RAJVEER JAT

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SUMMARY OF RESEARCH

Sufficient Instruments Filter *[Draft]*
Job Market Paper [*Working Paper*]

The Agricultural Productivity Gap: Informality Matters [*Paper*]
with *Bharat Ramaswami* [*Revise & Resubmit in the Journal of Development Economics.*]

Kernel Three Pass Regression Filter *[Paper]*
with *Daanish Padha* [*Reject & Resubmit in the Journal of Applied Econometrics.*]

JOB MARKET PAPER

Sufficient Instruments Filter *[Draft]*

Abstract: We introduce a novel five-layered deep learning-based tractable procedure to filter out sufficient information from many instruments for estimating parameters in regression models with endogenous regressors. Our method draws its merit from three key properties: the ability to incorporate supervision, the flexibility to accommodate non-linearity, and the capability for sufficient dimension reduction. We show that our method is consistent and asymptotically normal when many instruments are correlated. Simulation exercises show that this method consistently achieves lower bias and root mean squared error compared to competing benchmarks, across many specifications. We further validate our approach with two real-world applications in industrial organization and finance, yielding meaningful insights into causal relationships. Our method remains robust when the number of instruments exceeds the sample size, and performs well with weak and even invalid observed instruments, as long as there exists at least one linear combination of common factors among the observed instruments that serves as a valid instrument.

EDUCATION

University of California (UC), Riverside PhD in Economics *Expected: June'25*
Committee: Prof. Tae-Hwy Lee (Co-Chair), Prof. Aman Ullah (Co-Chair), Prof. Marcelle Chauvet, Dr. Ruoyao Shi,

Indian Statistical Institute (ISI), Delhi *MS in Quantitative Economics* *May'19*

Indian Institute of Technology (IIT), Roorkee B. Tech. in *Electrical Engineering* *May'16*

CONTACT INFORMATION

Placement Director	Dr. Joseph R. Cummins	Phone: (951) 827-1582	joseph.cummins@ucr.edu
Placement Coordinator	Gary Kuzas	Phone: (951) 827-1474	gary.kuzas@ucr.edu
Thesis Advisor	Prof. Tae-Hwy Lee	Phone: (951) 827-1509	taelee@ucr.edu
Candidate	Rajveer Jat	Phone: (951) 573-0953	rjat001@ucr.edu

FIELDS OF INTEREST

Theory: Econometric Theory(High-Dimensions, Causal Inference, Non-parametric), Machine Learning.
Applications: Applied Micro (Development, Labor, IO), Empirical Macro.

FELLOWSHIPS, HONORS, AND AWARDS

- Appointed to Lead University's Graduate Quantitative Methods Center by Graduate Division (UCR) 2024
- Conference Travel Grant Award, Graduate Division, University of California, Riverside 2024, 2022
- Dean's Distinguished Fellowship, University of California Riverside 2020
- Teaching Fellowship, Ashoka University, India 2019
- Book Prize Award for Exceptional Academic Performance, Indian Statistical Institute 2018, 2019
- Junior Research Fellowship (JRF) for scoring 99.99 percentile, University Grant Commission, India. 2019
- Graduate Fellowship at Indian Statistical Institute 2018, 2019
- Merit-cum-Means Scholarship, Indian Institute of Technology, Roorkee 2013, 2014, 2015, 2016

WORKING PAPERS

The Agricultural Productivity Gap: Informality Matters [*Paper*]
with *Bharat Ramaswami* [*Revise and Resubmit in the Journal of Development Economics.*]
-[*Media Coverage by Ideas for India.*]
Abstract: The literature has debated whether the productivity gap between agriculture and non- agriculture reflects mobility barriers or selection. Non-agriculture is not a homogeneous category. In developing countries, most of the non-agricultural employment is informal. Could it be that the productivity gap is driven by formal sector firms that are numerically small but economically substantial? This paper compares the productivity of agriculture to the informal and formal non-farm sectors in India. The comparison controls for sectoral differences in hours worked, human capital, and labor share of value added. The paper finds substantial productivity gaps with the formal sector but small and negligible gaps with the informal non-farm sector. Between 40-50% of non-farm workers are in sectors not more productive than agriculture. These findings suggest that the primary dualism in development is between the formal non- farm sector and the informal sector including agriculture.

Kernel Three Pass Regression Filter *[Paper]*
with Daanish Padha [*Reject and Resubmit in the Journal of Applied Econometrics*]
-[Accepted at The 2024 California Econometrics Conference.]
-[Accepted at The European Winter Meeting of the Econometric Society, 2024.]
-[Accepted at The 34^{th} Annual Midwest Econometrics Group Conference.]
-[Accepted at The 19^{th} Annual Conference on Economic Growth and Development, Indian Statistical Institute.]
Abstract: We forecast a single time series using a high-dimensional set of predictors. When predictors share common underlying dynamics, a latent factor model estimated by the Principal Component method effectively characterizes their co-movements. These latent factors succinctly summarize the data and aid in prediction, mitigating the curse of dimensionality. However, two significant drawbacks arise: (1) not all factors may be relevant, and utilizing all of them in constructing forecasts leads to inefficiency, and (2) typical models assume a linear dependence of the target on the set of predictors, which limits accuracy. We address these issues through a novel method: Kernel Three-Pass Regression Filter. This method extends a supervised forecasting technique, the Three-Pass Regression Filter, to exclude irrelevant information and operate within an enhanced framework capable of handling nonlinear dependencies. Our computationally efficient method demonstrates strong empirical performance, particularly over longer forecast horizons.

RESEARCH IN PROGRESS

Supervised Deep Factor Models with *Daanish Padha* [Work in Progress]
Abstract: We use a neural network to forecast a single time series. Inspired by the "Targeted Predictors" approach from Bai (2008), we first select a set of predictors by performing polynomial regression for each predictor individually. Unlike traditional factor models, which limit the search to an underlying planar structure, our approach explores a non-linear, low-dimensional manifold representation of the predictors that best explain the target variable y.

Information Theoretic Maximum Entropy Density Estimator [Work in Progress]
with Amos Golan, Tae-Hwy Lee, Millie Mao, and Aman Ullah

-Developing a new distribution learning method for faster non-parametric estimations.
-Unlike local variation-based kernel-based non-parametric, this method is global, which makes it faster.

TEACHING

Lead, Graduate Quantitative Methods Center, UC Riverside

- Basic Quantitative Methods for Finance (for MBA, Masters in Finance, MS in Financial Analytics) Fall 2024
- High-dimensional Statistics: Making Sense of Big Data (for PhDs and MS students) Fall 2024
- Non-parametric Regressions: Inferences and Implementation in R (for PhDs and MS students) *Winter 2025*
- Macroeconomics and Time Series Econometrics (for Grad students) *Winter 2025*
- Causal Inference Techniques (for Grad students) *Winter 2025*

Instructor, Dept. of Economics, UC Riverside

- Economic Development: Theory and Policy (Applications in Python, [Syllabus]) *Summer 2024 [Reviews]*
- Environmental Economics with Applications in R. ([Syllabus]) *Summer 2023 [Reviews]*

Teaching Assistant, Dept. of Economics, UC Riverside

- Econometric Theory III (Graduate level, [Syllabus]) Spring 2024 [Reviews]
- The Stock Market Fall 2021 [Reviews], Spring 2023 [Reviews], Fall 2023 [Reviews]
- Statistics for Economics Fall 2022 [Reviews], Winter 2024 [Reviews]
- Intermediate Microeconomics Summer 2022 [Reviews]
- Introductory Econometrics I Winter 2023 [Reviews]
- Introduction to Macroeconomics Winter 2022 [Reviews]
- Introduction to Microeconomics Spring 2022 [Reviews]

PROFESSIONAL EXPERIENCE

Lead, GradQuant, University of California Riverside Jul'24 - Present
-Leading the center for quantitative methods for grad students and post-doc researchers at UC Riverside.

Quant Consultant, Research Triangle Institute (RTI) International Jul'21 - Sep'21
- Developed statistical models for future cash flow streams to help $10 million investment decision problem.

Quant Research Intern, KPMG *Jan'20 - Aug'20*
-Solved an expected revenue estimation problem using a constrained optimization framework in Python.

Quant Consultant, Asian Infrastructure Investment Bank (AIIB) *Nov'19 to May'21*
-Developed mathematical models to guide the statistical pursuit of optimal solutions to investment problems.

C++ Software Engineer, HCL Technologies India *Oct'16-Jul'17*
-Using object-oriented programming, developed software solutions for business problems.

PRESENTATIONS IN RESEARCH CONFERENCES/SEMINARS

Dec 2024: Annual Conference by the Indian Statistical Institute Delhi, India
Dec 2024: The European Winter Meeting of the Econometric Society (EWMES 2024) Palma, Spain
Nov 2024: 34^{th} Annual Midwest Econometrics Group Conference at Uni. of Kentucky Lexington, KY, USA
Oct 2024: Fall 2024 Econometrics Seminar at UC Riverside Riverside, CA, USA
Sep 2024: The 2024 California Econometric Conference at UC Davis Davis, CA, USA
Oct 2023: Fall 2023 Econometrics Seminar at UC Riverside Riverside, CA, USA
May 2023: Spring 2023 Brown Bag Seminar at UC Riverside Riverside, CA, USA
Feb 2023: Winter 2023 Brown Bag Seminar at UC Riverside Riverside, CA, USA
Dec 2022: Annual Conference by The Econometric Society & Delhi School of Economics Delhi, India
Dec 2019: Annual Conference by the Indian Statistical Institute Delhi, India

LEADERSHIP POSITIONS

Lead Consultant at Graduate Quantitative Methods Center at UC Riverside	2024-2025
General Secretary (Finance), Student Government Body, IIT Roorkee	2014-2015
Class Representative of 2012-2016 Batch of B.Tech. in Electrical Engineering, IIT Roorkee	2012-2015

REFERENCES

Name	**Affiliation**	**Email**	**Phone**	**Ref. Type**
Prof. Tae-Hwy Lee	UC Riverside	taelee@ucr.edu	(951) 827-1509	Research
Prof. Marcelle Chauvet	UC Riverside	chauvet@ucr.edu	(951) 827-1587	Research
Prof. Bharat Ramaswami	Ashoka University	bharat.ramaswami@ashoka.edu.in	(951) 827-1587	Research
Dr. Ruoyao Shi	UC Riverside	ruoyao.shi@ucr.edu	(951) 827-1494	Research
Dr. Silviu Velovici	UC Riverside	silviu.velovici@ucr.edu	(951) 827-1474	Teaching