ZHONGHAO ZHANG

PhD Candidate | University of Victoria

Email: zhonghaoz@uvic.ca   Web: zhonghaoz.ca | Website | | Google Scholar |

| GitHub | | LinkedIn |

SUMMARY

PhD candidate in Mechanical Engineering at the University of Victoria developing uncertainty-aware modeling frameworks for urban flood and stormwater management. I integrate physically based models (e.g., MIKE+ and PCSWMM) with entropy as well as fuzzy theories to quantify uncertainty in model inputs and processes, aiming to improve interpretability and stakeholder-ready decision support. In addition, I maintain reproducible computational workflows (GIS, MATLAB, and Python) and actively publish and present in hydrology and water resources venues.

SELECTED RESEARCH HIGHLIGHTS

- **Fuzzy UQ + Generative AI hydrologic prediction:** Bridged fuzzy/entropy theory with physics-based models for data-efficient, near-real-time flood forecasting. (JP2; CP1; D1, D2)
- **LID modeling in PCSWMM®:** Verified LID process representations and scalability, and built a reproducible framework to evaluate performance across spatiotemporal scales. (JP4; PT2–PT5)
- **Climate & scale effects on stormwater:** Developed transferable siting/data-scaling frameworks, integrating IDF/climate tools with fuzzy C-means to enable repeatable, uncertainty-aware evaluations. (JP3; BC1; BC2; CP2)

SKILLS

Hydrological Modelling: PCSWMM, MIKE+

Core Competencies: Uncertainty Quantification • LID/GCM Modelling • Spatial Data Analysis • GIS Mapping • MATLAB • Fuzzy Inferencing • Risk Analysis

AI-assisted Development: Codex, Claude Code, Antigravity; LLM tooling & prototyping

PROFESSIONAL MEMBERSHIPS

- European Geosciences Union (EGU)
- Canadian Water Resources Association (CWRA)
- Canadian Association on Water Quality (CAWQ)

EDUCATION

University of Victoria Sept 2021 – Present

PhD in Mechanical Engineering | Victoria, BC, Canada

- Thesis: Scaling Nature based solution (LID) for stormwater management and quantifying uncertainty
- GPA: 8.25/9.00

Memorial University Sept 2019 – Feb 2021

Master of Applied Science in Safety and Risk Engineering | St. John's, NL, Canada

- GPA: 3.80/4.00 (Ranked Top 10%)
- Best project recipient

Central South University of Forestry and Technology Sept 2013 – Sept 2017

Bachelor of Science in Geographic Information Science | Changsha, China

- Excellent graduation thesis recipient

AWARDS

Philip H. Jones Award, Best Young Water Professional July 24, 2025

First place at the 2025 CAWQ Atlantic Symposium (St. John's, NL) for presenting the Fuzzy GPT application in peak flow prediction.

Best Presentation Award Nov 2023

ICEST 2023 Organizing Committee | Shandong University, Qingdao, China

Recognized for an outstanding presentation on fuzzy entropy-driven peak flow modelling at the 14th ICEST conference.

PUBLICATIONS

a) Articles published or accepted in peer-reviewed journals (JP)

1. Zhang, Z., & Valeo, C. (2026). Quantifying uncertainty in flowrate modelling using spatially defined fuzzy entropy based on hydrological processes in a catchment. *Journal of Hydrology*, 664, Article 134447. https://doi.org/10.1016/j.jhydrol.2025.134447

2. Zhang, Z., & Valeo, C. (2025). Fuzzy-based input method for uncertainty quantification in a deterministic model: Comparison with ChatGPT for peak flow prediction. *Journal of Hydrology X*, 28–29, 100208. doi.org/10.1016/j.hydroa.2025.100208

3. Zhang, Z., & Valeo, C. (2024). Low Impact Development Technologies for Mitigating Climate Change: Review and Direction. *National Science Open*, 3(1), 20230025. doi.org/10.1360/nso/20230025

4. Zhang, Z., & Valeo, C. (2022). Verification of PCSWMM's LID processes and their scalability over time and space. *Frontiers in Water*, 4. https://doi.org/10.3389/frwa.2022.1058883

b) Other peer-reviewed contributions

Book chapters (peer-reviewed conference proceedings in book series) (BC)

1. Zhang, Z., & Valeo, C. (2025). Quantifying Scaling-Up Uncertainty in Soil Data Using Fuzzy C-Means Clustering: A Framework for Application to Hydrological Modeling. In Y. Zeng (ed.), *Environmental Science and Technology: Sustainable Development III*, Environmental Science and Engineering, pp. 17–29. Springer, Cham. Oral presentation delivered at the ICEST 2024 conference. doi.org/10.1007/978-3-031-88862-5_2

2. Zhang, Z., & Valeo, C. (2023). Assessing Optimal LID Areas for Flood Mitigation: A Case Study on Vancouver Island, Canada. In Z. Yang (ed.), *Environmental Science and Technology: Sustainable Development*, ICEST 2022. Environmental Science and Engineering, pp. 89–100. Springer, Cham. Oral presentation delivered at the ICEST 2022 conference. doi.org/10.1007/978-3-031-27431-2_7

Conference papers (CP)

1. Zhang, Z., & Valeo, C. (2024). Quantifying spatial data uncertainty with fuzzy entropy [Conference paper; Oral presentation]. *IEEE Pacific Rim Conference on Communications, Computers, and Signal Processing (PACRIM 2024)*, Victoria, BC, Canada, August 21–23, 6 pp. ieeexplore.ieee.org/document/10690206

2. Zhang, Z., & Valeo, C. (2022). Potential for nature-based solutions to mitigate impacts of climate change [Conference paper; Oral presentation]. *3rd International Conference on New*

Horizons in Green Civil Engineering (NHICE-03), Victoria, BC, Canada, April 25–28.

Conference presentations (reviewed by abstract /invited) (PT)

1. Zhang, Z. & Valeo, C. (2025). Quantifying Uncertainty in Urban Hydrological Models and Exploring AI-based Prediction: A Case Study in the Saanich Area [Conference presentation]. *PEOPLE 2025 International Conference - Challenges and Opportunities in Environmental Sustainability under Climate Change*, jointly with the 2025 Atlantic Symposium of the Canadian Association on Water Quality (CAWQ), St. John's, NL, Canada, July 21–25.

2. Zhang, Z. & Valeo, C. (2024). Shannon Entropy in Urban Drainage Systems under changing climate: A case study of Small-Scale urban stormwater management system [Conference presentation]. *4th International Conference on New Horizons in Green Civil Engineering (NHICE-04)*, Victoria, BC, Canada, August 26–28.

3. Zhang, Z. & Valeo, C. (2023). Enhancing Low-Impact Development Modelling for Future Urban Stormwater Management: A Case Study in Vancouver Island [Conference presentation]. *14th International Conference on Environmental Science and Technology (ICEST 2023)*, Shandong University, Qingdao, China, November 23–25.

4. Zhang, Z. & Valeo, C. (2023). Scale-up Challenges and Information Loss in Low Impact Development Modeling for Urban Stormwater Management in Changing Climate [Conference presentation]. *The 3rd International Symposium on Sustainable Urban Drainage (SUDS 2023)*, Hangzhou, Zhejiang, China, October 20–22.

5. Zhang, Z. & Valeo, C. (2023). Determining LID Performance for Mitigating Flooding under a Changing Climate [Conference presentation]. *Canadian Water Resources Association (CWRA) National Conference 2023 — "Rising with the Tide: Working Together to Address Water Resource Challenges,"* Halifax, NS, Canada, June 18–21.

6. Zhang, Z. & Valeo, C. (2022) Potential in nature-based solutions for mitigating impacts of climate change [Conference poster]. *Canadian Water Resources Association (CWRA) National Conference 2022 Valuing Shared Waters*, Canmore, AB, Canada, June 5–8.

c) Journal papers in submission (SJP)

1. Zhang, Z., & Valeo, C. (2025). Information loss over hillslope flowpaths and scaling with runoff models. Manuscript submitted to *Water Resources Research*. January 15, 2026.

d) Technology transfer (D)

1. Zhang, Z. (2025). Fuzzy-HydroGPT-RTC v2.0 — PyQt6 GUI with ≈10 s real-time weather/flow scraping, GPT-based prediction, fuzzy UQ, and model evaluation. github.com/Zhonghao1995/HydroGPT-v2.0

2. Zhang, Z. (2025). HydroGPT v1.1 — End-to-end workflow for hydrology: data scraping, cleaning, GPT conversion, fuzzy UQ, metrics, and export. github.com/Zhonghao1995/HydroGPT-v1.1

WORKING EXPERIENCE

Research Assistant   Sept 2021 – Present

University of Victoria | Victoria, BC

- Conduct literature reviews, experiment design, and data analysis using AI/Fuzzy methods.
- Collaborate on research reporting and statistical interpretation.

Teaching Assistant   Jan 2022 – Present

University of Victoria | Victoria, BC

- Conduct tutorials/labs and provide student support for course materials.
- Grade assignments and monitor student progress.