Kejin Wu

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Research Interests

Sampling methods • Model-free bootstrap & Scalable subsampling
Time series analysis • Pertinent prediction inference
Machine learning • Deep generative models

Education

2019-now Ph.D. in Statistics, University of California, San Diego
2015-2019 B.S. in Mathematics and Applied Mathematics, Chongqing University

Fellowship, Honor & Award

2022 Libby Graduate Research Award
2021-2023 James B. Ax Graduate Fellowship
2019 Outstanding Student of Chongqing
2018 The Mathematical Contest in Modeling (MCM), COMAP, Meritorious Winner
2016 Mathematics Competition of Chinese College Students, First Prize Winner in Chongqing

R Package

expct: Estimate auto- and cross-correlations from irregularly spaced time series, with Prof. Ryan. (Github)

Publications & Preprints

2023 **Wu, K.** and Politis, D.N., Scalable Subsampling Inference of Deep Neural Networks. (Under working)
2023 Ryan, O., **Wu, K.** and Jacobson, N.C., Exploratory Continuous-Time Modeling (expct): Extracting Dynamic Features from Irregularly Spaced Time Series. (Under working)
2023 **Wu, K.**, Gupta, R., Pierdzioch, C., Karmakar, S., Climate Risks and Stock Market Volatility Over a Century in an Emerging Market Economy: The Case of South Africa. (Paper Link)
2023 **Wu, K.** and Politis, D.N., Prediction Inference of Non-linear Parametric Autoregressive Models with Bootstrap, 2023. (Paper Link)
2023 Politis, D.N. and **Wu, K.**, Non-parametric Forward Bootstrap on Predicting Non-linear Time Series: Consistency, Pertinence and Debiasing, Stats 2023. (Paper Link)

2023 **Wu, K.** and Karmakar, S., A model-free approach to do long-term volatility forecasting and its variants, Financial Innovation 2023. (Paper Link)

2021 **Wu, K.** and Karmakar, S., Model-Free Time-Aggregated Predictions for Econometric Datasets, Forecasting 2021. (Paper Link)

2020 **Wu, K.**, McFadden, J.R. and Jacobson, N.C., Determining Timing Effects of Microrandomized Trials Using Intensive Longitudinal Data and the Differential Time-Varying Effect Model, 2020. (Paper Link)

Presentations

2023 **Extracting Dynamic Features from Irregularly Spaced Time Series**, Society Ambulatory Assessment. (Online)(Slides)

Research Experience

2023 - now **Scalable subsampling with Deep Neural Networks**, with Prof. Politis
· Scalable subsampling is about choosing non-random subsamples to do estimations. This scalable subagging estimator is more computationally efficient and can be tuned to have the same (or better) rate of convergence compared to a naive estimator with a whole sample. With this technique, we are attempting to explore the possibility of achieving two goals at the same time: (1) Optimal rate of convergence with fixed depth and width DNN; (2) Prediction inference after building a subagging estimator of DNN.

2022 - 2023 **Non-linear time series prediction inference**, with Prof. Politis
· Developed a bootstrap-based method to do multi-step ahead prediction of a general Non-linear Autoregressive (NLAR) models. This method can avoid the error accumulation issue in multi-step-ahead non-linear predictions.
· Analyzed NLAR models with homoscedastic or heteroscedastic errors in a parametric or non-parametric form theoretically. Proved this method can return consistent point predictor. Moreover, built asymptotically valid and pertinent Prediction Intervals to measure the accuracy of point predictions.
· For parametric NLAR models, proposed a two-step estimation strategy to estimate the parameters. For non-parametric NLAR models, took the under-smoothing bandwidth to handle the inherent bias-type term from the non-parametric estimation.

2021 - now **Extracting Dynamic Features from Irregularly Spaced Time Series**, with Prof. Ryan and Prof. Jacobson
· Extended the existing Differential Time-Varying Effect Model (DTVEM) to detect and estimate the time in which interventions (exogenous variables) had impacts on their respective outcomes within intensive longitudinal data. Programmed this extended DTVEM in R and further developed the open-source DTVEM R package. Performed extensive simulations based on the idea of Microrandomized Trials design. Further explored lagged correlations within irregularly spaced time series data.

2020 - 2022 **Model-free prediction methodology in forecasting of financial time series**, with Prof. Karmakar
· Made two proposals to improve the NoVaS method: (1) Refine the existing transformation frame since one potential problem was found; (2) Develop an approach to build a new NoVaS transformation based on the GARCH (1,1) model. Consequently, three new NoVaS-type methods were

proposed. Programmed new NoVaS methods in R. Performed extensive pseudo-out-of-sample forecasting with different methods using simulated and real-world data.

Services

Journal reviewers
Statistics and Computing; Mathematics and Computers in Simulation; Journal of Systems Science and Information

Teaching Experience

Associate Instructor, University of California, San Diego
2023 Fall MATH 11: Calculus-Based Introductory Probability and Statistics
2023 Summer MATH 10A: Calculus I

2021 - 2024 **Teaching Assistant**, University of California, San Diego
MATH 287A: Time Series Analysis
MATH 180A: Introduction to Probability
MATH 180B: Introduction to Stochastic Processes I
MATH 180C: Introduction to Stochastic Processes II
MATH 181A: Introduction to Mathematical Statistics I
MATH 183: Statistical Methods
MATH 189: Exploratory Data Analysis and Inference
MATH 11: Calculus-Based Introductory Probability and Statistics