María Nariné Torres Cajiao, Ph.D. — Curriculum vitae

Summary Post-doctoral Associate in the State University of New York at Buffalo. Currently working towards a better understanding of urban drainage effects in cities by means of storm-water modeling, large-scale optimization, Geographical Information Systems (GIS), and remote sensing. Interested in carrying out multidisciplinary research to support storm-water management through decision support tools that integrate social, economic, and environmental aspects.

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Education

Universidad de Los Andes, Bogotá, Colombia
- PhD., Engineering, 2019
- M.Sc., Civil Engineering, 2015
- B.Sc., Environmental Engineering, 2013

University at Buffalo, Buffalo, NY, EEUU
- Visiting Scholar, August 2017-July 2019

Research Interests Green Infrastructure (GI), Sustainable Urban Drainage Systems (SUDS), drainage system modeling, linear and stochastic optimization, machine learning, remote sensing analysis, decision support systems, participatory modelling.

Research Experience

- Optimized spatial allocation of green infrastructure for large cities. Fall 2015 - Spring 2019
  Developed a two stage framework for green infrastructure siting in large cities coupling a stochastic mixed integer program, remote sensing tools, and a simplified urban drainage model. Applied the methodology to the case study Bogotá, Colombia.
  Advisors: Juan Pablo Rodriguez and Zhenduo Zhu.
  Universidad de Los Andes and University at Buffalo.
- Analysis of sewer system failures and urban trees relation. Spring 2015-Fall 2016
  Developed linear, probit and logit statistical analyses to understand the relevant factors governing urban tree roots intrusion to the sewer system.
  Advisors: Joao Paulo Leitao and Juan Pablo Rodriguez
  Universidad de Los Andes.
- Optimized scheduling of sewer system preventive maintenance. Spring 2015 - Fall 2015
  Joint work with Industrial Engineering Department to develop a methodology for the planning and scheduling of preventive maintenance operations in the sewer system of Bogotá under limited crew resources.
  Advisors: Juan Pablo Rodriguez and Andres Medaglia
  Universidad de Los Andes.
- Risk diagnosis associated with works in sewer system confined spaces. Spring 2013
  Designed and carry out a monitoring campaign to measure carbon monoxide concentrations on sewer gas. Developed spatial analyses to correlate sewer system and environmental variables with carbon monoxide concentrations.
  Advisors: Juan Pablo Rodriguez
  Universidad de Los Andes.
- Other projects: 1) Promoting green infrastructure installation in private land, 2) Using deep learning techniques for urban land use classification, 3) Statistical models comparison to predict the occurrence of sediment-related failures in the sewer system.

Teaching Experience

Department of Civil and Environmental Engineering. Universidad de Los Andes.

Graduate Teaching Assistant

- Introduction to Environmental Engineering. Spring 2015 - Fall 2015
- Urban Hydrology. Spring 2014 - Fall 2014
  Supported instructor in the development and grading of content.
  Lectured recitation session classes.

Undergraduate Teaching Assistant

- Final Design Project in Environmental Engineering. Spring 2013 - Fall 2013
- Introduction to Environmental Engineering. Fall 2012 - Spring 2013
  Supported instructor in grading of content.

Industry Experience

MapRisk. Bogotá (Colombia).

- Assistant Engineer in consulting services. Fall 2014
  Oil Spill Modeling using GNOME software for contingency plans evaluation.

Gradex. Bogotá (Colombia).

- Assistant Engineer in consulting services. Summer 2014
  Digital Elevation Models and Light Detection and Ranging information manipulation for catchment delineation in rural areas.

Publications

1. Torres, M. N., Fontecha, J. E., Zhu, Z., Walteros, J. L.,Rodríguez, J. P., (2019) A participatory approach based on stochastic optimization for the spatial allocation of Sustainable Urban Drainage Systems for rainwater harvesting. *Environmental Modelling and Software*. In press.

2. Torres, M.N., Rodríguez, J. P., Leitão J.P. (2017) Geostatistical analysis to identify characteristics involved in sewer pipes and urban tree interactions. *Urban Forestry and Urban Greening*. 25, 36-42.

3. Fontecha, J. E., Akhavan-Tabatabei, R., Duque, D., Medaglia A. L., Torres, M. N., Rodríguez, J. P. (2016). On the preventive management of sediment-related sewer blockages: a combined maintenance and routing optimization approach. *Water Science & Technology*. 74 (2), 302-308.

Working Papers

1. Torres, M. N., Fontecha, J. E., Zhu, Z., Ahmed, Z., Rodríguez, J. P. (2019). Spatial Modeling and Mixed Integer Linear Programming for sustainable urban drainage planning in large cities.

2. Torres, M. N., Fontecha, J. E., Zhu, Z., Rodríguez, J. P. (2019). A deep learning land-use-identification method applied to Green Infrastructure siting in an urban catchment.

3. Ferrans, P., Torres, M. N., Zhu, Z., Rodríguez, J. P. (2019). A systematic quantitative review on Green Infrastructure models and tools for stormwater management planning purposes for large-scale case studies.

Presentations

Talks and Posters (*Presenting author)

- Torres, M.N., Zhenduo, Z., Ahmed, Z. Rodríguez*, J. P.(2019). A Methodology to Prioritize Sub-catchments for Sustainable Urban Drainage Systems Allocation in Large Cities. 38^{th} IAHR World Congress. Panama City, Panama.
- Torres, M.N., Zhenduo, Z., Rodríguez*, J. P.(2018). A prioritization tool for SUDS planning in large cities by coupling an Urban Drainage Model with Mixed Integer Linear Programming. World Environmental and Water Resources Conference. 11^{th} International Conference on Urban Drainage Modelling. Palermo, Italy.
- Torres, M. N., Zhenduo, Z., Ahmed, Z., Rodríguez*, J. P.(2018). A two-stage GIS-based methodology to support optimal Green Infrastructure allocation for large cities. American Geophysical Union Fall Meeting. Washington, D.C (U.S.A).

- Torres, M.N.*, Zhenduo, Z., Rodríguez, J. P.(2018). A prioritization tool for SUDS planning in large cities by coupling an Urban Drainage Model with Mixed Integer Linear Programming. World Environmental and Water Resources Conference. 11^{th} International Conference on Urban Drainage Modelling. Palermo, Italy.
- Torres*, M. N., Zhenduo,Z., Rodríguez, J. P.(2018). Development of prioritazion tool of cities' catchments for the optimized siting of Green Infrastructure. Thirty sixth Greater Buffalo Environmental Conference. Buffalo, New York (U.S.A).
- Muñoz, A.F., Torres*, M. N., Fontecha J.E., Zhu, Z., Rodríguez, J. P. (2017). A methodology for optimal sitting of sustainable urban drainage systems. Case study: Universidad de Los Andes campus. 14^{th} International Conference on Urban Drainage. Prague (Chezck Republic).
- Torres*, M. N., Rodríguez, J. P., Leitão, J. P., de Oliveira-Nascimento, N., Granceri, M. (2017). Decision support tools for sustainable urban drainage systems: a systematic quantitative review. 9^{th} International Conference Novatech.
- Torres*, M. N., Rodríguez, J. P., Leitão, J. P., Mutis, H. E. (2014). Anlisis de la relación entre las fallas en el sistema de alcantarillado y el arbolado urbano de la ciudad de Bogotá. XXI Seminario Nacional de Hidráulica e Hidrología. Villa de Leyva (Colombia)
- Torres*, M. N., Rodríguez, J. P., Leitão, J. P. (2014). Comparison of statistical failure models to support sewer system operation. International Conference on Hydroinformatics. New York (U.S.A)
- Torres*, M. N., Rodríguez, J. P., Leitão, J. P., Mutis, H. E. (2014). Analysis of the relation between sewer system failures and urban trees. International Conference on Urban Drainage. Kuching (Malaysia)
- Torres, M. N.; Rodríguez*, J. P.; Leitão, J.P.; Coelho, S. T., Díaz-Granados, M. A. (2013). Towards sustainable sewer system operation: A comparison of different statistical models. Spatial Statistics Conference. Columbus, Ohio (U.S.A)

Honors & Awards

- Scholarships: Ph.D. Engineering, M.Sc. Civil Engineering.
- Academic & Research: Travel Grant for 11th International Conference on Hydroinformatics, New York, 2014.

Software and programming Skills

Software packages: CityDrain, SWMM, PCSWMM, HEC-RAS, Auto-CAD, Microsoft Office, ArcGIS, STATA, SAS, Matlab, Simulink, ESA-SNAP, Gurobi Optimizer.
Programming languages: Java, Xpress-MP, Python, R.

References

Juan Pablo Rodríguez Sánchez, Ph.D.: pabl-rod@uniandes.edu.co
Zhenduo Zhu, Ph.D.: zhenduoz@buffalo.edu
Jose Walteros, Ph.D.: josewalt@buffalo.edu