

## JIAN CAO

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### Academic Background

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#### TRINITY COLLEGE DUBLIN

Assistant Professor in Economics  
Research Fellow

August 2024 –Present  
January 2022 –July 2024

#### CALIFORNIA INSTITUTE OF TECHNOLOGY

Visitor  
Postdoctoral Scholar in Data Science and Election Integrity

January 2022 –Present  
July 2019 –December 2021

#### FLORIDA STATE UNIVERSITY

Senior Researcher  
Ph.D. Economics  
M.S. Economics

August 2018 –June 2019  
August 2018  
August 2016

#### CHINA UNIVERSITY OF MINING & TECHNOLOGY

Master of Financial Engineering

June 2014

#### HENAN UNIVERSITY OF ECONOMICS & LAW

B.A. Economics

June 2010

### Research Interests

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Econometrics, political methodology, computational social sciences  
— Comparative case studies, multiple imputation methods, social media analyses

### Peer-Reviewed Articles

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Cao, Jian, Thomas Chadeaux. 2024. "Dynamic Synthetic Controls: Accounting for Varying Speeds in Comparative Case Studies." *Political Analysis*. doi: 10.1017/pan.2024.14.

Li, Zhuofang, Jian Cao, Nicholas Adams-Cohen, and R. Michael Alvarez. 2023. "The Effect of Misinformation Intervention: Evidence from Trump's Tweets and the 2020 Election." *Multi-disciplinary International Symposium on Disinformation in Open Online Media 2023 Proceedings*. doi: 10.1007/978-3-031-47896-3\_7.

Cao, Jian, Seo-young Silvia Kim, and R. Michael Alvarez. 2022. "Bayesian Analysis of State Voter Registration Database Integrity." *Statistics, Politics and Policy*. doi: 10.1515/spp-2021-0016.

Cao, Jian, Christina M. Ramirez, and R. Michael Alvarez. 2021. "The politics of vaccine hesitancy in the United States." *Social Science Quarterly*. doi: 10.1111/ssqu.13106.

Alvarez, R. Michael, **Jian Cao**, and Yimeng Li. 2021. "Voting Experiences, Perceptions of Fraud, and Voter Confidence." *Social Science Quarterly*.  
doi: 10.1111/ssqu.12940.

Srikanth, Maya, Anqi Liu, Nicholas Adams-Cohen, **Jian Cao**, R. Michael Alvarez, and Anima Anandkumar. 2021. "Dynamic Social Media Monitoring for Fast-Evolving Online Discussions." *Knowledge Discovery and Data Mining 2021 Proceedings*.  
doi: 10.1145/3447548.3467171.

**Cao, Jian**, Nicholas Adams-Cohen, and R. Michael Alvarez. 2021. "Reliable and Efficient Long-Term Social Media Monitoring." *Journal of Computer and Communications*.  
doi: 10.4236/jcc.2021.910006.

## Working Papers

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"Multiple Imputation for Large Multi-Scale Data With Linear Constraints."  
(with Paul Beaumont)

"Ballot Rejections and Ballot Curing in Washington State."  
(with Canyon Foot, Jay Lee, R. Michael Alvarez, Paul Manson, and Paul Gronke)

## Work in Progress

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"Dynamic Interaction Panel Estimation: Accounting for Complex Interdependence in Panel Data."  
(with Thomas Chadeaux)

"Enhancing Regression Analysis through Self-Aligned DTW-Derived Speed Profiles in Time Series Data."  
(with Thomas Chadeaux)

"The Parallel Quasi-Monte Carlo Bayesian Multi-Scale Multiple Imputation Method."  
(with Paul Beaumont)

"Mailing It In: Voter Confidence in Vote-By-Mail In the 2020 Presidential Election."  
(with R. Michael Alvarez and Seo-young Silvia Kim)

## Research Experience

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### TRINITY COLLEGE DUBLIN

Research Fellow

January 2022 –Present

Project: Patterns of Conflict Emergence

Leading a project on identifying patterns in pre-conflict actions using multi-source data, aimed at enhancing conflict prediction models.

Collaborating with interdisciplinary teams to synthesize findings into actionable insights for policy planning.

## CALIFORNIA INSTITUTE OF TECHNOLOGY

Visitor

January 2022 –Present

Postdoctoral Scholar in Data Science and Election Integrity

July 2019 –December 2021

Project: Election Auditing

Developed probabilistic matching and Bayesian multivariate models using GCP for large election database auditing in California and Florida.

Implemented entity resolution and anomaly detection on daily snapshots of voter registration databases that contain more than 20 million records and detected  $10\times$  more true anomalies than the existing methods did.

Project: Twitter Monitoring

Developed serverless architectures using GCP, AWS, and Oracle for long-term Twitter monitoring. They ingest, process, and store more than 4.5 billion tweets (30 TB in size) related to COVID-19, primary/general elections, and protests.

Work closely with the Computer Science team and implemented topic, spatial, network, and sentiment analyses on the collected tweets and identified COVID-19 misinformation and voting issues in the 2020 Election cycle.

## FLORIDA STATE UNIVERSITY

Senior Researcher

August 2018 –June 2019

Project: Large Missing Data Multiple Imputation

Developed the fastest and most accurate Bayesian inference method for missing data multiple imputation.

Developed a parallel-sequential imputation method that can impute large multi-scale data sets with 1.5 billion observations (500 GB in size).

Project: Economic Impact Modeling

Analyzed the economic impact of Florida's housing and small business policies.

Developed a NETS-based impact analysis tool that has 1000 times finer resolution than the existing methods.

## Teaching

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Trinity College Dublin

Assistant Professor, *ECP77101*: Introductory Mathematics (2024);  
*ECU33081*: Mathematical Economics A (2024).  
*ECU44100*: Economics Capstone (2024, 2025).

Caltech

Post-doc lecturer, *SS 224*: Social Science Data (2019, 2021).

Florida State University

Teaching assistant, *ECO 3431*: Analysis of Economic Data (2017).

Henan University of Economics & Law

Teaching assistant, Statistics (2008).

## Fellowships, Grants, and Awards

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- 2022 Conflict Patterns in Financial News: research grant by Google.
- 2021 Election Integrity in California: research grant by John Randolph Haynes and Dora Haynes Foundation.
- 2020 Managing Elections During the COVID-19 Pandemic: research grant by Google.
- 2015–2016 Dean’s Scholarship, Florida State University.

## Software

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- `dsc` A R package for the Dynamic Synthetic Control method, an enhanced synthetic control method that accounts for misalignment in time series caused by inherent speed differences.
- `spike` A Python package for deploying long-term Twitter monitors and managing files on Google Drive, Google Cloud Storage, and SFTP file systems.

## Conference and Seminar Presentations

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- 2024 APSA 2024 (American Political Science Association Annual Conference).
- 2023 APSA 2023 (American Political Science Association Annual Conference);  
MISDOOM 2023 (Multi-disciplinary International Symposium on Disinformation in Open Online Media Annual Conference).
- 2021 KDD 2021 (Knowledge Discovery and Data Mining);  
ESRA 2021 (Election Sciences, Reform, & Administration Conference);  
RRoCCET 2021 (Research Running on Cloud Compute & Emerging Technologies).
- 2020 ESRA 2020 (Election Sciences, Reform, & Administration Conference);  
VoteCal (Vote California);  
Caltech COVID Dynamic Talk.
- 2019 Caltech SISL Talks (Social and Information Sciences Laboratory);  
FSU GSMC Talks (Graduate Modern Statistics Club).

## Peer Review Activities

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Political Behavior, American Journal of Political Science, SN Computer Science, Journal of Computer and Communications.

## References

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Paul Beaumont (primary advisor)  
Associate Professor of Economics  
Florida State University  
[beaumont@fsu.edu](mailto:beaumont@fsu.edu)

Thomas Chadeaux  
Professor in Political Science  
Trinity College Dublin  
[thomas.chadeaux@tcd.ie](mailto:thomas.chadeaux@tcd.ie)

R. Michael Alvarez  
Flintridge Foundation Professor  
of Political and Computational  
Social Science  
California Institute of Technology  
[rma@caltech.edu](mailto:rma@caltech.edu)

Animashree Anandkumar  
Bren Professor of Computing and  
Mathematical Sciences  
California Institute of Technology  
[arangelf@caltech.edu](mailto:arangelf@caltech.edu)