, N.**, H.W. Ross, and R.B. Machemehl. (2018). Multimodal level of service methodologies: Evaluation of the multimodal performance of arterial corridors. *97th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2018.
11. **Zuniga-Garcia, N.**, S. Kouchaki, H. Roshani, J.A. Prozzi, and J.B. Hernandez. (2018). Field investigation of relationship between pavement surface texture and friction. *97th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2018.
12. **Zuniga-Garcia, N.**, W. Martinez-Alonso, A. de Fortier Smit, F. Hong, and J.A. Prozzi. (2018). Economic analysis of pavement preservation techniques. *97th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2018.
13. **Zuniga-Garcia, N.**, A. de Fortier Smit, and J.A. Prozzi. (2018). Predicting friction with improved texture characterization. *97th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2018.
14. **Zuniga-Garcia, N.**, J.A. Prozzi, and A. de Fortier Smit. (2017). Cuantificación de la macro- y micro-textura del pavimento para la estimación de fricción. *XIX Congreso Ibero Latinoamericano del Asfalto (CILA)*, Medellín, Colombia, November 2017.
15. **Zuniga-Garcia, N.**, J.A. Prozzi, and W. Martinez-Alonso. (2017). Análisis estocástico del costo del ciclo de vida de técnicas de preservación de pavimentos. *XIX Congreso Ibero Latinoamericano del Asfalto (CILA)*, Medellín, Colombia, November 2017.
16. Martinez-Alonso, W., **N. Zuniga-Garcia**, A. de Fortier Smit, and J.A. Prozzi. (2017). Life-cycle cost analysis of pavement preservation techniques in Texas. *96th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2017.
17. **Zuniga-Garcia, N.**, A. de Fortier Smit, M. Trevino, P. Buddhavarapu, and J.A. Prozzi. (2016). Laboratory design of quieter asphalt surfaces. *95th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2016.
18. **Zuniga-Garcia, N.**, A. de Fortier Smit, M. Trevino, P. Buddhavarapu, and J.A. Prozzi. (2015). Laboratory design of quieter asphalt surfaces. *27th Annual Road Profile Users' Group (RPUG) Meeting*, Raleigh, NC, November 2015.
19. **Zuniga-Garcia, N.**, and F. Elizondo-Arrieta (2013). Propuesta de una metodología para la evaluación del desempeño de tratamientos superficiales. *XVII Congreso Ibero Latinoamericano del Asfalto (CILA)*, Antigua, Guatemala, November 2013.

## Technical Reports

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1. **Zuniga-Garcia, N.** and R.B. Machemehl. (2019). Traffic analysis: Estimation of 24-hour travel times. Report prepared for the Texas Department of Transportation (TxDOT) Dallas District.
2. **Zuniga-Garcia, N.** and J.A. Prozzi. (2016). Contribution of micro- and macro-texture for predicting friction on pavement surfaces. Center for Highway Pavement Preservation (CHPP) Report UTA No. 3-2016.
3. Smit, A. de Fortier, M. Trevino, **N. Zuniga-Garcia**, P. Buddhavarapu, and J.A. Prozzi. (2016). Selection and design of quiet pavement surfaces. Texas Department of Transportation (TxDOT) Report FHWA/TX-16/0-6819-1.

# Research Projects

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## PRINCIPAL INVESTIGATOR

### Impact of Transportation Network Companies on Ground Access to Airports

Aug. 2019 - Present

With Dr. Randy B. Machemehl

Sponsored by ACRP at TRB

- Using Intelligent Transportation Systems (ITS) data sources to evaluate the impact of ride-sourcing on ground access to airports.
- Cleaning and processing transit location and demand information for multiple years.

### Evaluation Ride-Sourcing Search Frictions and Driver Productivity

Aug. 2017 - Aug. 2018

With Dr. Randy B. Machemehl, Dr. James G. Scott, Mauricio Tec and Dr. Natalia Ruiz-Juri

- Cleaning and mining of data from more than 1.5 million ride-sourcing trips, collected by an Austin based e-hailing company.
- Using big data statistical models to assess ride-sourcing search frictions, driver productivity, and demand density.

### Evaluation of the Multimodal Performance of Arterial Corridors

Jun. 2017 - Dec. 2017

With Dr. Randy B. Machemehl and Heidi W. Ross

Sponsored by HDR

- Implementing multimodal level of service metrics for corridor-level analysis.
- Assessing bicycle, pedestrian, and transit performance in arterial corridors to evaluate the multimodal level of service.

### Economic Analysis of Pavement Preservation Techniques

Jan. 2016 - Dec. 2016

With Dr. Jorge A. Prozzi and Dr. Andre de Fortier Smith

Sponsored by TxDOT

- Implementing a stochastic life-cycle cost analysis of pavement preservation techniques using data +14,000 construction projects.

### High-Definition Field Texture Measurements for Predicting Pavement Friction

Jan. 2016 - Dec. 2016

With Dr. Jorge A. Prozzi, Dr. Andre de Fortier Smith and Dr. Christian Claudel

Sponsored by USDOT

- Developing Multiple Linear Regression models to predict highway friction using transportation infrastructure data.
- Implementing signal processing techniques (such as linear filters) in Python, to enhance pavement texture characterization.

### Selection and Design of Quiet Pavement Surfaces

Jan. 2015 - Dec. 2015

With Dr. Jorge A. Prozzi and Dr. Andre de Fortier Smith

Sponsored by TxDOT & FHWA

- Developing laboratory procedures to measure and evaluate asphalt and concrete pavement noise.

## CO-INVESTIGATOR

### Bond Corridor Performance Analysis

Jun. 2017 - Present

With Dr. Randy B. Machemehl, Dr. Natalia Ruiz-Juri and Heidi W. Ross

Sponsored by HDR

- Developing a Shiny on-line application (using R) for the evaluation of multimodal performance metrics at corridor level.
- Processing and mining of ITS data from multiple sources, e.g. GTFS, AVL, APC, Bluetooth.

### Transit in the Context of New Transportation Paradigms

Jan. 2019 - Aug. 2019

With Dr. Randy B. Machemehl, Dr. Natalia Ruiz-Juri and Heidi W. Ross

Sponsored by D-STOP Center

- Cleaning and mining of data from more than 3 million dock-less bikes and scooters trips in Austin, Texas.
- Using spatial statistical models to evaluate the impact of dock-less scooters on public transportation demand.

### First-Mile-Last-Mile Collector-Distributor System using Shared Autonomous Vehicles

Jan. 2019 - Aug. 2019

With Dr. Kara M. Kockelman and Khrisna Murthy Gurumurthy

- Using agent-based simulation (MATSim) to evaluate operations impacts of using SAVs as a FMLM transit solution.

### Work Zones Traffic Analysis for Freeway Maintenance Projects

Jan. 2017 - Aug. 2019

With Dr. Randy B. Machemehl and Nabeel A. Khwaja

Sponsored by TxDOT

- Using microsimulation software (TSIS-CORSIM) and ITS information to assess the traffic impact of work-zones in Dallas, Texas.

# Skills

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**Languages** English (*Full professional proficiency*) | Spanish (*Native proficiency*) | Portuguese (*Elementary proficiency*)

**Computing** R | SQL | Python | MATLAB | C++

**Software** TSIS-CORSIM | SPSS | SAS | MS Office | L<sup>A</sup>T<sub>E</sub>X | ArcGIS | AutoCAD

**Statistics/ML** Spatio-temporal models | Reinforcement Learning | Deep Learning | MCMC | Network Data and Models

## Graduate Coursework

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**Transportation Engineering:** Public Transportation Engineering, Infrastructure System Management, Sensors and Signal Interpretation, Linear Regression and Discrete Choice Methods, Transportation Network Analysis, Advanced Theory of Traffic Flow.

**Statistics and Data Sciences:** Design and Analysis of Experiments (ANOVA), Bayesian Statistical Methods, Statistical Consulting Seminar, Statistical Modeling, Statistical Models for Big Data, Mathematical Statistics I and II.

**Engineering Education:** Knowing and Learning in STEM Education, Supervised Teaching in Civil Engineering, Assessment and Curriculum Design in Engineering, Engineering Teaching Practicum, Teaching Portfolio Preparation.

**Infrastructure Materials:** Pavement Design and Performance, Paste and Concrete Rheology, Advanced Concrete Materials, Concrete Durability, Computational Methods for Geological Sciences, Advanced Legal Concepts in Civil Engineering.

## Leadership and Relevant Activities

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### UNIVERSITY SERVICE

<b>Chair, Tenant Advisory Board (TAB)</b>	2019 - 2020
University Housing and Dining, University of Texas at Austin	
<b>Committee Member, University of Texas Shuttle Bus Committee</b>	2016 - 2020
Parking and Transportation Services, University of Texas at Austin	
<b>President, Women in Transportation Seminar (WTS) Student Chapter</b>	2017 - 2018
Cockrell School of Engineering, University of Texas at Austin	
<b>Seminar Series Director, Graduate Engineering Council (GEC)</b>	2017 - 2018
Cockrell School of Engineering, University of Texas at Austin	

### PROFESSIONAL SERVICE

<b>Committee Chair, Women in Transportation Seminar (WTS)</b>	2018 - 2020
Heart of Texas (WTS-HOT) Professional Chapter	
<b>Conference and Journal Referee</b>	2017 - 2020
International Journal of Pavement Engineering, Taylor & Francis	
Transportation Research Board (TRB) Meeting & Transportation Research Record (TRR) Journal	
<ul style="list-style-type: none"><li><i>Committees:</i> Artificial Intelligence and Advanced Computing Applications (AED50), Statistical Methods (ABJ80), Bicycle and Pedestrian Data (ABJ35), Pavement Surface Properties and Vehicle Interaction (AFD90).</li></ul>	
<b>Friend of Committee, Transportation Research Board (TRB)</b>	2017 - 2020
Artificial Intelligence and Advanced Computing App. (AED50), Statistical Methods (ABJ80).	
<ul style="list-style-type: none"><li><i>Activities:</i> In charged of the website development and communication update for the committee AED50 (formerly ABJ70).</li></ul>	

## Volunteer Experience

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2017-2019 **Explore UT - Cockrell School of Engineering**, University of Texas at Austin Open House.

2017-2019 **Introduce a Girl to Engineering (Girl Day)**, Women in Engineering Program, University of Texas at Austin.

Oct. 2017 **Keep Austin Beautiful Adopt a Street Clean-Up**, Capital Area Section of ITE (CAS-ITE).

## Professional Affiliations

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*Student Member*, Institute of Transportation Engineers (ITE).

*Student Member*, Intelligent Transportation Society (ITS).

*Student Member*, Women's Transportation Seminar (WTS).

*Student Member*, American Society of Civil Engineers (ASCE).

*Student Member*, Institute for Operations Research and the Management Sciences (INFORMS).

## Undergraduates Supervised

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**GLUE Program:** Neve Enloe (Fall 2019) / Emily Tyndall (Spring 2019) / Tiffany Tang (Fall 2017), *winner of the GLUE Award*.

**DRP Program:** Emily Nguyen (Fall 2018), *winner of the 2018 Carey Scholarship*.

**UTC-UI Program:** Luis Arruti (Summer 2016) / Andres Sanchez (Summer 2015).