Zihui Ma, Ph.D.

415-990-9440 | zma88@umd.edu | Zihui Ma | Web: Zihui Ma | Google Scholar: Zihui Ma

ACADEMIC APPOINTMENTS

University of Maryland College Park

Postdoctoral Fellow (incoming) 2024 Aug –
Topic 1: *Semantic Foundations and Formal Methods for Evolutionary System-of-System Architectures*
Sponsor: US Department of Defense (DOD)
PIs: Mark A. Austin, PhD; Jennifer Golbeck, PhD
Topic 2: *Advanced AI for Disaster Management and Community Resilience*
Advisor: Gregory B. Baecher, PhD, NAE, Dist.M. ASCE
Affiliation: Center for Risk and Reliability & Institute for Systems Research

Graduate Research Assistant 2020 – 2024
Topic*: Human-centered Decision-making and Disaster Informatics*
Advisor*:* Gregory B. Baecher, PhD, NAE, Dist.M. ASCE
Affiliation: Center for Risk and Reliability

Graduate Teaching Assistant 2019 – 2020
graded coursework, led office hours, monitored class exams; and assisted a total of >300 students

EDUCATION

University of Maryland College Park

Ph.D. in Civil Engineering 2020 – 2024
Dissertation*: "Natural Language Processing, Social Media and Epidemiological Model for Wildfire Response and Resilience Enhancement"*
Advisor: Gregory B. Baecher, PhD, NAE, Dist.M. ASCE

M.S. in Civil Engineering (concentrate on project management) 2018 – 2020
Thesis*: "Reliability-Based Modeling for Missouri River Dam System"*
Sponsor: US Army Corps of Engineers (USACE)
Advisor: Gregory B. Baecher, PhD, NAE, Dist.M. ASCE

San Francisco State University

M.S. in Civil Engineering (concentrate on structure/seismic engineering) 2015 – 2017
Thesis*: "Real-time Non-intrusive Information Extraction for Highway Trucks"*
Advisor: Zhaoshuo Jiang, PhD, PE, LEED AP

San Francisco State University. and Zhejiang University of Science and Technology

B.S in Civil Engineering 2011 – 2015
Joint degree program
Dean's list student

RESEARCH INTERESTS

- Environmental Impacts and Social Dynamics
- Computational Social Science
- Social Inequality and Social Justice
- Community Resilience and Social Vulnerability
- Environmental Economics and Health Geography
- Natural Hazards and Risk Management
- Human-centered AI and AI for Social Good

AWARDS & HONORS

2024 Arthur M. Wellington Prize, ASCE 2024

2024 Thomas Fitch Rowland Prize, ASCE's Construction Institute 2024

Future Faculty Fellowship (Travel funds $2,500), A. James Clark School of Engineering, University of Maryland – College Park 2022

Undergraduate Seismic Design Competition (Rank #28), Earthquake Engineering Research Institute (EERI) 2015

Foreign Exchange Scholarship (First-class award ￥30,000), Zhejiang University of Science and Technology 2013

SELECTED RESEARCH EXPERIENCE

Social Disparities of Wildfire Awareness *(ongoing)* 2024 –

Research project, conducted at Univ. of Maryland College Park

- Discover the relationship between public awareness and socio-economic factors in addressing the environmental inequality
- Construct a behavioral SIR model to map timely social resilience indices at the urban level

Social Computing for Wildfire Resilience Enhancement 2021 – 2024

Dissertation, conducted at Univ. of Maryland College Park

- Utilized advanced machine learning tools (i.e., BERT) to investigate spatial-temporal patterns in Twitter community responses during wildfire seasons
- Integrated epidemiology models (e.g., SIR and Multi-wave SIR) and large-scale social behavioral data to quantitatively measure situational awareness at city scale
- Proposed a real-time evacuation mapping system to discover patterns in evacuations induced by wildfires
- Identified influential users and their account types through wildfire information dissemination networks

AI-Driven Earthquake Damage Forecasting 2023

Research project, conducted at Univ. of Maryland College Park

- Developed a human-centered approach using crowdsourced data for rapid seismic assessment

- Built muti-classification models to parse the damage levels adapted from the Modified Mercalli Intensity (MMI) scale
- Created a geographic damage distribution map to secure timely responses

Perceptions of ChatGPT in Higher Education Among Online Communities 2023

Research project, conducted at Univ. of Maryland College Park

- Utilized BERT-based topic modeling to discover key concerns of generative AI models in the educational sector based on Twitter data
- Performed social network analysis to pinpoint influential voices among Twitter communities
- Discussed the potential collaborative approach among all stakeholders to ensure the responsible and ethical use of AI in educational environments

Crowdsourcing-Based Airport System Robustness Evaluation 2022

Research project, conducted at Univ. of Maryland College Park

- Leverage Google Maps reviews to examine how COVID-19 impacts airport service quality (ASQ) in the U.S
- Created an ontology of keywords regarding ASQ attributes to categorize and analyze the reviews
- Classified sentiment of ASQ topics using fine-grained sentiment analysis
- Used statistical models to investigate the key ASQ topics and their impact on rating

Data-Driven Project Risk Management Performance Evaluation 2022 – 2023

Research project, conducted at Univ. of Maryland College Park and Build American Center (BAC)

Sponsor: U.S. Department of Transportation (DOT)

- Developed data-driven metrics that identify the types of risk project managers and provided insights into the dynamic trajectories of project risks
- Assessed project management performance through historical federal highway transportation projects' annual reports

Social-Media Oriented COVID-19 Lockdown Policy Agreement and Vaccine Acceptance Assessment 2021 – 2022

Research project, conducted at Univ. of Maryland College Park

- Applied crowdsourced data and mobility data to evaluate social distance and monitor the risk of human interactions during the pandemic
- Developed a rapid assessment model to investigate public vaccine acceptance at city and county levels
- Accessed the relationship between demographic factors and public attitudes and behaviors

Intelligent Blackout Responses and Community Resilience 2019 – 2020

Research project, conducted at Univ. of Maryland College Park

- Classified Twitter data in the 2019 NYC blackout into several response types
- Analyzed community resilience by tracking the human mental outlooks and behavioral patterns with proposed index metrics

Simulation-Based Missouri River Dam System Reliability Assessment 2019 – 2020

Master thesis, conducted at Univ. of Maryland College Park

Sponsor: US Army Corps of Engineers (USACE)

- Built Monte Carlo simulation models for reliability analysis of dam operations on the Missouri River
- Tested the system availability under several maintenance scenarios
- Proposed practical regulatory recommendations for system managers

PAPERS IN PREPARATION & PREPRINTS

(*corresponding author)

1. **Ma, Z**.* collaborate with Hu, G., Lin, T., Li, L, Hu, S., & Baecher, G. B. (2024). Social Behavioral Epidemiology Model for Wildfire Situational Awareness Mapping. Intended for Nature Communications.
2. **Ma, Z**. collaborate with Yu, H., Fan, L., Li, L., Zhou, J., Xian, L., Hua, W., Zhang, Y., Gandhi, A., & Ma,X. (2024). Large Language Models in Biomedical and Health Informatics: A Bibliometric Review (arXiv:2403.16303). arXiv. https://doi.org/10.48550/arXiv.2403.16303. Intended for Journal of Biomedical and Health Informatics (*Major Revision*).
3. **Ma, Z**.* collaborated with Li, L., Mao, Y., Wang, Y., Patsy, O. G., Bensi, M. T., Hall, M. A., & Baecher, G. B. (2023). A survey of using social media data and natural language processing techniques to investigate natural disasters, intended for Natural Hazard Review (*Accepted*).
4. **Ma, Z**.* collaborated with Li, L., & John, J. (2023). Thriving in a pandemic: Lessons learned from students' perceptions in a resilient university program seen through the CoI lens, arXiv. https://doi.org/10.48550/arXiv.2310.20183.
5. **Ma, Z**. collaborated with Li, L., Gao, L., Zhou, J., Choy, D. F., & Hall, M. A. (2021). Can Social Media Data Be Utilized to Enhance Early Warning: Retrospective Analysis of the U.S. Covid-19 Pandemic (p. 2021.04.11.21255285). https://doi.org/10.1101/2021.04.11.21255285

JOURNAL PAPERS

(*corresponding author)

1. **Ma, Z.***, Li, L., Hemphill, L., Baecher, G. B., & Yuan, Y. (2024). Investigating disaster response for resilient communities through social media data and the Susceptible-Infected-Recovered (SIR) model: A case study of 2020 Western U.S. wildfire season. *Sustainable Cities and Society*, *106*, 105362. https://doi.org/10.1016/j.scs.2024.105362
2. **Ma, Z**. collaborated with Fan, L., Li, L., Lee, S., Yu, H., & Hemphill, L. (2024). A Bibliometric Review of Large Language Models Research from 2017 to 2023. *ACM Transactions on Intelligent Systems and Technology*. https://doi.org/10.1145/3664930
3. **Ma, Z**. collaborated with Erfani, A., Cui, Q., & Baecher, G. B. (2023). Ex Post Project Risk Assessment: Method and Empirical Study. *Journal of Construction Engineering and Management*, 149(2), 04022174. https://doi.org/10.1061/JCEMD4.COENG-12588 (*received 2024* ***ASCE Best Paper***)
4. **Ma, Z**. collaborated with Li, L., Fan, L., Lee, S., Yu, H., & Hemphill, L. (2023). ChatGPT in education: A discourse analysis of worries and concerns on social media. *Education and Information Technologies,* https://doi.org/10.1007/s10639-023-12256-9
5. **Ma, Z**. collaborated with Li, L., Mao, Y., & Wang, Y. (2022). How has airport service quality changed in the context of COVID-19: A data-driven crowdsourcing approach based on sentiment analysis. *Journal of Air Transport Management*, 102298. https://doi.org/10.1016/j.jairtraman.2022.102298

6. **Ma, Z**. collaborated with Li, L., Zhou, J., Bensi, M. T., Hall, M. A., & Baecher, G. B. (2022). Dynamic assessment of the COVID-19 vaccine acceptance leveraging social media data. *Journal of Biomedical Informatics*, *129*, 104054. https://doi.org/10.1016/j.jbi.2022.104054
7. **Ma, Z**. collaborated with Li, L., Lee, H., & Lee, S. (2021). Can social media data be used to evaluate the risk of human interactions during the COVID-19 pandemic? *International Journal of Disaster Risk Reduction*, *56*, 102142. https://doi.org/10.1016/j.ijdrr.2021.102142
8. **Ma, Z**. collaborated with Li, L., & Cao, T. (2021). Data-driven investigations of using social media to aid evacuations amid Western United States wildfire season. *Fire Safety Journal*, *126*, 103480. https://doi.org/10.1016/j.firesaf.2021.103480
9. **Ma, Z**. collaborated with Li, L., & Cao, T. (2020). Leveraging social media data to study the community resilience of New York City to 2019 power outage. *International Journal of Disaster Risk Reduction*, *51*, 101776. https://doi.org/10.1016/j.ijdrr.2020.101776

CONFERENCE PAPER

1. **Ma, Z**. collaborated with Li, L., Yuan, Y., & Baecher, G.B. (2023). "Appraising Situational Awareness in Social Media Data for Wildfire Response," ASCE Inspire conference, Arlington, Virginia, November 16 – 18, 2023.
2. **Ma, Z**. collaborated with Li, L., Bensi, M. T. & Baecher, G. B. (2023). "Social Media Crowdsourcing for Damage Assessment Following Earthquake Disasters," Geo-risk 2023, Arlington, Virginia, July 23-26. (*feature paper & plenary presentation, 9 of 163 papers)*
3. **Ma, Z**. collaborated with Erfani, A., Cui, Q., & Baecher, G. B. (2023). "Data-Drive Evaluation of Project Risk Registers: Theory, Method, and Case Studies," Geo-risk 2023, Arlington, Virginia, July 23-26.
4. **Ma, Z**. collaborated with Patev, R.C., Li, L., & Baecher, G.B. (2022). "Missouri River System Simulation," US Society on Dams Annual Conference, San Diego, April 11-14.

PRESENTATIONS & INVITED TALK

(*presenter)

1. **Ma, Z**.* collaborated with Hu, G., Lin, T., Li, L., Hu, S., & Baecher, G.B. (2024). "Assessing Inequitable Social Responses to Wildfires: A Case Study of California Using the Epidemiology Model," AGU Fall Meeting 2024, Washington, D.C, December 9-13, 2024. (*Submitted*)
2. **Ma, Z**. collaborated with Li, L., Lu, Y., Hu, S., Liu, J., Deng, M., Han, Z., Baecher, G.B. & Hemphill, L. (2024). "Assessing the damage of natural disasters using multimodal large language models and social media crowdsourcing," AGU Fall Meeting 2024, Washington, D.C, December 9-13, 2024. (*Submitted*)
3. **Ma, Z**.* collaborated with Sousa, R.L., Hu, S., Einstein, H.H., & Baecher, G.B. (2024). "Unveiling Social Disparities in Landslide Recovery through Multimodal Data Analysis," NetMob 2024, Washington, D.C, October 7-9, 2024. (*Accepted*)
4. **Ma, Z**.* collaborated with Li, L., & Baecher, G.B. (2024). "Topic-based SIR model for Wildfire Situational Awareness," Natural Hazards Research Summit 2024, College Park, Maryland, USA, May 14-15, 2024. (*Poster presentation*)
5. **Ma, Z**.* collaborated with Li, L., Yuan, Y., & Baecher, G.B. (2023). "Leveraging social media data for enhancing wildfire situational awareness," Natural Hazard Workshop, Broomfield, Colorado, USA, July 12-13, 2023. (*Oral presentation*)

6. **Ma, Z.*** collaborated with Li, L., Yuan, Y., & Baecher, G.B. (2023). "Appraising Situational Awareness in Social Media Data for Wildfire Response," ASCE Inspire Conference, Arlington, Virginia, November 16-18, 2023. (*Poster presentation*)
7. **Ma, Z.*** collaborated with Erfani, A., Cui, Q., & Baecher, G. B. (2023). "Data-Drive Evaluation of U.S. Major Transportation Project Risk Registers," Geo-risk 2023, Arlington, Virginia, July 23-26. (*Oral presentation*)
8. **Ma, Z.*** collaborated with Li, L., Bensi, M. T., Hemphill, L. & Baecher, G. B. (2023). "Epidemic model for disaster response in Twitter community: experiment in 2020 Western U.S. wildfire season," AGU Fall Meeting 2023, San Francisco, California, December 11-15, 2023. (*Oral presentation*)
9. **Ma, Z.*** collaborated with Li, L., & John, J. (2023). "The impact of the COVID-19 Pandemic on Student's expectations," Affordable Degrees-at-Scale Symposium, USA, December 4-6. (*Poster presentation*)
10. **Ma, Z.*** (2023) "Investigating disaster response through social media data and the Susceptible-Infected-Recovered (SIR) model," invited presentation to co-host seminar by the Center for Disaster Resilience and Center for Risk and Reliability, University of Maryland, September 20, 2023.

TEACHING & MENTORING

Teaching

Teaching Assistant, *Project Cost Accounting and Finance*	2019 – 2024
Teaching Assistant, *Introduction to Project Management*	2022 – 2024
Teaching Assistant, *Introduction to Construction Management*	2023
Teaching Assistant, *Legal Aspects of Architectural and Engineering Practice*	2022
Course designer, edX course – *Developing the Risk Management Plan with Expert Judgement* (launched Sep.30, 2022)	2021 – 2022

Mentoring

Mentor for one graduate student at Univ. of Maryland – College Park, "Impact of hurricanes on healthcare facilities"	2023
Mentor for one undergraduate student at Univ. of Maryland – College Park, "The application of natural language processing in nature disaster"	2022
Mentor for one undergraduate student at Univ. of Maryland – College Park, "Misinformation in the COVID-19 pandemic"	2021

ONLINE MEDIA

Engineering at Maryland magazine reported the research studying wildfire evacuation patterns as a part of the "Pending Disaster" feature story for the Fall 2021 issue.

SERVICE TO PROFESSION

Journal Article Reviewer

- Sustainable Cities and Society
- Cities
- International Journal of Disaster Risk Reduction
- International Journal of Transportation Science and Technology

- Natural Hazard Review
- IEEE Transactions on Computational Social Systems
- Progress in Disaster Science
- PeerJ Computer Science
- Intelligent Automation & Soft Computing
- Computers, Materials & Continua

Conference Proceeding Reviewer

- 12NCEE National Conference on Earthquake Engineering

LEADERSHIP & ACTIVITIES

Graduate Assistant Advisory Committee (GAAC), University of Maryland 2022 –
Student Member, American Geophysical Union (AGU) 2022 –
Professional Affiliate member, American Society of Civil Engineers (ASCE) 2022 –
Student member, Earthquake Engineering Research Institute (EERI) 2014 –

INDUSTRY EXPERIENCE

Staff Engineer, Yu&Associates, Inc., Elmwood Park, NJ, USA 2017 – 2018

- Overseen the preliminary subsurface investigation of various construction projects, e.g.,
  - *the rehabilitation of Throngs Neck Bridge*
  - *reconstruction of the playground in Bensonhurst Park*
  - *construction of new facilities at the Springfield Gardens United Methodist Church*
- Provided support to the senior project manager for boring location plans and soil profile drawings
- Conducted cost estimation for bidding proposals and geotechnical reports

Staff Engineer, JHB Engineering, Montebello, NY, USA 2017

- Conducted field readings and building condition inspection survey during the pre-construction phase
- Performed excavation and foundation design
- Managed daily logistics and collaborated with external contractors during construction to resolve issues and enhance project timelines

Intern, Zhejiang Jianjing Investment & Consultation Co. Ltd, Zhejiang, China 2018

- Assisted in project planning, scheduling, and coordination
- Reviewed all requests for information and change requests, providing timely and appropriate responses

SKILLS & CERTIFICATES

Programming: Python, R, Git, MATLAB/Simulink
Software: Tableau, GoldSim, ArcGIS, QGIS, NodeXL, AutoCAD, Revit, Risk Assessment Software (@RISK), Sap2000
Language: English, Chinese (Mandarin)
Certificate: Engineer-in-Training (Civil), CA|#159139