

Wenyu Chiou

Ph.D. Candidate · Civil & Environmental Engineering | Complex Adaptive Water Systems (CAWS) Lab, Lehigh University

My research develops governed LLM-driven agent and multi-agent systems for coupled human–water modeling — bridging empirical behavioral data, interpretable rule-based simulation, and large language models to study human–flood interaction and decision-making under risk.

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github.com/WenyuChiou · linkedin.com/in/wenyu-chiou · wenyuchiou.github.io · Google Scholar

§ 01 Education

Ph.D., Civil & Environmental Engineering, Lehigh University Aug 2024 – present · expected Dec 2027

Complex Adaptive Water Systems (CAWS) Lab · Advisor: Prof. Y.C. Ethan Yang · Center for Catastrophe Modeling and Resilience (CMR)

Dissertation: *Advancing Coupled Human-Flood Modeling: From Empirical Foundations to LLM-Driven Multi-Agent Simulation*

Research: LLM-driven coupled ABM–catastrophe model framework for household flood adaptation; Water Agent Governance Framework (WAGF) checking LLM-agent decisions against physical, financial, and behavioral-theory constraints before they act; multi-agent systems for quantitative risk assessment.

M.S., Hydrological and Oceanic Sciences, National Central University (NCU), Taiwan Sep 2021 – Jun 2023

Surface Hydrology Group · Institute of Hydrological and Oceanic Sciences (IHOS) · GPA 4.3/4.3 · Dean’s Award, College of Earth Sciences (Jun 2023). Thesis: groundwater flow characteristics of the Taoyuan coastal zone.

B.S., Earth Sciences, National Central University (NCU), Taiwan Sep 2017 – Jun 2021

GPA 3.9/4.3 · Best Undergraduate Student Project and Report (Nov 2020).

§ 02 Research Experience

Ph.D. Candidate — Complex Adaptive Water Systems (CAWS) Lab, Lehigh University Aug 2024 – present

- Co-authored the *Water Resources Research* (2026) article evaluating large language models as behavioral components in a human–water simulation — published; second author of two.
- Designed a human-versus-LLM study using 937 household responses, label-blind socioeconomic personas, confirmatory factor analysis, multi-group structural equation modeling, and repeated-run stability checks to compare generated behavior with measured pathways; manuscript in preparation.
- Building the **Water Agent Governance Framework (WAGF)** with validation rules, execution control, and audit logs — agent decisions are checked against physical, financial, and behavioral-theory constraints before simulation-state updates; research software in preparation for release.
- Built a 52,141-household coupled agent-based × catastrophe flood model (27 census tracts, 2011–2023; 50 stochastic runs per scenario) with NFIP premium, payout, and deductible mechanics to assess physical flood damage, insurance payouts, and household out-of-pocket financial exposure; behavior calibrated through structural equation modeling and Bayesian methods.
- Designed and fielded a 937-household flood-adaptation survey (Passaic River Basin, NJ) and a survey-to-agent parameterization pipeline (structural equation modeling → Bayesian calibration) that turns empirical data into calibrated agent parameters.

Research Assistant — Surface Hydrology Group, IHOS, National Central University 2023 – 2024

- 2D/3D groundwater numerical modeling and calibration for the Taoyuan coastal zone (HydroGeoChem); evaluated nature-based solutions for groundwater and watershed management.

- Processed IPCC AR6 downscaled climate-model ensembles for Taiwan; automated multi-model comparison pipelines (Python, MATLAB).

- Stable-isotope hydrology ($\delta D/\delta^{18}O$), Feitsui Reservoir.

§ 03 Publications

PEER-REVIEWED

[1] Yang, Y. C. E., & Chiou, W. (2026). Leveraging Large Language Models for Agent-Based Simulation of Human–Water System Interactions. *Water Resources Research*, 62(6), e2025WR042111. doi.org/10.1029/2025WR042111 *Published*

MANUSCRIPTS UNDER REVIEW AND IN PREPARATION

[2] Chiou, W. Y., Yang, Y. C. E., Tanaka, T., Jamrussri, S., & Feng, S. *Household Flood Adaptation and Financial Outcomes: A Coupled Human–Flood Modeling Analysis of Homeowners and Renters. Water Resources Research.*

Under revision following peer review

[3] Chiou, W. Y. *Flood Adaptation Decision Variables and Pathways across Social Groups: A Comparison between Human Survey Responses and Responses Generated by Large Language Models.* Planned submission to *Progress in Disaster Science.*

In preparation

CONFERENCE PRESENTATIONS

Chiou, W., & Chiou, H. — “What Makes AI Believable? Comparing AI and Human Responses in Mental Health Risk Assessment.” ISDSA 2026 Annual Meeting (International Society for Data Science and Analytics); recorded presentation.

Chiou, W., Yang, Y. C. E., Tanaka, T., Jamrussri, S., & Feng, S. — “Modeling Long-Term Flood Adaptation Action Across Marginalized and Non-Marginalized Groups: A Coupled Agent-Based Model.” Poster NH41E-0449, abstract 1890827, AGU25, New Orleans.

ISHC 2025, Tokyo, Japan — oral presentation 38-03, July 2025; co-authored with collaborators across Lehigh, FAU, Kyoto, and UTokyo.

AGU Fall Meeting 2023 — abstract; submarine groundwater discharge study combining electrical resistivity tomography, field observation, and numerical simulation.

§ 04 Awards & Fellowships

Dean’s Award, College of Earth Sciences — National Central University

Jun 2023

Interdisciplinary Research Fellowship (Hydrology/Geophysics/Geology) — NSTC, Taiwan · \$4,000 USD/year

2021 – 2023

Best Undergraduate Student Project and Report in Earth Sciences — National Central University

Nov 2020

Undergraduate Student Research Project Grant — NSTC, Taiwan · \$1,600 USD total

2020 – 2021

§ 05 Research Interests

- LLM multi-agent systems
- Agent evaluation & governance
- Agent-based modeling
- Catastrophe modeling
- Human–water interaction
- Decision-making under risk
- Structural equation modeling

§ 06 Methods & Tools

AGENT SYSTEMS

LLM agents · multi-agent systems · structured prompting · validation rules · audit logs · simulation coupling

PROGRAMMING

Python · TypeScript · R · MATLAB · C++

Git · Jupyter · SPSS · AMOS · ArcGIS Pro

Claude Code · Codex CLI · Cursor · Ollama · MCP · plugin/skill development

§ 07 Research Software · LLM Agent Systems & AI Research Workflows

research-hub AI-operable research workspace · PyPI v1.1.1 · Maintained open-source tool An AI-operable research workspace for Zotero, Obsidian, and NotebookLM — search, ingest, and sync papers through one CLI, MCP server, and REST API. Listed in Awesome MCP Servers.	WAGF — Water Agent Governance Framework LLM-agent simulation governance · In preparation for release A governed LLM-agent framework for human–water simulation that checks agent decisions against physical, financial, and behavioral-theory constraints before simulation-state updates.
FLOODABM Coupled ABM × CAT model · Research prototype, archived A large-scale simulation (52,141 households) that quantifies human–flood interaction and insurance outcomes; Zenodo-archived companion code with CITATION.cff.	agent-collab-skills Multi-agent orchestration · Maintained open-source tool Multi-agent orchestration — task splitting, output reconciliation, adversarial debate, shared memory, and a pre-merge acceptance gate.
codex-delegate AI research workflow tooling · Maintained open-source tool Agent-delegation wrappers that verify change from git state, not the delegate’s own report; a regression test pins a real upstream failure. CI on Ubuntu and Windows.	ai-research-skills Research workflow · Maintained open-source tool A research workflow for identifying gaps, finding and synthesizing literature, designing studies, and drafting papers — supporting the full research lifecycle from idea assessment to manuscript development.

§ 08 Professional Service

Graduate Student Committee Member — Lehigh University, Dept. of Civil & Environmental Engineering

2025 – present

§ 09 Community & Open-Source

awesome-agentic-ai-zh

6K+ GitHub stars (verified August 2026)

Trilingual (zh-TW / zh-Hans / EN) 7-stage roadmap from LLM basics to production multi-agent systems; automated checks keep all three languages in sync; external contributors.

Selected open-source engineering contributions

Root-caused an engine-selection bug and added a regression test in BuilderIO/agent-native; fixed Windows file-permission handling in langchain-ai/openwiki; and added first-class Taiwan-market and institutional-flow data support to daily_stock_analysis.