

# Natalia Zuniga-Garcia

## CURRICULUM VITAE

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## Education

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**Ph.D. in Civil Engineering** May 2020 (Expected)  
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** 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** 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

## Academic Appointments

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

- Led weekly sessions for fourth-year civil engineering students. Course: IC 0810 Diseño Vial (*Geometric Design*).

## Teaching Experience

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### TEACHING ASSISTANT

**CE 392M Public Transportation Engineering (Instructor: Dr. Randy B. Machemehl)** Fall 2018 / Fall 2019  
Department of Civil, Architectural and Environmental Engineering, University of Texas at Austin

**CE 367P Pavement Design and Performance (Instructor: Dr. Jorge A. Prozzi)** Spring 2016 / Fall 2016  
Department of Civil, Architectural and Environmental Engineering, University of Texas at Austin

### MENTOR

**Graduates Linked with Undergraduates in Engineering (GLUE)** Fall 2017 / Spring, Fall 2019  
Women in Engineering Program (WEP), University of Texas at Austin

**Directed Reading Program (DRP)** Fall 2018  
Department of Mathematics, University of Texas at Austin

**University Transportation Center Undergraduate Internship (UTC-UI)** Summer 2015 / Summer 2016  
Center for Transportation Research (CTR), University of Texas at Austin

## 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.

**Undergraduate Research Assistant** 2010 - 2012  
Sustainable Urban Development Program (ProDUS), University of Costa Rica

- Collaborated in data collection, analysis, and processing for urban planning projects / Use of Geographic Information Systems.

## Honors & Awards

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- 2020 **Graduate Research Award**, Airport Cooperative Research Program (ACRP), Transportation Research Board (TRB)
- 2019 **Study in Intelligent Transportation Systems (ITS) Scholarship**, Intelligent Transportation Society (ITS) Texas
- 2019 **Mary Kate Collins Memorial Endowed Presidential Scholarship in Civil Engineering**, UT-Austin
- 2018 **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)

## Publications

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### REFEREED JOURNAL PUBLICATIONS

1. **Zuniga-Garcia, N.**, M. Tec, J.G. Scott, N. Ruiz-Juri, and R.B. Machemehl. 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.

### 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*.
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*.

## 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.
4. Pujol-Mesalles, R., J. Agüero-Velverde, and **N. Zuniga-Garcia** (2014). Elaboración de auditorías de demanda y cálculo de parámetros operativos del servicio de transporte remunerado de personas, modalidad autobús - Interlineas. Report prepared for Autoridad Reguladora de Servicios Públicos (ARESEP), San José, Costa Rica.

## Conference Presentations

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1. **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. *99th Annual Meeting of the Transportation Research Board*, Washington, DC, January 2020.
2. **Zuniga-Garcia, N.** and R.B. Machemehl. 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**. 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. 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 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.

## Skills

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<b>Languages</b>	English ( <i>Full professional proficiency</i> )   Spanish ( <i>Native proficiency</i> )   Portuguese ( <i>Elementary proficiency</i> )
<b>Programming</b>	<i>Advanced proficiency</i> : R, <i>Intermediate proficiency</i> : Python   MATLAB, <i>Basic proficiency</i> : SQL   C++
<b>Software Packages</b>	TSIS-CORSIM   SPSS   SAS   MS Office   L <sup>A</sup> T <sub>E</sub> X   ArcGIS   AutoCAD

# 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.

# 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.

**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.

**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.

## 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

Requirements: 16 credits. *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

Requirements: 7 workshops and a qualifying teaching statement.

### Inclusive Classrooms Leadership Certificate

Nov. 2018

Division of Diversity and Community Engagement, University of Texas at Austin

Austin, TX

Requirement: 2-days workshop.

## Leadership and Relevant Activities

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### UNIVERSITY SERVICE

#### *Chair, Tenant Advisory Board (TAB)*

2019 - 2020

University Housing and Dining, University of Texas at Austin

#### *Committee Member, University of Texas Shuttle Bus Committee*

2016 - 2020

Parking and Transportation Services, University of Texas at Austin

#### *President, Women in Transportation Seminar (WTS) Student Chapter*

2017 - 2018

Cockrell School of Engineering, University of Texas at Austin

#### *Seminar Series Director, Graduate Engineering Council (GEC)*

2017 - 2018

Cockrell School of Engineering, University of Texas at Austin

### PROFESSIONAL SERVICE

#### *Committee Chair, Women in Transportation Seminar (WTS)*

2018 - 2020

Heart of Texas (WTS-HOT) Professional Chapter

#### *Conference and Journal Referee*

2017 - 2020

Transportation Research Board (TRB) Meeting & Transportation Research Record (TRR) Journal

*Committees:* Artificial Intelligence and Advanced Computing Applications (ABJ70), Statistical Methods (ABJ80), Bicycle and Pedestrian Data (ABJ35), Pavement Surface Properties and Vehicle Interaction (AFD90).

#### *Friend of Committee, Transportation Research Board (TRB)*

2017 - 2020

Artificial Intelligence and Advanced Computing App. (ABJ70), Statistical Methods (ABJ80).

*Activities:* In charged of the website development and communication update for the committee ABJ70 (currently AED50).

### VOLUNTEER EXPERIENCE

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*, American Society of Civil Engineers (ASCE).

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