Jihuan (Aaron) Zhang

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EDUCATION

Ph.D. in Economics Expected May 2027
Indiana University Bloomington, IN, USA
Dissertation: "Essays in Econometrics and Machine Learning"
Advisor: Keli Xu; Committee Members: Ruli Xiao, Ito Yuki, Yinxi Xie.

M.A. in Economics 2019
Boston University, MA, USA

B.A. in Economics 2018
East China Normal University, Shanghai, China

FIELDS

Econometrics, Machine Learning, Environmental Economics

TEACHING EXPERIENCE

Indiana University Bloomington

Full Teaching Responsibilities

Statistical Analysis for Business and Economics (Undergraduate; ECON-E370) 2025, 2026
Math Bootcamp for the M.S. program in Economics (Graduate) 2022, 2023

Teaching Assistant

Statistical Analysis for Business and Economics (Undergraduate; ECON-E370) 2023–2025
Econometrics I: Statistical Foundation (Graduate; first-year Ph.D.; ECON-E571) 2024
Fundamentals of Economics I (Undergraduate; ECON-E251) 2023
Intro to Macroeconomics (Undergraduate; ECON-E202) 2022
Fundamentals of Economics II (Undergraduate; ECON-E252) 2021, 2022

JOB MARKET PAPER

Random Forests for Nonsmooth Binary Choice Models

We propose a semiparametric estimation procedure for binary choice models using random forests without imposing smoothness or a parametric functional form on the systematic component. Our method uses existing random forest implementations to obtain the tree partitions without additional numerical optimization at each split. The proposed estimator then transforms adjusted within-leaf sample proportions through the inverse of the known error distribution function and averages the resulting tree-level estimates of the systematic component. The paper also develops a stratified cross-validation procedure that jointly selects the standard random forest tuning parameters and the additional tuning parameter introduced by the proposed method. Under suitable regularity conditions, the theoretical analysis establishes L^2 convergence rates while accommodating continuous and discrete covariates whose dimensions may grow polynomially with the sample size. The simulation results support adapting random forests to the binary choice structure. Compared with the benchmark methods, our proposed estimator performs particularly well when the systematic component exhibits sharp nonlinearities or discontinuities. The LendingClub application demonstrates how the estimator can describe heterogeneous and nonlinear effects in the systematic component without imposing prespecified credit score categories.

WORK IN PROGRESS

Slow Decaying Local Projections
with Keli Xu

Local projection (LP) has become a popular tool for estimating impulse responses in macroeconomics. In this paper, we focus on stationary processes whose impulse responses decay too slowly to be absolutely summable. The LP method is particularly attractive in this context because it does not require explicitly modeling or estimating the parameters governing the slow decay. However, existing asymptotic theory for the semiparametric LP regression with a growing lag order does not cover this setting, because of the failure of the commonly assumed condition on the tail sum of the coefficients. A different theory is therefore needed. In a multivariate system, we establish consistency and a convergence-rate bound for the LP estimator, allowing for both growing propagation horizons and high-order dependence in the shocks —properties that have not been formally established for other semiparametric impulse-response estimators. We further extend our results to the structural LP estimator, allowing the Wold coefficients to be not absolutely summable.

Estimation of Large Dimensional Binary Choice Models with Penalized Random Forests

We propose a modified random forest estimator for binary choice models that uses the negative log-likelihood function in place of the impurity measures employed in standard random forests. In addition, we incorporate both L_1 and L_2 penalties into the recursive partitioning procedure to regularize the coefficients associated with the systematic component. Simulation studies suggest that the proposed estimator performs well in finite samples and is particularly effective at estimating discontinuous or nearly discontinuous functions.

Inference of High Dimensional Local Projection under General Conditions
with Keli Xu

The project aims to extend inference for local projections to high-dimensional settings while maintaining a set of weak assumptions. The asymptotic normality for estimated impulse responses is derived with an estimable variance.

Asymptotic Theory for Nonparametric Regression by Random Forest
with Joon Y. Park and Doyeon Pyun

In this paper, we establish consistency results for nonparametric regression by random forests. Based on the work of Chi et al. (2022), we provide several theoretical advancements, including (i) dispensing with the symmetrically distributed error assumption, (ii) allowing for dependence between the error and the covariates, (iii) accommodating discrete-type covariates, and (iv) improving convergence rates. Moreover, using a regularization method for balanced splits, we demonstrate that convergence rates can be further improved by reducing the variance part of the mean-squared error of the estimator.

PUBLICATION

Research completed before the Ph.D.

Environmental Kuznets Curve Hypothesis on CO_2 Emissions: Evidence for China.
Journal of Risk and Financial Management, 2021, 14(3), 93.

OTHER RESEARCH EXPERIENCE

Research Assistant, Prof. Chengzheng Li 2019, 2020
Department of Economics, Jinan University, Guangzhou, China

Research Assistant, Prof. Bahar Erbas 2019
Department of Economics, Boston University, MA, USA

HONORS AND AWARDS

Lloyd Orr Dissertation Fellowship, Indiana University	2026
Susan C. Thrasher Fellowship, Indiana University	2025
Department of Economics Graduate Fellowships, Indiana University	2021–2027
Academic scholarship, East China Normal University	2014, 2015

PRESENTATIONS

Hoosier Economic Conference	2024

SKILLS

Programming languages: R, Python, MATLAB, Fortran
Languages: English (Fluent), Mandarin (Native)

DISSERTATION COMMITTEE AND REFERENCES

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