

# ERNESTO F. MARTINEZ PAZ

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## EDUCATION

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- PhD** University of Michigan, Civil and Environmental Engineering Sept 2023  
Dissertation: “Sensing Drinking Water: Towards real time technology to monitor, control, and study drinking water quality at the tap.”  
Committee: Krista Wigginton (co-chair), Branko Kerkez (co-chair), Lutgarde Raskin, Elizabeth F.S. Roberts
- MS** University of Michigan, Civil and Environmental Engineering Dec 2019  
M.S. in Environmental Engineering  
Advisor: Krista Wigginton (co-chair), Branko Kerkez (co-chair)
- BS** University of California Los Angeles, Civil Engineering Dec 2016

## HONORS AND AWARDS

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- Rackham Graduate Student Research Grant** 2021  
Grant of \$1500 awarded for my research as a precandidate using chlorine sensors to monitor water quality at the tap. Awarded by the Rackham Graduate School at the University of Michigan.
- Dow Sustainability Masters Fellowship** 2018  
Award of \$20,000. Program supports students who are committed to finding interdisciplinary, actionable, and meaningful sustainability solutions to local-to-global scales; to prepare future sustainability leaders to make a positive difference in organizations worldwide. Award requires 1-year long interdisciplinary project working directly with a client. A report describing project and deliverables can be found at <https://graham.umich.edu/activity/18066>

## RESEARCH EXPERIENCE

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- Graduate Student Research Assistant**, University of Michigan 2017 - 2023  
Advisors: Krista Wigginton and Branko Kerkez
- Real Time Water Systems Lab:
    - Designed, built, and deployed first-of-its-kind multiparametric drinking water quality and hydraulic wireless sensor network. Used Particle microcontrollers to acquire and relay data through cellular or WIFI connections. Leveraged existing lab back-end infrastructure (InfluxDB and Grafana) for real-time

- integrations for data management, visualization, storage. Architecture can be found in my publication below (Martinez Paz et al. 2021)
- Scripted a pipeline to analyze data using open-source R and Python libraries. Pipeline currently being used by other students in the department.
  - Built a script in Python that automatically analyzes data and decides to actuate a valve based on an outcome. Script is hosted in a web service and interacts with each node individually through the internet.
  - Environmental Biotechnology Lab:
    - Produced Free and Total Chlorine curves using a UV-vis spectrophotometer and the DPD method to measure relationships between Oxidation-Reduction Potential Sensors and chlorine residual concentration in drinking water.
    - Designed field protocols for water quality data collection through in-situ water sampling and testing. Using field photometers and handheld probes to measure drinking water quality parameters: pH, conductivity, turbidity, hardness, alkalinity, sulphate, chloride, phosphate, free and total chlorine, total and fecal coliforms.
    - Application of qPCR and NanoDrop in the detection and quantification of targeted DNA from environmental samples.
  - Field Work:
    - Deployed and maintained the two largest drinking water quality wireless sensor networks that measures water quality directly at the tap.
      - 19 sensor nodes in Mexico City,
      - 13 sensor nodes in Ann Arbor.
    - Utilized ethnographic tools to gather qualitative data on water quality and availability perceptions from interacting with human subject participants in their home.

## **PUBLICATIONS**

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### ***Journal Publications***

Martinez Paz, E.F., Tobias, M., Escobar, E., Raskin, L., Roberts, E.F.S., Wigginton, K., and Kerkez, B., “Wireless Sensors for Measuring Drinking Water Quality in Building Plumbing: Deployments and Insights from Continuous and Intermittent Water Supply Systems,” ACS ES&T Engineering, vol. 3, no. 2, 2022, pp. 423-433.

### ***Conference Papers***

(Extended Abstract - Reviewed)

Martinez Paz, E.F., Raskin, L., Wigginton, K., and Kerkez, B., “Adaptive Flushing of Building Drinking Water Taps Using Real-Time Oxidation-Reduction Potential and Temperature Signals,” Proceedings of Hydroinformatics Conference, July 04-07, 2022.

Martinez Paz, E.F., Tobias, M., Escobar, E., Raskin, L., Roberts, E.F.S., Wigginton, K., and Kerkez, B., "Open Source Water Quality Sensing in Mexico City's Drinking Water Distribution Systems," Proceedings of Hydroinformatics Conference, July 2020. [Submitted] [Canceled for COVID]

## **ORAL PRESENTATIONS**

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Martinez Paz, E.F., Raskin, L., Wigginton, K., and Kerkez, B., "Adaptive Flushing of Building Drinking Water Taps Using Real-Time Oxidation-Reduction Potential and Temperature Signals," Hydroinformatics Conference, July 2022.

Dowdell, K., Olsen, K., Martinez Paz, E.F., Lee, S., Keown, J., Lahr, R., Busch, A., Steglitz, B., LiPuma, J.J., Olson, T., Hammes, F., Raskin, L., "Evaluation of Near-Real Time Flow Cytometry for Continuous Monitoring of a Full-Scale Drinking Water Ozone System," AEESP Research and Education Conference, June 2022.

Martinez Paz, E.F., Cole, F., Kerkez, B., Roberts, E.F.S., "Sensing Water in Mexico City" Seminar at Institute of Social Research UofM, February 2022.

Cheng, Y., Martinez Paz E.F., "Introduction to Machine Learning," Environmental Biotechnology at UofM Chalk Talk, June 2020.

Martinez Paz, E.F., Roberts, E.F.S., Wigginton, K., and Kerkez, B., "Mixed Methods For Monitoring Drinking Water Quality in Mexico City, Mexico." Sustainability and Development Conference, October 2019.

Martinez Paz, E.F., Abrams, E., Pflleiderer, E., Gutfreund, R., "Building sustainable water policy through mapping Mexico City's water sector," Dow Sustainability Fellows Symposium, December 2018.

## **PROFESSIONAL TRAINING**

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### **Data Science Certificate,**

Michigan Institute for Data Science, 2022

Description: Technical Breadth in Analysis Methods, Data Management, and Algorithms and Applications.

### **Science Communication Fellow,**

University of Michigan, Museum of Natural History, 2020

Description: Fellows accepted into the program participate in a series professional development workshops hosted by museum staff, focused on building the skills to effectively engage public audiences. Fellows develop meaningful, inquiry-based activities that showcase

their research then share these activities with K-12 students and/or the public at community outreach events. Hosted by the Museum of Natural History at the University of Michigan.

## **PROFESSIONAL SERVICE**

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### **(2x) Mentor for the Undergraduate Research Opportunity Program (UROP)**

University of Michigan, Real-time Water Systems Lab

Thought students the basics of electronics, sensors, and data. Assigned them year-long projects for their own development.

### **Graduate Student Advising Council**

University of Michigan, Department of Civil and Environmental Engineering, 2019-2021

## **PROFESSIONAL EXPERIENCE**

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### **Sanitation Districts of Los Angeles County**

#### ***Operations Engineering Intern at JWPCP – Wastewater Treatment Plant***

Carson, CA, 2016-2017

- Analyzed and made weekly data reports on digested solids and dewatering processes' performance.
- Designed and proposed underground pipe-isolation work of abandoned digesters' utilities including raw and digested sludge, low- and high- pressure steam, digester gas, water, and electricity. Coordinated work with field crews and included input into the work design.
- Led hot-tap project to isolate live digested sludge line. Hired a contractor based on lowest bid to do the job. Point of Contact.

### **Southern California Edison**

#### ***Local Planning Distribution Intern***

Santa Monica, CA, 2013-2016

- Field visits for on-site meetings with residential developers, for electrical grid equipment and infrastructure analysis.
- Performed asset evaluation with field-gathered data and structural analysis software.
- Red-lined electrical designs based on developers construction drawings.

### **San Diego Mesa Community College**

#### ***Math Tutor***

Santa Monica, CA, 2011-2013

- Assisted students of diverse cultural backgrounds ages 17 to 60+ with their varying learning needs.
- Conducted individual and group discussions on a variety of topics in the fields of math, physics, and Spanish.

## **LANGUAGES**

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**English:** Proficient in professional settings, writing and speaking.

**Spanish:** Native speaker.

## **COMPUTER SKILLS**

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**Programming:** R, Python, Matlab, C++

**Applications:** ArcGIS, Excel

**Online Platforms:** InfluxDB, Particle, Grafana, Airtable

## **OTHER**

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Live music, cooking, urban spelunking.  
American and Mexican Citizenship

## REFERENCES

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**Dr. Krista Wigginton**, Associate Professor  
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