Junhao (Kris) Zhang

jz4189@columbia.edu · www.kriszhang.ca · linkedin.com/in/kris-zhang-1aa31a249

Research interests: climate risk and the environmental footprint of AI infrastructure — data-center water use, electricity demand, and siting — using statistical modelling, geospatial analysis, and machine learning.

Education

Columbia University — Columbia Climate School **New York, NY**
M.S., Climate (incoming) *Sept. 2026*

University of Waterloo **Waterloo, ON**
B.Math., Mathematics & Business Administration (Double Major); Statistics Minor *Sept. 2022 – Dec. 2025*

Coursework: Forecasting, Deterministic OR Models, Advanced Optimization, Biostatistics, Survey Sampling, Linear Modeling, Data Structures, Corporate Finance.

Technical Skills

Languages/Tools: Python, R, SAS, MATLAB, SQL, Gurobi, Haskell, Lean 4, Excel, Bloomberg Terminal
Methods: Linear and mixed-integer optimization, time-series forecasting, regression modelling and diagnostics, sensitivity analysis, numerical ODE modelling, formal verification

Research Experience

Climate-Informed Mortality Modelling for Insurance and Financial Risk **May – Aug. 2025**
Directed Research · Mentor: Rhoda Dadzie-Dennis *Waterloo, ON*

- Implemented and extended the Lee–Carter mortality model on Ontario data (1991–2023), adding mean annual temperature as a climate covariate to improve long-horizon mortality forecasting.
- Evaluated baseline vs. climate-adjusted models out-of-sample in R and Python using RMSE, MAPE, and residual diagnostics; co-authored an editor-reviewed article for the Canadian Mathematical Society's *Notes from the Margin*.

Formal Theorem Proving in Applied Mathematics Using Lean 4 **Sept. – Dec. 2025**
Directed Research · Mentor: Sita Gakkhar *Waterloo, ON*

- Used dependent type theory and tactic-based workflows to formalize vectors, dot products, and linear-programming feasibility conditions in Lean 4.
- Completed a machine-checked proof of the Weak Duality Theorem for linear programming, demonstrating how formal verification can strengthen the reliability of applied mathematical arguments.

Mathematical Modelling of Cell–ECM Mechanotransduction **Jan. – Apr. 2026**
Directed Research · Mentor: Gordon R. McNicol *Waterloo, ON*

- Implemented and analysed 18 coupled ODEs in Python and MATLAB; ran parameter-sensitivity and inhibitor dose-response experiments that generated testable predictions about switch-like adhesion behaviour.
- Presented results at the Directed Reading Programme symposium and co-authored an editor-reviewed applied-mathematics article.

Selected Quantitative Projects

Schedule Optimization for GO Transit Networks **Sept. – Dec. 2025**
Python, Gurobi, mixed-integer programming *Waterloo, ON*

- Built a capacity- and transfer-constrained scheduling model; in the modelled peak-period scenario, modest timing adjustments reduced total passenger transfer waiting time by more than 50% without adding infrastructure.

Multiple Linear Regression for S&P 500 Price Dynamics **Sept. – Dec. 2024**
R, Bloomberg Terminal, model diagnostics *Waterloo, ON*

- Compared specifications using adjusted R^2, AIC, BIC, PRESS, VIF, and residual checks; documented limitations from time dependence and non-stationarity.