Hongru Du

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Highlight

- Founding contributor of Johns Hopkins CSSE COVID-19 dashboard.
- Published 11 peer-reviewed articles in premier journals, with 4 manuscripts under review.
- As of January 2025, my Google Scholar profile lists over 13,000 citations, including 8 high-impact papers.
- Achievements were awarded by INFORMS, Data Science and AI Institute at Johns Hopkins University, and ESRI.
- Delivered 14 invited talks and conference presentations, and served as a reviewer for 9 peer-reviewed journals and 3 academic conferences.

Research Interests

My research bridges the fields of **Systems Engineering** and **Public Health**, where I develop **computational and artificial intelligence methods** to tackle broader societal challenges. Specifically, my research focuses on:

- **Data-Driven Decision-Making**
- **Multimodal Machine Learning for Social Systems**
- **Modeling Human Behavior in Complex Systems**

Education

Johns Hopkins University, USA, Ph.D. in Systems Engineering — Sept 2019 – May 2025

- Advisor: Prof. Lauren Gardner
- **Thesis:** From Data to Decisions: Engineering Approaches to Equitable and Resilient Public Health Systems

University of Wisconsin-Madison, USA, M.Sc in Industrial Engineering — Sept 2017 – Jan 2019

- Advisor: Prof. Vicki Bier

University of Edinburgh, UK, B.Sc in Material Chemistry — Sept 2013 – May 2017

Tianjing University, China, B.Eng in Chemical Engineering — Sept 2013 – May 2017

Awards

- **INFORMS 2024 Poster Competition Second Place Award**, INFORMS 2024 *2024*
- **Best Demonstration Project Award**, Data Science and AI Institute *2024*
- **Graduate Student Teaching Award Nominee**, Johns Hopkins University *2023*
- **ESRI Making a Difference Award**, ESRI *2020*
- **Richard D. Hickman Fellowship**, Johns Hopkins University *2019*
- **Tianjin Environmental Protection Science and Technology Award** *2016*
- **International Student Scholarship**, University of Edinburgh *2015*

Selected Publications

1. **Du, H.***, Zhao, J.*, Zhao, Y.*, Xu, S., Lin, X., Chen, Y., Gardner, L.M. and Yang, H., 2024. Advancing Real-time Pandemic Forecasting Using Large Language Models: A COVID-19 Case Study. arXiv preprint arXiv:2404.06962, 2024. (In Press *Nature Computational Science*).
2. **Du, H.***, Zahn, M.*, Loo, S., Alleman, T., Truelove, S.A., Patenaude, B., Gardner, L.M., Papageorge, N. and Hill, A.L., 2024. Modeling dynamic disease-behavior feedbacks for improved epidemic prediction and response. medRxiv, pp.2024-11. (Submitted to *PNAS*.)
3. **Du, H.**, Saiyed, S. and Gardner, L.M., 2024, Association between vaccination rates and COVID-19 health outcomes in the United States: a population-level statistical analysis. *BMC Public Health*, 24(1), pp.1-14.

4. **Du, H.**, Dong, E., Badr, H.S., Petrone, M.E., Grubaugh, N.D. and Gardner, L.M., 2023. Incorporating variant frequencies data into short-term forecasting for COVID-19 cases and deaths in the USA: a deep learning approach. *eBioMedicine*, 89.
5. Rankin, N., Saiyed, S., **Du, H.** and Gardner, L.M., 2025. A multi-city COVID-19 categorical forecasting model utilizing wastewater-based epidemiology. *Science of The Total Environment*, 960, p.178172.
6. Xu, S., **Du, H.**, Dong, E., Wang, X., Zhang, L. and Gardner, L.M., 2025. A Multi-pathogen Hospitalization Forecasting Model for the United States: An Optimized Geo-Hierarchical Ensemble Framework. medRxiv, pp.2025-01. (Under Review *Epidemics*.)
7. Badr, H.S., **Du, H.**, Marshall, M., Dong, E., Squire, M.M. and Gardner, L.M., 2020. Association between mobility patterns and COVID-19 transmission in the USA: a mathematical modelling study. *The Lancet Infectious Diseases*, 20(11), pp.1247-1254.
8. Dong, E., **Du, H.** and Gardner, L., 2020. An interactive web-based dashboard to track COVID-19 in real time. *The Lancet infectious diseases*.

Invited Talks

- *Tuanshan Hill Anti-XID Forum, China CDC, Online* *2024*
- *Applied Micro Brownbag Seminar, Department of Economics, Johns Hopkins University, Baltimore, MD, USA* *2024*
- *Johns Hopkins Alumni virtual weekend, Baltimore, MD, USA [link]* *2021*
- *2021 ABET SYMPOSIUM, Online (Closing Keynote Speaker [link])* *2021*
- *Johns Hopkins Biomedical Engineering Spring Speaker Series, Baltimore, MD, USA* *2020*

Research Mentorship

Samee Saiyed, Ph.D. candidate, Johns Hopkins University	2022 – present
Naomi Rankin, Ph.D. candidate, Johns Hopkins University	2023 – present
Shaochong Xu, Ph.D. candidate, Johns Hopkins University	2023 – present
Liyue Zhang, Master's student, Johns Hopkins University	2024 – present

Teaching Experience

Applied Modeling for Public Health 2023 Workshop, Instructor	October, 2023
EN.560.653 An Introduction to Network Modeling, Teaching Assistant	2020, 2021, 2022

Professional Service

Serve as reviewer for journals: *BMC Public Health*, *JMIR Public Health and Surveillance*, *PLOS ONE*, *BMJ Public Health*, *Wellcome Open Research*, *Virus Evolution*, *Dialogues in Health*, *Journal of Public Health Policy*, *Applied Economics*.

Serve as reviewer for conferences: *MIDAS 2024*, *APHA 2024*, *TRB 2023*.

To University:

- *Representative*, Civil and Systems Engineering Graduate Association *2021 to 2022*
- *Communication Coordinator*, Center for Systems Science & Engineering *2022 to now*

To Community:

- FluSight real-time influenza forecasting, CDC *2023 to now*
- Forecast Hub real-time COVID-19 forecasting, CDC *2021 to 2023*

Professional Associations

- Member, American Public Health Association (APHA)
- Member, Models of Infectious Disease Agent Study (MIDAS)
- Member, Institute for Operations Research and the Management Sciences (INFORMS)