Sriman Pankaj Boindala, PhD

Alexander von Humboldt Research Fellow — Civil & Infrastructure Systems Engineering
Chair of Digital Water Systems, Technical University of Berlin (TU Berlin), Germany
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PROFILE SUMMARY

Sriman Pankaj Boindala is an Alexander von Humboldt Research Fellow at TU Berlin, specializing in systems-level modeling, optimization, and resilience of urban water distribution networks under severe uncertainty. Bridging hydraulic engineering, transport physics, and mathematical optimization, his research addresses critical vulnerabilities in municipal water infrastructure where conventional probabilistic assumptions fail. Grounded in robust optimization, Info-Gap Decision Theory, stochastic modeling, and data-driven methods, his research spans three core thrusts:

- **Optimization Under Uncertainty in WDS Design & Operations:** Advancing the resilience of smart water grids and distribution architectures using robust optimization, stochastic modeling, Info-Gap Decision Theory, and advanced control theory frameworks.
- **Water Quality & Contaminant Dynamics:** Modeling contaminant propagation, booster disinfection scheduling under uncertainty.
- **Infrastructure Equity & Adaptation:** Embedding distributive justice and equitable resource allocation directly into algorithmic decision-making.

He has authored 14 peer-reviewed journal articles (h-index: 10, > 220 citations) in top water management journals and was awarded the Marie Skłodowska-Curie Seal of Excellence in consecutive cycles (2024, 2025). He serves as an Associate Editor for the ASCE *Journal of Water Resources Planning and Management* and chairs the ASCE-EWRI Task Committee on Generative AI in Publishing.

EDUCATION

- **Ph.D. Civil and Environmental Engineering**, Technion-Israel Institute of Technology, Haifa, Israel (**2020–2023**).
  Thesis: Uncertainty Inclusion in Design-Optimization of Multi-Quality Water Distribution Systems
- **M.Eng. Structural Engineering**, Birla Institute of Technology and Science, Pilani, India (**2017–2019**).
  Thesis: Investigation of Crushed Concrete Aggregates as a Replacement for Natural Aggregates in Alkali Activated Binder Concrete
- **B.Eng. Civil Engineering**, Birla Institute of Technology and Science, Pilani, India (**2013–2017**).
  Thesis: Understanding and Diagnosing Differences in Hydrological Model Structures

EMPLOYMENT & RESEARCH EXPERIENCE

Alexander von Humboldt Research Fellow **2026 – Present**
TU Berlin, Chair of Digital Water Systems, Germany

- **Project:** *Adaptive Resilience of Water Distribution Systems (ARWADS)*
- Researching adaptive topology frameworks and intelligent control systems for enhancing the structural resilience of cyber-physical water distribution networks (WDNs) under extreme stresses (pipe breaks, contamination, water scarcity).
- Developing physics-informed machine learning (PIML) and reinforcement learning paradigms for real-time network reconfiguration.

Postdoctoral Researcher **2025**
Technion – Israel Institute of Technology

- **Project:** *Israel–Germany Joint Research Grant — "StaySafe: Intermittent Agricultural Irrigation"*
- Developed numerical approximations for antimicrobial resistance gene (ARG) transport kinetics and bacterial regrowth in reclaimed wastewater irrigation systems.

- Collaborated with faculty at TU Munich and Technion to couple microbial fate models with agricultural irrigation scheduling under intermittent supply regimes.

Postdoctoral Researcher **2024**
KIOS Research and Innovation Center of Excellence, University of Cyprus

- **Project:** *ERC Synergy Grant — Water-Futures*
- Collaborated with KIOS, KWR Water Research Institute, Athens University, and Bielefeld University to embed social equity and distributive justice parameters into WDN optimization.
- Formulated advanced mathematical programming models to achieve fair, equity-driven disinfection distribution across diverse municipal demographic sectors in large-scale systems.

Independent Research Collaborator | ***[Self-Initiated, Unfunded]*** **2022 – 2023**
INRS Canada & Technion – Israel Institute of Technology

- **Focus:** *Optimal Water Quality Management Considering Incomplete Mixing at Cross-Junctions*
- Independently initiated a cross-institutional collaboration to address a critical gap in junction-mixing physics within WDN models.
- Extended EPANET-IMX to capture physical incomplete-mixing uncertainties at pipe cross-junctions, improving disinfectant concentration predictability under structural and spatial uncertainty.

Independent Research Collaborator | ***[Self-Initiated, Unfunded]*** **Ongoing**
IIT Kanpur, Technion – Israel Institute of Technology & KSCSTE-CWRDM, Kerala

- **Focus:** *Optimal Operation of Intermittent Water Supply Systems Considering Consumer Behavior*
- Developing an optimization framework for pump scheduling to improve equitable demand distribution in intermittent water supply (IWS) systems, incorporating consumer behavioral responses.

Ph.D. Researcher (Full Tuition Fee Waiver & Scholarship) **2020 – 2023**
Technion – Israel Institute of Technology

- **Dissertation:** *Uncertainty Inclusion in Design-Optimization of Multi-Quality Water Distribution Systems*
- Developed computational frameworks integrating Evolutionary Algorithms, Robust Optimization, stochastic modeling, and Info-Gap Decision Theory (MATLAB/Python) to optimize WDN design under severe uncertainty.
- Optimized network pressure dynamics, control theory mechanisms, and structural reliability across normal operation and cascading failure scenarios.

HONORS & AWARDS

- **Alexander von Humboldt Research Fellowship** (2026–2028)
  Alexander von Humboldt Foundation, Germany
  One of the most prestigious international research fellowships, awarded annually to a highly selective cohort of outstanding scientists worldwide based on a self-designed, independent research proposal.

- **Marie Skłodowska-Curie Actions – Seal of Excellence** (2024 & 2025)
  European Commission — MSCA Individual Postdoctoral Fellowship Programme
  Awarded in two consecutive cycles to top-ranked proposals that satisfy the program's rigorous quality threshold but exceed available funding limits.

- **Best Reviewer Award (2024)** — *Journal of Water Resources Planning and Management*, ASCE. Presented at ASCE-EWRI Conference 2025.
- **Best Paper Award (2021)** — First International Conference on Recent Advancements in Civil Engineering (ICRACE 2021), NIT Silchar.
- **Best Oral Presentation Award (2018)** — National Symposium on Emerging Environmental Challenges (EEC 2018), CSIR-NEERI.

TECHNICAL & COMPUTATIONAL CAPABILITIES

- **Optimization & Decision Theory:** Robust Optimization, Info-Gap Decision Theory (IGDT), Multi-Objective Optimization, Stochastic Modeling, GUROBI, CVXPY, LINGO.
- **Infrastructure & Hydraulic Simulation:** EPANET, EPANET-IMX, EPANET-MSX, WNTR, EPyT.
- **Scientific Computing & Tools:** Python, MATLAB, R, ArcGIS.

TEACHING & MENTORSHIP EXPERIENCE

Pedagogical Instruction & Course Support

- **Introduction to Data Science for Multi-disciplinary Engineering (TU Berlin)** – Teaching Support (Instructor: Prof. Andrea Cominola)
  Assisting in the instruction of foundational data science methodologies—including statistical analysis, regression modeling, and decision tree algorithms—with a focus on their practical application and Python-based tutorials in water resources engineering and modeling.
- **Fluid Mechanics & Water Resources Engineering (CE F212)** – Teaching Assistant
  Authored a specialized engineering reference manual embedding MATLAB solutions for fluid mechanics and hydraulic network dynamics problems. Supported foundational concepts critical to civil systems engineering.
- **Structural & Network Optimization (CE G514)** – Teaching Assistant
  Supported Master's students with numerical optimization assignments, risk analysis, and systems-level MATLAB simulation projects.
- **Hydrology (CE F321)** – Teaching Assistant
  Formulated instructional coursework materials, project guidelines, and rubrics for surface water hydrology and risk mitigation concepts.

Invited Lectures (Systems Engineering & Modeling)

- **Boindala, S. P.** (November 2025). "Steady-State and Extended Period Simulations (EPS): Understanding Pressures, Flows, and Demands", *Short-Term Course on Source to Tap: Design and Analysis of Water Supply Systems*, Indian Institute of Technology (IIT) Kanpur.
- **Boindala, S. P.** (May 2026). "Simulation of Water Quality Dynamics in Water Distribution Systems: Theory and Hands-on with WNTR", *Data Science & Artificial Intelligence for Urban Water Management SoSe 2026*, Chair of Digital Water Systems, TU Berlin.

Graduate Research Mentorship

- **Technical University of Berlin & Technion (2023–Present):** Formally and informally co-guided multiple Master's student researchers on computational infrastructure research, mathematical modeling of contaminant kinetics, optimization routines, and machine learning models for hydraulic network analytics.

INTERNATIONAL LEADERSHIP & PROFESSIONAL SERVICE

Editorial Roles

- **Associate Editor**, *Journal of Water Resources Planning and Management*, ASCE
- **Lead Guest Editor**, Special Collection on *Machine Learning and Artificial Intelligence in Water Distribution Systems*, *Journal of Water Resources Planning and Management*, ASCE
- **Co-Guest Editor**, Special Issue on *Optimisation of Water Distribution System Design and Operation Under Uncertainty*, *Water*, MDPI

Task Committee Leadership

- **Chair**, ASCE-EWRI Task Committee on Generative AI in Publishing
  Leading international experts in formulating ethical guidelines and implementation policies for advanced generative models in scientific literature.

- **Member**, ASCE-EWRI Task Committee on ML/AI Applications in Water Engineering.

PUBLICATIONS

Google Scholar Citations: 221 **h-index:** 10 **i10-index:** 10 (As of Sept 2026)

Journal Publications

1. Wéber, R., Sándor, L., Abhijith, G. R., **Boindala, S. P.**, & Ostfeld, A. (2027). Modeling Incomplete Solute Mixing at Pipe Junctions in Water Distribution Networks: Parametric CFD Simulations and a Predictive Regression Approach. *Journal of Hydraulic Engineering*, 153(1), 04026055.
2. **Boindala, S. P.**, Vrachimis, S. G., Eliades, D. G., & Polycarpou, M. (2025). Fairness in the distribution of water quality in drinking water supply systems. *Water Resources Management*. (**Submitted).
3. Salfety, O., Sarne, O., **Boindala, S. P.**, Abhijith, G. R., & Ostfeld, A. (2025). A Cell Model for Pollutant Transport Quantification in Rainfall–Runoff Watershed Events. *Water*, 17(11), 1693.
4. **Boindala, S. P.**, Jaykrishnan, G., & Ostfeld, A. (2025). Booster Disinfection Scheduling under Uncertainty in Water Distribution Systems: Approximate Robust Reformulation Approach. *Journal of Water Resources Planning and Management*.
5. **Sriman Pankaj, B.**, Vasan, A., & Jabez Christopher, J. (2024). Bio-inspired mix design optimization of self-compacting concrete using machine learning algorithms. *IJMMNO*.
6. Abhijith, G. R., Naidu, M. N., **Boindala, S. P.**, Vasan, A., & Ostfeld, A. (2023). Analyzing the role of consumer behavior in coping with intermittent supply in water distribution systems. *Journal of Hydroinformatics*, 25(5), 1766–1787.
7. Chundi, V., Raju, S., **Boindala, S. P.**, & Swain, S. S. (2023). A Non-Destructive Pavement Evaluation for the Development of a Multi Distress Regression Model Integrated with the BACKCSA Model. *IJPCRT*, 16(4), 873–887.
8. **Boindala, S. P**., Jaykrishnan, G., & Ostfeld, A. (2023). Robust Optimal Booster Disinfectant Injection in Water Systems under Uncertainty. *Water*, 15(9), 1777.
9. Vogeti, R. K., **Boindala, S. P.**, Kumar, D. N., & Raju, K. S. (2022). Streamflow forecasting in a climate change perspective using E-FUSE. *Journal of Water and Climate Change*, 13(11), 3934–3950.
10. **Pankaj, B. S.**, Jaykrishnan, G., & Ostfeld, A. (2022). Optimizing water quality treatment levels for water distribution systems under mixing uncertainty at junctions. *Journal of Water Resources Planning and Management*, 148(5), 04022013.
11. **Boindala, S. P.**, & Ostfeld, A. (2022). Robust Multi-Objective Design Optimization of Water Distribution System under Uncertainty. *Water*, 14(14), 2199.
12. Vasan, A., Srinivasa Raju, K., & **Sriman Pankaj, B.** (2022). Fuzzy optimization-based water distribution network design using self-adaptive cuckoo search algorithm. *Water Supply*, 22(3), 3178–3194.
13. **Pankaj, B. S.**, Naidu, M. N., Vasan, A., & Varma, M. R. R. (2020). Self-adaptive cuckoo search algorithm for optimal design of water distribution systems. *Water Resources Management*, 34(10), 3129–3146.

Selected Refereed Conference Proceedings

1. **Boindala, S. P.**, Vrachimis, S. G., Eliades, D. G., & Polycarpou, M. (2025). Optimal Chlorine Dosage Scheduling in Drinking Water Distribution Systems Considering Fairness Objectives. *World Environmental and Water Resources Congress 2025*, 987–1000.
2. **Boindala, S. P.**, Perelman, G., & Ostfeld, A. (2025). Robust Sample Average Approximation for Optimal Chlorine Disinfection under Multiple Uncertainties. *World Environmental and Water Resources Congress 2025*, 1001–1009.
3. **Boindala, S. P.**, Yousefian, R., Duchesne, S., & Ostfeld, A. (2024). Robust Booster Disinfection Scheduling Using Incomplete Mixing Water Quality Model (EPANET-IMX). *World Environmental and Water Resources Congress 2024*, 1367–1379.

4. Vizanko, B., Shmaya, T., **Boindala, S. P.**, Ostfeld, A., & Berglund, E. (2024). Operating Water Distribution Systems for Equitable Access to Clean Water. *World Environmental and Water Resources Congress 2024*, 1229–1235.

5. **Boindala, S. P.**, Jaykrishnan, G., & Ostfeld, A. (2023). Optimal Booster Chlorination Scheduling in WDS under Uncertainty: A Robust Counterpart Approach. *World Environmental and Water Resources Congress 2023*, 952–962.

6. **Boindala, S. P.**, Abhijith, G. R., Ihjas, K., & Ostfeld, A. (2024). Towards Optimal Scheduling of Intermittent Water Supply Systems Incorporating Consumer Behavior. *Engineering Proceedings*, 69(1), 168.

7. **Boindala, S. P.**, & Ostfeld, A. (2024). Multiobjective optimization of water distribution system under uncertainty using robust optimization. *Proc. 2nd Joint CCWI/WDSA Conference*.

8. **Boindala, S. P.**, Abhijith, G. R., Aumeier, B. M., Steger, A., Salomons, E., Elkayam, R., Drewes, J. E., & Ostfeld, A. (2025). Challenges in Mathematical Modelling of Anti-Microbial Resistance Fate in Water Systems. *Proceedings of 21st International CCWI Conference, University of Sheffield*.