Hongwei Wang

MSc Student in Interdisciplinary Data Science and Artificial Intelligence

Abu Dhabi, United Arab Emirates | hw4375@nyu.edu | hw4375-collab.github.io | hw4375-collab

Education

MSc **New York University Abu Dhabi**, Interdisciplinary Data Science and Artificial Intelligence — Abu Dhabi, United Arab Emirates
- Expected completion: August 2028. — Aug 2026 – Aug 2028

BSc **Xi'an Jiaotong-Liverpool University**, Mathematics — China
- Undergraduate dual-degree educational background; the accompanying University of Liverpool entry records the second awarded degree. — Sept 2022 – Aug 2026

University of Liverpool, Applied Mathematics — United Kingdom
- First Class Honours Bachelor's Degree in Applied Mathematics. — 2026

Research Experience

New York University Abu Dhabi, MIDSAI Research Participant — Data Science & AI — Abu Dhabi, United Arab Emirates
- Investigating mathematical autoformalization and semantic faithfulness through controlled evaluation of AI-generated formalizations and Lean-assisted verification workflows. — July 2026 – present
- Mentor: Pierre Youssef, CIDSAI.

New York University Abu Dhabi, Topological Quantum Computation Formalization — Abu Dhabi, United Arab Emirates
- Exploring Cubical Agda formalizations of homotopy-theoretic constructions relevant to topological quantum computation. — 2026 – present
- Academic guidance: Urs Schreiber.

Xi'an Jiaotong-Liverpool University, Categorical Algebra and Homotopy Theory — Final Year Project — China
- Studied algebraic topology and homotopy theory from a categorical perspective, connecting these topics with dependent type theory and Lean 4 formalization. — 2025 – 2026
- Advisor: Alastair Darby.

Westlake University and Yau Mathematical Sciences Center, Tsinghua University, Lean 4 Formalization Benchmark for 1-Category Theory — China
- Constructed and manually verified Lean 4 formalizations of classical results in 1-category theory for evaluating formal proof generation. — Dec 2025
- Rongge Xu.

Xi'an Jiaotong-Liverpool University, AI-Assisted Mathematical Reasoning and Education — Research Assistant — China
- Developed a Ramsey-type self-play experiment and AI-assisted tools for mathematical problem solving and visualization. — Oct 2024 – Apr 2025
- Advisor: Jinsong Xu.

Westlake University / Institute for Theoretical Sciences, Visiting Scholar — China
- Xing Gu's group. — Sept 2025 – Mar 2026

Selected Projects

Monoidal Category Formalization — Lean 4 2026
Formalizations involving monoidal categories, categorical constructions, and strictification-related structures using dependent types and Mathlib.

Semantic Boundary — LLM Reasoning Verification and Faithfulness 2026
Controlled benchmarks comparing direct LLM reasoning, self-checking, and Lean-assisted verification, with attention to reasoning errors and semantic mistranslation.

FalconVerifier — AI Reasoning Verification 2026
Public verification prototype that separates model-generated interpretation from deterministic formal verification and records machine-checkable assurance artifacts.

Arabic Pregroup Grammar — Lean 4 2026
Typed Arabic grammatical representations with pregroup-style types and machine-checkable reductions; initial VSO/SVO examples are formalized as sentence-level proof certificates.

Academic Talks and Activities

When Proof No Longer Means Understanding — New York University Abu Dhabi (5 November 2026): Academic talk on formal correctness and mathematical understanding.

∞-type Café Summer School — Lecturer (August 2026): Three-lecture, six-hour online series on infinity categories and formal reasoning.

AI for Mathematics Seminar — Founder and Lecturer (June 2026): Xi'an Jiaotong-Liverpool University. Organized and taught introductory Lean 4, type theory, and formalized-mathematics material.

Undergraduate Category Theory Seminar — Organizer and Lecturer (2025): Xi'an Jiaotong-Liverpool University. Led a reading seminar based on Tom Leinster's Basic Category Theory.

XJTLU Winter Pure Mathematics Seminar — Founder, Organizer, and Lecturer (2024–2025): Xi'an Jiaotong-Liverpool University.

IWoAT Summer School — Participant (August 2026): Stable Homotopy Theory.

Technical and Mathematical Skills

Formal Methods: Lean 4, Mathlib, formal verification, theorem proving, dependent type theory.

Mathematics: Higher Category Theory, Homotopy Theory, Algebraic Topology, Type Theory, Formal Semantics.

AI and Computing: Python, Git, LLM evaluation, benchmark design, autoformalization, AI reasoning verification.

Additional Tools: LaTeX, Cubical Agda.