Natalia Zuniga

Curriculum Vitae

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Education

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 pavement 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

Graduate Certificate in Engineering Education *May 2020*
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

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

Honors & Awards

2020 **Graduate Research Award,** Airport Cooperative Research Program (ACRP), Transportation Research Board (TRB) at The National Academies of Sciences, Engineering & Medicine (NASEM)
2020 **GLUE Mentor Award,** Women in Engineering Program (WEP), UT-Austin
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)

Professional Experience

Graduate Research Assistant *2015 - Present*

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

- Performed data analysis and transport-operation evaluations for several funded research projects.
- Responsible for delivering oral and written presentations to the sponsors, including final or partial products.
- Led and collaborated in the preparation of several research proposals (budget of $300k+ each) with an awarded rate of 75%.
- Published 4 first-authored and 2 co-authored peer-reviewed papers, and 19 conference proceeding.

Statistical Consultant *(Student)* *Fall 2017*

Department of Statistics and Data Sciences, University of Texas at Austin

- Provided statistical consulting services to students, faculty, and private companies.

Transportation Engineer *2013 - 2014*

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

- Collaborated in the preparation of urban planning evaluations for several public-funded projects.
- Designed, implemented, and analyzed surveys and field data collection processes for transportation and urban studies.
- Led more than 50 undergraduate research assistants in the development of field data collection activities.

Undergraduate Research Assistant *2010 - 2012*

University of Costa Rica

- Collaborated in data collection, analysis, and processing for urban planning projects.
- Application of in-person interviews for household surveys.
- Use of Geographic Information Systems (GIS) and ArcGIS for analyzing land-use changes.

Teaching Experience

Adjunct Assistant 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*

Undergraduates Supervised

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).

Skills

Languages	English *(Full professional)* | Spanish *(Native)* | Portuguese *(Elementary)*
Computing	R | SQL | Python | MATLAB | C++ | Java
Software	TSIS-CORSIM | SPSS | SAS | MS Office | LaTeX | ArcGIS | AutoCAD
Statistics/ML	Spatio-temporal models | Reinforcement Learning | Deep Learning | MCMC | Network Data and Models

Publications [Google Scholar page]

Refereed Journal Publications

1. Gurumurthy, K.M., K.M. Kockelman, and **N. Zuniga-Garcia**. (2020). First-mile-last-mile collector-distributor system using shared autonomous mobility. Forthcoming in *Transportation Research Record*.

2. **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.

3. **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.

4. **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.

5. 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.

6. **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. **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

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. Aguero-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.

Theses

1. **Zuniga-Garcia, N.** Characterizing emerging urban transportation modes: Models and methods (Doctor of Philosophy in Civil Engineering Dissertation). The University of Texas at Austin, Austin, TX, United States. *Currently under development.*

2. **Zuniga-Garcia, N.** (2018). Spatial pricing empirical evaluation of ride-sourcing trips using the graph-fused lasso for total variation denoising (Master in Statistics Thesis Report). The University of Texas at Austin, Austin, TX, United States.

3. **Zuniga-Garcia, N.** (2017). Predicting friction with improved texture characterization (Master in Civil Engineering Thesis). The University of Texas at Austin, Austin, TX, United States.

4. **Zuniga-Garcia, N.** (2012). Propuesta de una metodología para la evaluación del desempeño de tratamientos superficiales en laboratorio (Licentiate in Civil Engineering Thesis). University of Costa Rica, San José, Costa Rica.

Conference Presentations

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 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.

Research Projects

Principal Investigator

Machine Learning for Modeling E-Scooter Trips *Aug. 2019 - Present*

With Dr. Randy B. Machemehl, Dr. James G. Scott and Mauricio Tec

- A negative binomial regression is used to model e-scooters as first/last mile solution to transit access using 12+ million trips.
- A methodological framework is implemented to solve confounding variables problems using Gradient Boosting Machine (GBM).

Impact of Transportation Network Companies on Ground Access to Airports *Aug. 2019 - Present*

With Dr. Randy B. Machemehl *Sponsored by ACRP at NASEM*

- 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 asses the traffic impact of work-zones in Dallas, Texas.

Leadership and Relevant Activities

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*

International Journal of Pavement Engineering, Taylor & Francis

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

- *Committees:* Artificial Intelligence and Advanced Computing Applications (AED50), 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. (AED50), Statistical Methods (ABJ80).

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

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

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).