

Mohamad H. Kazma

PhD Candidate, Civil Engineering

mohamad.h.kazma@vanderbilt.edu
mhkazma.github.io

JH265, 2301 Vanderbilt Place
Vanderbilt University, Nashville, TN

Education

PhD, Civil Engineering (Civil and Infrastructure Systems Engineering) **Jan. 2022 - Expected Aug. 2026**
Vanderbilt University Nashville, TN

Advisor: Dr. Ahmad F. Taha (*Dept. of Civil and Environmental Engineering*)

Committee: Dr. Ahmad F. Taha (Chair); Dr. Thomas Beckers; Dr. Sankaran Mahadevan; Dr. Daniel Work.

Dissertation: Advances in Scalable Observability and Sensor Placement for Nonlinear Systems: Theory and Applications.

MSc, Civil Engineering **Jan. 2022 - Dec. 2024**
Vanderbilt University Nashville, TN

BEng, Civil and Environmental Engineering **Jan. 2015 - May 2019**
Notre Dame University-Louaize Zouk Mosbeh, Lebanon

Research Interests

Primary: Observability and sensor placement in nonlinear dynamical systems, submodular optimization for infrastructure monitoring, and control-theoretic methods for civil infrastructure networks.

Secondary: Water distribution network modeling, power grid stability analysis, coupled hydrologic-hydrodynamic systems modeling, uncertainty quantification in complex systems, and resilience-oriented control of infrastructure systems.

Publications

Journal Articles Under Review

- [U4] **Kazma, M. H.**, & Taha, A. F. (2026). Exploring Uncertainty Propagation in Coupled Hydrologic and Hydrodynamic Systems via Distribution-Agnostic State Space Analysis. Under review at *Advances in Water Resources*, arXiv:2603.05740.
- [U3] Taha, A. F., **Kazma, M. H.**, & Albustami, A. A. (2026). Revisiting the PBH Test: Broken Eigenvalues and Fast Algorithms. Under review at *IEEE Control Systems Letters (L-CSS)*.
- [U2] Zhang, H., **Kazma, M. H.**, Ma, M., Johnson, T. T., & Taha, A. F. (2026). Verification and Forward Invariance of Control Barrier Functions for Differential-Algebraic Systems. Under review at *IEEE Transactions on Automatic Control*.
- [U1] Zhang, H., **Kazma, M. H.**, Wooding, B., Ma, M., Johnson, T. T., & Taha, A. F. (2026). Control Barrier Certificates for Differential-Algebraic Systems. Under review at *IEEE Control Systems Letters (L-CSS)*.

Journal Articles

- [J5] **Kazma, M. H.**, & Taha, A. F. (2026). Partitioning and Observability in Linear Systems via Submodular Optimization. Accepted at *IEEE Transactions on Automatic Control*, in press, arXiv:2505.16169.
- [J4] **Kazma, M. H.**, & Taha, A. F. (2026). Observability for Nonlinear Systems: Connecting Variational Dynamics, Lyapunov Exponents, and Empirical Gramians. Conditionally accepted at *IEEE Transactions on Control of Network Systems*, arXiv:2402.14711.
- [J3] **Kazma, M. H.**, Elsherif, S. M., & Taha, A. F. (2025). Observability and generalized sensor placement for nonlinear quality models in drinking water networks. *Journal of Water Process Engineering*. DOI: 10.1016/j.jwpe.2025.108339.
- [J2] **Kazma, M. H.**, & Taha, A. F. (2025). Stability and Uncertainty Propagation in Power Networks: A Lyapunov-based Approach with Applications to Renewable Resources Allocation. *IEEE Transactions on Power Systems*. DOI: 10.1109/TPWRS.2025.3539250.
- [J1] **Kazma, M. H.**, & Taha, A. F. (2025). Revisiting the Optimal PMU Placement Problem in Multimachine Power Networks. *IEEE Transactions on Control Systems Technology*. DOI: 10.1109/TCST.2024.3487029.

arXived Articles

- [rX1] Elsherif, S. M., **Kazma, M. H.**, & Taha, A. F. (2024). Quality-Aware Hydraulic Control in Drinking Water Networks via Controllability Proxies. arXiv:2401.12214.

Conference Papers / Proceedings

- [C10] **Kazma, M. H.**, & Taha, A. F. (2025). Multilinear Extensions in Submodular Optimization for Optimal Sensor Scheduling in Nonlinear Networks. *American Control Conference (ACC) 2025*. DOI: 10.23919/ACC63710.2025.11107694.

- [C9] **Kazma, M. H.**, & Taha, A. F. (2025). Generalizable Stability Metrics for Power Grids. *American Control Conference (ACC) 2025*. DOI: 10.23919/ACC63710.2025.11107812.
- [C8] Elsherif, S. M., **Kazma, M. H.**, & Taha, A. F. (2025). Controllability Gramians Make Water Safer: Water Quality and Hydraulic Regulation in Drinking Networks. *American Control Conference (ACC) 2025*. DOI: 10.23919/ACC63710.2025.11107804.
- [C7] Elsherif, S. M., **Kazma, M. H.**, Taha, A. F., & Abokifa, A. A. (2024). Water Quality Controllability Metrics, Limitations, and Hydraulic Dependencies. *World Environmental and Water Resources Congress 2024*. ASCE. DOI: 10.1061/9780784485477.124.
- [C6] **Kazma, M. H.**, & Taha, A. F. (2024). ODE Transformations of Nonlinear DAE Power Systems. *IEEE Power & Energy Society General Meeting 2024*. DOI: 10.1109/PESGM51994.2024.10688501.
- [C5] **Kazma, M. H.**, Nugroho, S. A., Haber, A., & Taha, A. F. (2023). State Robust Observability Measures for Nonlinear Network Systems. *IEEE Conference on Decision and Control (CDC) 2023*. DOI: 10.1109/CDC49753.2023.10383254.
- [C4] **Kazma, M. H.**, & Taha, A. F. (2023). Optimal Placement of PMUs in Power Networks: Modularity Meets A Priori Optimization. *American Control Conference (ACC) 2023*. DOI: 10.23919/ACC55779.2023.10156230.
- [C3] Salem, T., **Kazma, M. H.**, Bitar, J., Moussa, J., & Falah, D. (2021). Mechanical characterization of a concrete masonry block enhanced with micro-encapsulated phase changing materials. *Journal of Physics: Conference Series*. DOI: 10.1088/1742-6596/2042/1/012184.
- [C2] Salem, T., Metni, N., **Kazma, M. H.**, & Hanna, H. (2020). Numerical investigation of the impact of integrating solar collectors under stagnation. *REDEC 2020*. DOI: 10.1109/REDEC49234.2020.9163872.
- [C1] Salem, T., **Kazma, M. H.**, Metni, N., & Hanna, H. (2020). Impact on Thermal Comfort from the Integration of Solar Panels Under Stagnation in Buildings: A Numerical Investigation. *International Conference on Efficient Building Design 2020*.

Extended Abstracts

- [A3] **Kazma, M. H.**, Elsherif, S. M., & Taha, A. F. (2024). On Placement of Water Quality Sensors for Nonlinear Multi-Species Models in Drinking Networks. *EWRI Congress*.
- [A2] Elsherif, S. M., **Kazma, M. H.**, & Taha, A. F. (2024). Smarter Pump Scheduling Can Improve Water Quality Dynamics in Distribution Networks. *EWRI Congress*.
- [A1] **Kazma, M. H.**, & Taha, A. F. (2022). Revisiting the Optimal Sensor Placement Problem in Power Networks. *INFORMS Annual Meeting*.

Research Experience

Graduate Research Assistant

Jan. 2022 - Present

Vanderbilt University, Advisor: Dr. Ahmad F. Taha, Dept. of Civil and Environmental Engineering

Nashville, TN

Funded by Dr. Taha's NSF CAREER Award No. 2152450 (Division of Civil, Mechanical, and Manufacturing Innovation). Research focus: modeling, optimization, and monitoring of large-scale nonlinear dynamical systems representing complex infrastructure networks.

- Developing advanced algorithms that leverage *control theory* and *submodular optimization* to improve observability and monitoring of infrastructure systems.
- Enhancing infrastructure resilience through sensor placement and uncertainty quantification.

Research Assistant

Jun. 2019 - Dec. 2021

Notre Dame University-Louaize, Dept. of Civil and Environmental Engineering

Zouk Mosbeh, Lebanon

- CNRS-funded project: Impact of Integrating Solar Thermal Panels in Lebanese Buildings on the Indoor Environment. Supervised installation of two experimental test rooms and developed a numerical model using TRNSYS software.
- IP-valorization funded project: Concrete Masonry Units (CMUs) Enhanced with Phase-Changing Materials (PCMs). Performed thermal and mechanical testing of CMUs and conducted building performance simulations using TRNSYS software.

Teaching Experience

Graduate Teaching Assistant

SP2025

CE 3300: Risk, Reliability, and Resilience Engineering, Instructor: Dr. Hiba Baroud

Vanderbilt University

Taught 6 out of 12 modules covering probability, statistical inference with applications to engineering systems using R.

Graduate Teaching Assistant

SP2024

CE 6380-01: Applied Machine Learning, Instructor: Dr. Sankaran Mahadevan

Vanderbilt University

Covered modern machine learning methods with Python implementation for science and engineering applications.

Part-Time Lab Instructor

FA2021

Notre Dame University-Louaize, Drilling & Production Eng. Lab (PEN 472)

Zouk Mosbeh, Lebanon

Conducted hands-on laboratory experiments on properties of drilling and completion fluids, and gas measurement.

Part-Time Lab Instructor

Notre Dame University-Louaize, Environmental Eng. Lab (CEN 365)

SP2020 - SP2021

Zouk Mosbeh, Lebanon

Conducted hands-on experiments for design of landfill systems, wastewater treatment, and environmental monitoring.

Work Experience

Co-founder

PCM-CMU TECH, IP Valorization Grants Program

Jul. 2020 - Dec. 2021

Beirut, Lebanon

Conducted market research, validated the idea, developed an MVP, and refined the business model.

Civil Engineering Intern

ABNIAH S.A.R.L, Operations Department

Jun. 2018 - Jul. 2018

Beirut, Lebanon

Followed up on executed civil works, performed quantity takeoff, reviewed shop drawings, and prepared daily reports.

Assistant Translator

Annan Translations, Translation and Documentation

Jun. 2016 - Aug. 2016

Beirut, Lebanon

Supported translation of legal documents, liaised with government departments, and proofread/edited documents.

Academic Service

Journal Reviewer

IEEE Transactions on Power Systems, IEEE Control Systems Letters, Automatica, Journal of Water Resources Planning and Management, IEEE Transactions on Automatic Control, IFAC Control Engineering Practice, IEEE Transactions on Control of Network Systems, Systems & Control Letters, IEEE Transactions on Control Systems Technology, and Water Resources Research.

Conference Reviewer

IEEE Power & Energy Society General Meeting, IEEE Conference on Decision and Control (CDC), American Control Conference (ACC).

Professional

Student member of IEEE and ASCE; IEEE societies: IEEE Control Systems Society, IEEE Power & Energy Society, and IEEE Systems, Man, and Cybernetics Society.

Awards & Certifications

- Certified Associate in Project Management (CAPM®), Expired July 2024.
- Selected to join the 2020 IP Valorization Grants Program at Berytech — Innovation Voucher (\$25,000).
- Co-recipient of the Center of Innovation and Technology Innovation Voucher 2019 from ELCIM – IRI (\$6,000) for project "Concrete Masonry Units Enhanced with Phase Changing Materials".
- Participant, Annual ASCE 2019 Popsicle Bridge Competition (Lebanon) — 2nd place team.

Technical Skills

Programming

Python, MATLAB, R, Julia, L^AT_EX

Optimization

CVX, Gurobi, CPLEX, YALMIP, SeDuMi

Software

EPANET, PowerWorld, GAMS, GitHub, Power BI, Tableau, ANSYS, Abaqus, SAP2000, AutoCAD, Civil 3D, TRNSYS-18, Primavera P6, MATPOWER, Cantera, QGIS

Machine Learning

TensorFlow, PyTorch, Scikit-learn

Decision Analysis




Palisade Suite (Evolver, @Risk)

Languages

Arabic (Native/Fluent), English (Fluent)

Referees

Available upon request.

 Google Scholar  ORCID  Website

Last Updated: March 12, 2026