Jiachen Cong

jcong3@illinois.edu https://jiachencong.github.io 601 S 1st St-301, Champaign, IL, USA.

EDUCATION

University of Illinois Urbana-Champaign, Department of Statistics Aug. 2024 — May. 2026
Master of Science in Statistics GPA: 3.87/4.00
Nankai University, School of Finance Sep. 2020 — Jun. 2024
Bachelor of Economics in Finance (with Honours) GPA: 3.73/4.00
Finance Elite Scholars Honors Program

SELECTED GRADUATE LEVEL COURSES

- Real Analysis (MATH 540), A
  (Textbook: *Real Analysis*, 2nd ed., Folland)
- High Dimensional Statistics (STAT 578), A
  (Lecture notes, Prof. Jingbo Liu;
  High-Dimensional Probability, by Vershynin)
- Advanced Regression Analysis (STAT 527), A
- Advanced Mathematical Statistics (STAT 511), A+
  (Textbook: *All of Statistics*, Wasserman)
- Statistical Learning (STAT 542), A
- Topics in Statistics-Advanced Causal Inference
  (STAT 578), A

RESEARCH & PUBLICATION

Binary Response Forecasting under a Factor-Augmented Framework Dec. 2023 — Present

T. Cheng, **J. Cong**, F. Liu, & X. Yang (Authors listed in alphabetical order by last name)
Under Review at *Journal of Business & Economic Statistics*.
Available at: `https://arxiv.org/abs/2507.16462`

- We propose a novel **factor-augmented forecasting regression** (FAR) model with a **binary response variable**, extending the original continuous outcomes FAR framework by Bai & Ng (2006), to binary response settings allowing for α-mixing dependence and diverging N and T.
- Developed a maximum likelihood estimation procedure and established **asymptotic properties of the estimators**, including:
  - **consistency** and $\sqrt{T}$**-asymptotic normality** of coefficient estimators;
  - consistency properties of predicted probabilities, with convergence rate $O_P\left(\frac{1}{\sqrt{N}\wedge\sqrt{T}}\right)$;
  - an **information-criterion–based** method for determining the number of factors (we also proved the selection consistency).
- Conducted Monte Carlo simulations (500 replications) across three experimental designs: (i) correctly specified models with light-tailed innovations, (ii) correctly specified models with heavy-tailed innovations, and (iii) quasi-MLE under heavy-tailed innovations using a standard normal likelihood. In each scenario, we imposed varying autocorrelation structures (i.i.d., weak, strong), across sample sizes $N \in \{100, 200, 300\}$, $T \in \{100, 200, 400\}$; examined finite-sample performance using RMSE and AUC. Simulation results support the theoretical findings.
  Code & results for simulation study: Github link.
  Result of simulation:PDF link.
- Presented at the 2024 International Workshop on Econometrics with its Application and Practice in Finance, where I was the **only undergraduate** invited to present alongside faculty and graduate researchers.

Accelerating Conformal Prediction via Approximate Leave-One-Out Apr. 2025 — Present

J. Cong, J. Liu
Under Review at *AISTATS 2026*.
Available at: `https://jiachencong.github.io/Accelerating_Conformal_Prediction.pdf`

- We proposed **Fast Jackknife+** and **Fast Jackknife-minmax** algorithms that integrate the **Approximate Leave-one-out (ALO)** estimators—derived via the Newton step and Woodbury identity—into conformal prediction (CP) frameworks, substantially reducing computation while preserving coverage guarantees. Our work extends ALO theory to the CP domain and introduces an **explicit estimator** for CP acceleration.

- Derived and proved **uniform error bounds** for **ALO-based** predictions at a new covariate $\boldsymbol{x}_{n+1}$ by decomposing ALO errors into symmetric quadratic terms, showing $O_P\left(\frac{\text{polylog(n)}}{\sqrt{p}}\right)$ uniform convergence under high-dimensional settings, extending the approximate leave-one-out theory.
- Proved **asymptotic equivalence** in coverage and interval length between **Fast Jackknife(+/minmax)** and their exact counterparts under **high-dimensional settings**, extending results to **general covariance structures** Σ (not necessarily diagonal). Additionally, in a special high-dimensional linear model setting, we established that **Full Conformal**, **Split Conformal**, **Jackknife+**, and **Jackknife-minmax** prediction intervals are asymptotically equivalent.
- Implemented extensive simulations under **high-dimensional Gaussian** and **Pseudo-Huber** regularizer settings, achieving **5–20× acceleration**, negligible efficiency loss, and over **99%** Jaccard similarity, consistently outperforming AMP-based acceleration methods. Conducted empirical experiments on real datasets (Energy Efficiency and Concrete Strength datasets), demonstrating **identical coverage** (with no loss of efficiency as measured by the average prediction interval length) to original conformal methods with a **97% reduction in runtime**.
  Code & results for simulations & real data experiments: Github link.
  Result of simulation & real data study:PDF link.

Forecasting of China's Inflation Rate
Jan. 2022 – Mar. 2022

Group Leader

- Designed and implemented an integrated **ARIMA–LSTM forecasting pipeline** to jointly capture linear and nonlinear trends in China's monthly inflation data.
- Developed and evaluated a **hybrid ARIMA–LSTM forecaster**, achieving **18–20% MAPE** in out-of-sample forecasting of China's monthly inflation rates for March–June 2022.
- Ranked **Top 2.35%** in the 3rd "Ruisi" Data Modeling Contest (National Undergraduate & Graduate Data Science Competition).

RESEARCH INTERESTS

High-dimensional inference; latent factor models; uncertainty quantification; statistical learning; computational statistics; causal inference.

ACADEMIC SERVICE

Reviewer, **AISTATS 2026** (International Conference on Artificial Intelligence and Statistics).

AWARDS & HONORS

First Prize, 13th Chinese Mathematics Competitions for College Students (Ranked top 1%) Dec. 2021
Outstanding Award (Top Prize), 2021 Tianjin Undergraduate Mathematical Competition (Ranked top 0.5%) Jul. 2021
Outstanding Undergraduate Thesis of Nankai University (Top 5%) Jun. 2024
Innovation Scholarship, Nankai University (2021–2022 Academic Year) Oct. 2022

OTHER EXPERIENCES

Teaching Assistant for Mathematical Statistics Nankai University, Sep. 2023 - Jan. 2024

- Assisted in designing and refining course materials for core topics in mathematical statistics, including probability theory, estimation, hypothesis testing, linear regression, ANOVA and maximum likelihood estimation (MLE) parts.
- Developed homework solutions; held weekly office hours; provided guidance on statistical reasoning, proof strategies, and problem-solving methods. Collaborated with the instructor to update lecture slides and examples.

SKILLS

- **Programming:** Python, MATLAB, R, C++, LaTeX, HTML, STATA.
- **Languages:** Chinese (native), English (fluent).