

Yurui (Raymond) Wu

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EDUCATION

University of North Carolina at Chapel Hill

Aug 2024 – Expected Dec 2026

B.S. in Statistics and Analytics; Minor in Economics

Chapel Hill, NC

GPA: 3.93/4.00 | Transferred from the University of International Business and Economics in 2024.

Selected coursework: Mathematical Statistics (PhD-level), Probability, Stochastic Modeling, Deep Learning, Time Series Analysis, Regression Inference, Optimization, Linear Algebra, Differential Equations, Econometrics.

RESEARCH INTERESTS

Statistical Learning Theory and Inference; Machine Learning and Deep Learning; Optimization and Decision-Making under Uncertainty; Dynamical Systems and Game Theory.

RESEARCH EXPERIENCE

Test-Time Adaptation for Non-Stationary Time Series

Aug 2025 – Jan 2026

First author and student research lead; STOR 566 project mentored by Dr. Yao Li (UNC-Chapel Hill)

- Led a four-person study of causal test-time adaptation under regime shifts, keeping forecasting backbones frozen while adapting normalization parameters from recent unlabeled observations.
- Investigated entropy minimization and temporal consistency for classification, augmentation-consistency losses and EMA teacher targets for regression, and stability safeguards including drift penalties and uncertainty-based fallbacks.
- Designed chronological evaluations on synthetic ETT distribution shifts and daily SPY, QQQ, and EUR/USD series spanning pandemic, inflation, and recovery regimes, with leakage-aware train/test separation.
- Found benefits from normalization-based adaptation under gradual synthetic drift, but more robust performance from simple BatchNorm-statistics updates in financial data; documented cases in which aggressive adaptation degrades results.

Participation Dynamics on AI-Augmented Two-Sided Platforms

Nov 2025 – Present

Independent research with Dr. Fan Yao (UNC-Chapel Hill)

- Formulate a dynamic participation game linking viewer groups, human creators, and AI shadow creators through recommendation exposure, endogenous satisfaction, AI-induced crowd-out, and human-ecology-dependent quality.
- Establish existence of fixed-policy equilibria and equivalence with best-response steady states; derive spectral-radius conditions for uniqueness and global geometric convergence using a nonnegative comparison matrix.
- Obtain primitive threshold certificates for four human-creator support regimes, with comparative statics for participation costs and crowd-out; characterize how relaxation changes convergence and local stability without changing equilibria.
- Use computational experiments to examine welfare-ecology trade-offs, discontinuous creator dropout, target human-share effects, and period-two/period-four cycles under aggressive adjustment.

Vector-Output Deep Regression under Temporal Dependence

Feb 2026 – Present

Independent research with Dr. Yuefeng Han (University of Notre Dame)

- Study nonparametric vector regression with temporally dependent lag-window covariates, using average per-coordinate prediction risk and normalized empirical excess loss to separate statistical complexity from output dimension.
- Develop an exact finite-horizon reduction of row-sparse ReLU recurrent networks to feedforward networks; track row supports and total sparsity through unfolding and establish bottleneck factorizations for suitable latent readouts.
- Extend scalar sparse-ReLU oracle inequalities under exponential α -mixing to vector outputs: under the stated class and excess-loss conditions, obtain average-risk control of order $\phi_n L(\log n)^6$, or $\phi_n(\log n)^7$ when $L \asymp \log n$; analyze constrained approximate empirical-risk minimization.
- Derive composite Hölder representations under row- ℓ_1 restrictions and compare DeepFNN, BottleneckFNN, SparseRNN, LSTM, and VAR baselines in synthetic experiments on structural match, sample size, and effective memory.

Evaluation of Data-Analysis AI Agents

Aug 2025 – Dec 2025

Research Assistant for Dr. Guanting Chen (UNC-Chapel Hill)

- Investigated evaluation methodologies for data-analysis AI agents, comparing InfiAgent-DABench, InsightBench, and DataSciBench in statistical correctness, insight generation, and reproducibility.
- Proposed a multidimensional evaluation framework integrating programmatic statistical checks, fact-grounded insight matching, visualization quality, decision utility, and stability, with weighted scoring and bootstrap uncertainty assessment.
- Developed reproducible Python experiments on financial and retail time series, including trend and volatility analysis, LSTM forecasting, statistical visualizations, and structured outputs for automated evaluation.

RESEARCH PAPERS AND MANUSCRIPTS

- **Wu, Y.**, Deng, Q., Chung, W., and Li, M. (2026). *Test-Time Adaptation for Non-stationary Time Series: From Synthetic Regime Shifts to Financial Markets*. *arXiv preprint*, [arXiv:2602.00073](https://arxiv.org/abs/2602.00073).
- **Wu, Y.** *Participation Dynamics in Two-Sided Platforms with AI Shadow Creators*. *Working manuscript (in preparation)*; research with Dr. Fan Yao.
- **Wu, Y.** *Sparse Recurrent Containment for Average-Risk Vector Regression under Temporal Dependence*. *Working manuscript (in preparation)*; research with Dr. Yuefeng Han.

TEACHING AND ACADEMIC SERVICE

Course Grader, STOR 566: Deep Learning

Aug 2026 – Present

Department of Statistics and Operations Research, UNC-Chapel Hill

- Assess homework and quizzes in an upper-level undergraduate/graduate course, including mathematical derivations, neural-network architecture and optimization, and Python/PyTorch implementations.
- Apply consistent rubric-based grading; review computational outputs and identify conceptual or implementation errors to support actionable feedback to students.

Undergraduate Teaching Assistant, MATH 232 / MATH 233

Jan 2025 – Dec 2025

Calculus II (Fall 2025) and Calculus III (Spring 2025), UNC-Chapel Hill

- Supported classroom problem solving and weekly office hours, explaining single- and multivariable calculus concepts and helping students turn intuition into precise mathematical solutions.
- Led two-hour examination review sessions for audiences of more than 60 students; created original practice exams and guided review problems for three examinations per semester.

SELECTED INDUSTRY RESEARCH EXPERIENCE

China Pacific Life Insurance Co., Ltd.

May 2026 – Aug 2026

Asset Allocation and Investment Research Intern

Shanghai, China

- Built macroeconomic and market-sentiment models for Chinese equity allocation, integrating liquidity, credit, inflation, earnings, and technical-breadth signals with rolling, lag-safe out-of-sample assessment.
- Developed IC-weighted forecast combinations and scenario analyses; modeled crude-oil pass-through to producer prices with lead-lag tests, time-varying elasticities, and residual-bootstrap uncertainty.

Orient Securities

May 2025 – Aug 2025

Quantitative Research Intern

Shanghai, China

- Researched short-horizon large-/small-cap rotation using relative momentum, volatility, turnover, and breadth; a backtested strategy achieved 6.6% annualized excess return and a 59% win rate.
- Explored Neural ODE and Neural Jump SDE specifications for regime-sensitive market timing; tested rolling features, turnover, fees, robustness, and benchmark attribution.

RESEARCH METHODS AND TECHNICAL SKILLS

Statistical & Mathematical methods: Statistical Inference, Probability and Stochastic Modeling, Nonparametric Regression, Time Series Analysis, Optimization and Dynamical Systems, Numerical Methods and Simulation.

Programming & Research Tools: Python (NumPy, SciPy, pandas, PyTorch, TensorFlow, scikit-learn, Matplotlib), R, SQL; LaTeX, Git, Linux.

Languages: Mandarin Chinese (native), English (professional), Cantonese (intermediate).