Bruno Fava

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Northwestern Economics

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Citizenship: Brazilian

Fields

Research: Econometrics, Development Economics
Teaching: Econometrics, Machine Learning, Statistics

Education

Ph.D., Economics, Northwestern University (anticipated) 2026
Committee: Federico Bugni (co-chair), Dean Karlan (co-chair), Ivan Canay, Joel Horowitz
M.A., Economics, Northwestern University 2021
B.A., Economics, Insper, São Paulo, Brazil 2019

Fellowships & Awards

Dissertation University Fellowship, Northwestern University 2025–2026
Best Student Paper Award at the Midwest Econometrics Group Annual Conference 2024
Susan Schmidt Bies Prize for Doctoral Student Research on Economics and Public Policy 2023
Northwestern University's Institute for Policy Research Fellowship 2022
Distinguished Teaching Assistant Award 2022
Data Science Fellowship - Northwestern University 2020
Lemann Foundation Fellowship for Study Abroad in St. Gallen (Switzerland) 2019

Teaching Experience

Teaching Assistant, Northwestern University
Money and Banking Winter 2022
Intro to Applied Econometrics Fall 2021
Teaching Assistant, Insper
Statistics II Aug/2018-Dec/2018
Statistics I Feb/2018-Dec/2018

Research Experience

Research Assistant, Northwestern University
Professor Dean Karlan Fall 2022 - Spring 2025
Professor Joel Horowitz Fall 2024 - Spring 2025
Professor Lori Beaman Fall 2022
Professor Eric Auerbach Spring 2022

Seminar Presentations

Michigan State University (Spring 2025)

Conference Presentations

World Congress of the Econometric Society, Seoul, South Korea 2025
Southern Economic Association 94th Annual Meeting, Washington, DC 2024
Midwest Econometrics Group Conference, University of Kentucky 2024
IPA & GPRL Research Gathering, Northwestern University 2024

Job Market Paper

"Training and Testing with Multiple Splits: A Central Limit Theorem for Split-Sample Estimators"

Abstract: As predictive algorithms grow in popularity, using the same dataset to both train and test a new model has become routine across research, policy, and industry. Sample-splitting attains valid inference on model properties by using separate subsamples to estimate the model and to evaluate it. However, this approach has two drawbacks, since each task uses only part of the data, and different splits can lead to widely different estimates. Averaging across multiple splits, I develop an inference approach that uses more data for training, uses the entire sample for testing, and improves reproducibility. I address the statistical dependence from reusing observations across splits by proving a new central limit theorem for a large class of split-sample estimators under arguably mild and general conditions. Importantly, I make no restrictions on model complexity or convergence rates. I show that confidence intervals based on the normal approximation are valid for many applications, but may undercover in important cases of interest, such as comparing the performance between two models. I develop a new inference approach for such cases, explicitly accounting for the dependence across splits. Moreover, I provide a measure of reproducibility for p-values obtained from split-sample estimators. Finally, I apply my results to two important problems in development and public economics: predicting poverty and learning heterogeneous treatment effects in randomized experiments. I show that my inference approach with repeated cross-fitting achieves better power than previous alternatives, often enough to find statistical significance that would otherwise be missed.

Working Papers

"Predicting the Distribution of Treatment Effects via Covariate-Adjustment, with an Application to Microcredit"

Abstract: Important questions for impact evaluation require knowledge not only of average effects, but of the distribution of treatment effects. The inability to observe individual counterfactuals makes answering these empirical questions challenging. I propose an inference approach for points of the distribution of treatment effects by incorporating predicted counterfactuals through covariate adjustment. I provide finite-sample valid inference using sample-splitting, and asymptotically valid inference using cross-fitting, under arguably weak conditions. Revisiting five randomized controlled trials on microcredit that reported null average effects, I find important distributional impacts, with some individuals helped and others harmed by the increased credit access.

"Algorithmic Targeting in Credit Markets: Consequences of Data-Driven Lending Practices" with Susan Athey, Dean Karlan, Adam Osman, and Jonathan Zinman

Abstract: New machine learning methods may allow lenders to increase profits by enhancing targeting decisions based on individual-specific information. But are those who are most profitable to the bank also those who benefit the most from receiving access to credit? Using data from three randomized controlled trials on microcredit and machine learning algorithms, we demonstrate that lenders can increase profits by up to 27% through algorithm-driven lending decisions. However, the most profitable clients are often wealthier and more educated, shifting lending away from traditionally disadvantaged groups. We find no evidence that prioritizing lender profits negatively impacts borrower outcomes. Implementing an inclusive lending strategy that maximizes profits while maintaining average borrower income reduces lender profitability, achieving only one-third of the gains compared to profit maximizing targeting. These findings highlight the critical tensions arising from algorithmic credit allocation, emphasizing that as predictive technologies evolve, the trade-offs between profitability and social inclusion may intensify.

Work in Progress

"Is Participant Feedback Predictive of Impact?" with Gharad Bryan, Dean Karlan, Isabel Oñate, and Christopher Udry

"What Can We Learn from Harmonizing and Analyzing RCTs of Grant and Training Programs to Promote Entrepreneurship?" with Florian de Bundel, Dean Karlan, William Parienté, and Christopher Udry

Publications

"Probabilistic Nearest Neighbors Classification" with Paulo C. Marques F. and Hedibert F. Lopes

Entropy (2024), 26(1), 39

Abstract: Analysis of the currently established Bayesian nearest neighbors classification model points to a connection between the computation of its normalizing constant and issues of NP-completeness. An alternative predictive model constructed by aggregating the predictive distributions of simpler nonlocal models is proposed, and analytic expressions for the normalizing constants of these nonlocal models are derived, ensuring polynomial time computation without approximations. Experiments with synthetic and real datasets showcase the predictive performance of the proposed predictive model.

"The Illusion of the Illusion of Sparsity: An exercise in prior sensitivity" with Paulo C. Marques F. and Hedibert F. Lopes

Brazilian Journal of Probability and Statistics (2021), Vol. 35, No.4, 699-720

Abstract: The emergence of Big Data raises the question of how to model economic relations when there is a large number of possible explanatory variables. We revisit the issue by comparing the possibility of using dense or sparse models in a Bayesian approach, allowing for variable selection and shrinkage. More specifically, we discuss the results reached by Giannone, Lenza and Primiceri (2020) through a "Spike-and-Slab" prior, which suggest an "illusion of sparsity" in Economics datasets, as no clear patterns of sparsity could be detected. We make a further revision of the posterior distributions of the model, and propose three experiments to evaluate the robustness of the adopted prior distribution. We find that the pattern of sparsity is sensitive to the prior distribution of the regression coefficients, and present evidence that the model indirectly induces variable selection and shrinkage, which suggests that the "illusion of sparsity" could be, itself, an illusion. Code is available on Github.

Languages

English (fluent), Portuguese (native), Spanish (advanced)

References

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