

Inan Bostanci

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Introduction

I am a PhD candidate in Mathematics and Computer Science at Freie Universität Berlin, conducting my research at the Zuse Institute Berlin. My work focuses on developing hybrid modeling frameworks that combine agent-based and compartmental (ODE) models to simulate infectious disease spread, integrating real-world mobility, weather, and policy data. I am particularly interested in how individual behavior, mobility, and interventions interact to shape large-scale population health dynamics. My background bridges social science, statistics, and computational modeling, and I enjoy building data-driven models that inform public health forecasting, policy evaluation, and complex systems research.

Education

Free University of Berlin, PhD (Dr. rer. nat.) in Mathematics and Computer Science Expected 06/26

- Researching hybrid agent-based and ODE models for infectious disease modeling, focusing on scalability, realism, and data integration
- Research conducted as full-time research assistant at Zuse Institute Berlin and supervised by Dr. Tim Conrad

Utrecht University, M.Sc. in Methodology & Statistics in the Behavioral, Biomedical and Social Sciences 09/20 – 06/22

- Thesis: Data Linkage to Validate and Calibrate Traffic Estimations on a Nationwide Scale. (Grade: 9.0, top of cohort)
- Coursework included statistical inference, machine learning, deep learning, data mining

Leipzig University, B.A. in Sociology 10/15 – 03/20

- Focus on quantitative methods, social network analysis, applied statistics
- Thesis: The Effect of Social Networks on Labor Market Outcomes. (Grade: 1.3)

Experience

Research assistant & PhD Student, Zuse Institute Berlin (Department of Visual and Data-Centric Computing, Bioinformatics in Medicine group) – Berlin, DE 11/22 – today

- Developed a hybrid agent-based and ODE simulation framework, balancing scalability, accuracy, and data fidelity for COVID-19 spread, integrating real-world mobility and weather data
- Applied a deep learning-based neural parameter calibration approach to fit complex ODE models to real-world COVID-19 time series data with custom loss functions and uncertainty quantification techniques
- Led model validation and parameter fitting pipelines to compare simulated vs. empirical case curves
- Contributed to national COVID-19 forecasting via the MODUS-COVID project in collaboration with TU Berlin, delivering simulation-based policy briefs to German health authorities

Intern, Statistics Netherlands (CBS) – Heerlen, NL 09/21 – 05/22

- Designed and implemented a data linkage framework integrating population registry, traffic sensor data, and geospatial infrastructure to model national rush hour patterns
- Used CBS's secure big data environment for scalable preprocessing and modeling
- Delivered Jupyter notebooks for traffic prediction and anomaly detection to CBS analysts

Student research assistant, Institute of Public Health, Charité – Berlin, DE 11/19 – 09/20

- Supported national research project on rare disease diagnostics with data management, analysis, and visualization
- Attended internal colloquia on public health research methodology

Student assistant, School of Media, Communication and Sociology, University of Leicester – remote 03/17 – 09/20

- Research project Far-Right Environmental Risk Communication in the European Parliament
- Collecting, monitoring and qualitative coding of data and parliamentary speeches of the EU parliament and of newspaper articles

Intern, Ministry of Trade – Ankara, TR

08/19

- Assistance in Turkey's first Nudge Unit (applying behavioural science in public policy)
- Attendance in international meetings to implement blockchain technology in international trade
- Literature reviews

Student Assistant, multiple projects, Institute for Sociology, Leipzig University – Leipzig, DE

10/16 - 12/19

- Data analysis and visualization, data research, literature research
- Preparing lecture slides
- Managing the learning management system
- Assistance in EU-funded project SOLIDUS (Horizon 2020, grant agreement #649489)
- Assisted in authoring of the “European Solidarity in Times of Crisis”-monograph
- Preparing and analyzing reports
- Preparing, conducting, and evaluating focus group meetings, interviews and national seminars
- Tutoring and marking students homework in statistics

Publications

Bostanci, I. & Conrad, T. (2025). Integrating Agent-Based and Compartmental Models for Infectious Disease Modeling: A Novel Hybrid Approach. *Journal of Artificial Societies and Social Simulation* 28(1). DOI: 10.18564/jasss.5567. Data and code: git.zib.de/ibostanc/hybrid_abm_ode

Paltra, S., **Bostanci, I.** & Nagel, T. (2024). The effect of mobility reductions on infection growth is quadratic in many cases. *Scientific Reports* 14. DOI: 10.1038/s41598-024-64230-1.

Bostanci, I., Gootzen, Y. & Lugtig, P. (2023). Data Linkage to Validate and Calibrate Traffic Estimations on a Nationwide Scale: A Framework for Official Statistics. *CBS Discussion Paper*. cbs.nl/en-gb/background/2023/11/validation-and-calibration-of-traffic-estimations. Data and code: github.com/iebos/dacimob

Awards

Best Poster Award

03/24

At 2nd National Conference on Infectious Disease Modeling (MONID);

Poster Title: Modeling Infection Spread and Counter-Measures in a Pandemic Situation with Coupled Models

Technical Skills

Programming languages: Python (advanced), R (advanced), Java (basic), Julia (basic)

Libraries: PyTorch, scikit-learn, pandas, numpy, matplotlib, statsmodels, geopandas, igraph (R), tidyverse (R),

Modeling & Analysis: Statistical inference, multilevel modeling, agent-based modeling (ABM), hybrid ABM-ODE modeling, sensor data integration (e.g., traffic loops, mobile phones), machine learning (random forests, classification models, link prediction, ensemble methods), parameter fitting, time series analysis, text classification, contact network analysis, graphical models, Bayesian networks

Tools & Environments: Git, GitHub, GitLab, Jupyter, Latex, Pycharm, Linux

Languages

German (native), English (fluent), Turkish (conversational), French (basic)

Other Projects

- Opinion Dynamics ABM (Spring School, School of Complex Adaptive Systems, Arizona State University) – Modeled social influence and polarization using agent-based simulations in a one-week intensive program
- Sequential Hybrid Simulation (TU Berlin) – Co-developed mono-directional hybrid epidemic model as part of a joint research collaboration

Selected Talks

- "Hybrid ABM-ODE Model for COVID-19 Spread in Berlin and Brandenburg", elevator pitch presentation at the 3rd National Conference on Infectious Disease Modeling (MONID) 2025
- “Data Linkage to Validate and Calibrate Traffic Estimations on a Nationwide Scale: A Framework for Official Statistics”, presentation at the General Online Research Conference 2023