Sayyed Mohsen Vazirizade

Post-Doctoral Research Fellow at Vanderbilt University
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https://scholar.google.com/citations?user=rbegTHsAAAAJ&hl=en

Research Interests:
Machine Learning, Predictive Modeling, Surrogate Modelling, Mathematical Modeling, Risk Analysis, Uncertainty Modeling, Reliability Engineering

EDUCATION

Vanderbilt University, Nashville *Jan. 2020 – Present*
- Post-Doctoral in Computer Science

The University of Arizona, Tucson *Jan. 2017 – Dec. 2019*
- Ph.D. Candidate in Engineering Mechanics & Structural Engineering, Minor in Computer Science, GPA 4.0
  Dissertation: A Novel Integrated Method for Reliability Estimation of Dynamic Nonlinear Complex Systems in Time Domain

The University of Arizona, Tucson *Jan. 2017 – Dec. 2019*
- M.Sc. in Industrial Engineering, GPA 4.0
  Thesis: Uncertainty Quantification of Sea Waves - An Improved Approach

Johns Hopkins University, Baltimore *May 2018 – May 2019*
- Online 40-week Program in Data Science, GPA 4.0
  Final Project: Predictive Model for Text Using Text Mining
  Topics: Data Scientist's Toolbox, R Programming, Getting and Cleaning Data, Exploratory Data Analysis, Reproducible Research, Statistical Inference, Regression Models, Machine Learning, Developing Data Products, Version Control with Git (Git, GitBash, SourceTree), Google Cloud Platform (GCP), Databases and SQL, GCP BigQuery, Anomaly Detection, OOP, Geospatial Visualization, Introduction to Spark

Sharif University of Technology, Tehran, Iran *Sep. 2013 – Sep. 2015*
- M.Sc. in Risk and Earthquake Engineering, GPA 3.91
  Thesis: Online Nonlinear Structural Damage Detection Using Signal-base Methods and Artificial Neural Networks

Iran University of Science & Technology, Tehran, Iran *Sep. 2009 – Sep. 2013*
- B.Sc. in Civil & Structural Engineering, GPA 3.84

Computer Skills
Python (numPy, scipy, pandas, geopandas, statsmodels, scikit-learn, keras, tensorflow, flask, dash, pyspark, pulp, networkx, nxviz, matplotlib, seaborn, plotly, folium, shapely, dask, etc.), R (shiny, Swirl, R Markdwon, knitr, caret, tm, dplyr, ggplot2, plotly, googleVis, leaflet, igraph, etc.), MATLAB, C++, SQL (Microsoft SQL Server, BigQuery), NoSQL (MongoDB), AWS, GCP, ArcGIS, Auto CAD, MS Office Suite

RESEARCH EXPERIENCE

Post-Doctoral Research Fellow, Department of Computer Science, Vanderbilt University *Jan. 2020 – Present*
- Developing applied pipeline and Machine Learning models for prediction of accident rates in highways (Python, NoSQL)
- Assuring Cyber-Physical Systems with Learning Enabled Components and Anomaly Detection (coauthored a grant funded by CISCO)

- Developing a robust platform for allocating limited resources to the demand points and decision making under uncertainty (Python)
- Developing High-dimensional Data-driven and Deep Learning models to predict and optimize energy consumption for Multi-Modal transit systems (Python)
- Evaluating Network Resiliency of water transportation systems using Graph Theory (Python, R, NSF Grant #1600319)
- Evaluating inland water transportation of Ganges-Brahmaputra delta using Network Science (Grant #1600319)
- Supervised research activities of more than 10 interns, undergraduate, and graduate students

Data Scientist, Department of Mathematics, University of Arizona *May 2019 – Dec. 2019*

- Developed Optical Character Recognition (OCR) for Persian language and building deep learning model (Python)
- Generated Computer Vision (CV) scripts for data preparation (Matlab)
- Generated Natural Language Processing (NLP) for post processing of OCR (R)
- Developed Predictive Model for hurricanes in North Atlantic basin using Machine Learning and climate data (R)

NSF Graduate Researcher and Instructor, University of Arizona *Jan. 2017 – Aug. 2019*

- Led research and development for NSF-funded project (Grant # CMMI-1403844), "theoretical Foundation and Computational Tools for Complex Nonlinear Stochastic Dynamical Engineering Systems"
- Assisted PI to secure over $400,000 in grant funding by skillfully leading a team of researchers to complete all projects on time, resulting in annual grant renewal
- Developed associated numerical algorithms and a user-friendly, open-source reliability software package for risk analysis of engineering systems (Matlab, Tcl, R)
- Performed risk assessments to determine which proactive reliability tools should be applied to best mitigate risk
- Directed a research team for estimating probability engineering system failure using Design of Experiments (DOE), MCS (Monte Carlo Simulation), Markov chain, adaptive sequential design, subset simulation, sensitivity analysis, dimension reduction techniques, and variance reduction methods
- Applied Parallel Processing Techniques and employed large computer clusters to verify results (Bash, MatLab, OpenMP)
- Conducted assorted applications, including building, offshore jacket type structure, solder ball, and dam risk estimation to show multi-disciplinary application of developed platform for NSF (Grant # CMMI-1403844)
- Utilized statistical methods to improve safety, durability, and damage tolerance of engineering systems (R)
- Developed statistical environmental model based on recorded data and data analysis (SQL, R)
- Mentored two undergraduate student interns each summer in NSF project (Grant # CMMI-1403844)
- Member of Data Science Institute, Data 7

Research Assistant, UNESCO, Iran *Sep. 2015 – Dec. 2016*

- Conducted scientific and practical study and support of risk mitigation plans to provide necessary solutions in different phases of mitigation, preparedness, response, and recovery in-line with sustainable development
- Promoted and developed specialized knowledge in field of disaster and risk management
- Studied parameters and factors for increasing environment safety
- Cooperated in building database and data mining for uncovering mechanisms of injury in seismic damage

Research and Teaching Assistant, Sharif University of Technology, Iran *Sep. 2013 – Sep. 2015*

- Proposed an online Structural Health Monitoring (SHM) technique
- Employed Artificial Neural Networks (ANN) to predict the location and intensity of the damage (Python)
- Compared Empirical Mode Decomposition (EMD) and Ensemble EMD (EEMD) used by Hilbert Huang for signal processing (Matlab)
- Proposed revisions for new edition of Iranian National Building Code

Research Assistant, Iran University of Science and Technology, Iran *Sep. 2009 – Sep. 2013*

- Cooperated in research project investigating air void and frost resistance of Self Compacting Concrete (SCC)
- Data visualization and data management

TEACHING EXPERIENCE

Sayyed Mohsen Vazirizade
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Instructor, University of Arizona *Jan. 2017 – Dec. 2019*
- Instructor of record for "Engineering Economics", ENGR 211 P
- Instructor of record for "Dynamics", ENGR 211 I
- Instructor of record for "Hydraulics", ENGR 329 CE
- Guest instructor for course "Advance Quality Engineering": Model Selection with R

Instructor, GEICO, Tucson *Sep. 2017 – Dec. 2017*
- Guest instructor for course "Probability" to improve knowledge of employees

Instructor, UNESCO, Iran *Sep. 2015 – Sep. 2016*
- Promoted seismic risk awareness and implemented plans of action for related agencies
- Presented workshops to increase knowledge level of researchers and engineers
- Instructed in many workshops for open-source and open-license engineering software "OpenSees"

Teaching Assistant, Sharif University of Technology *Sep. 2013 – Sep. 2015*
- Teaching Assistant (TA) for "structural loading"

Teaching Assistant, Iran University of Science and Technology *Sep. 2009 – Sep. 2013*
- Teaching Assistant (TA) for "Mechanics of Material"
- Instructor of record for "Introduction to MATLAB"

PROFESSIONAL EXPERIENCE

Project Manager, Azhirak Company, Iran *Jun 2015 – Dec. 2016*
- Designed structures based on codes, guidelines, and other regulations
- Used engineering and design software and equipment to prepare engineering design documents
- Inspected construction sites to monitor progress and ensure conformance to plans, and specifications
- Calculated costs and conducted project feasibility based on data analysis, applied knowledge of engineering

CERTIFICATES, HONORS, and AWARDS

- Highly Commended Award for the paper, International Journal of Structural Integrity *2019*
- Outstanding Graduate Student Award, University of Arizona, Tucson, AZ *2019*
- Dean Scholarship of the Department of Mathematics *2019*
- Delbart R. Lewis Fellowship as Talented Graduate Student, University of Arizona, Tucson, AZ *2019*
- Google Cloud Platform Big Data and Machine Learning Fundamentals (Certificate) *2019*
- Google Cloud Platform Fundamentals: Core Infrastructure (Certificate) *2019*
- Dave Lawson Memorial Scholarship, Phoenix, AZ *2019*
- Information Security Awareness, University of Arizona, Tucson, AZ (Certificate) *2019*
- Graduate and Professional Student Council Travel Grant, Tucson, AZ *2019*
- Databases and SQL for Data Science, IBM, Armonk, NY (Certificate) *2019*
- Engineering College Travel Award, Tucson, AZ *2019*
- Data Science by Bloomberg, John Hopkins University, Baltimore, MD (Certificate) *2019*
- Version Control with Git, Cousera (Certificate) *2019*
- TATO - Teaching Assistant Policy Training Online (Certificate) *2018*
- University of Arizona Requirements & Defensive Driving, University of Arizona, Tucson, AZ (Certificate) *2018*
- Delbart R. Lewis Fellowship as Talented Graduate Student, University of Arizona, Tucson, AZ *2018*
- Responsible Conduct of Research by NSF, University of Arizona, Tucson, AZ (Certificate) *2017*
- Ranked 7th among 1,000 participants in Nationwide University Entrance Exam for Ph.D., Iran *2015*
- Top 10% Student in College, Sharif University of Technology, Tehran, Iran *2015*
- Brilliant Talent Award, Iran University of Science & Technology, Tehran, Iran *2013*
- Ranked 16th in finale of 18th National Engineering Olympiad, Iran *2013*
- Ranked 36th among 16,000 civil-engineers in Nationwide University Entrance Exam for M.Sc., Iran *2013*
- Optimal Design Contest 4th Place, Iran University of Science & Technology, Tehran, Iran *2012*
- Lightweight Design Contest 2nd Team, Iran University of Science & Technology, Tehran, Iran *2011*
- Ranked 600th among 400,000 students in Nationwide University Entrance Exam for B.Sc., Iran *2009*

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- Semi-finalist in National Astronomy Olympiad, Iran *2007 and 2008*

CONFERENCES, WORKSHOPS, and TALKS

- Guest Speaker for the course "Big Data Science and Engineering": Big Data in Accident Data Set *2021*
- Presenter, TDOT Innovation to Implementation Fair, Virtual *2021*
- Institute for Operations Research and Management Sciences (INFORMS) Conference, Virtual *2020*
- Grace Hopper Conference, Virtual *2020*
- NetSci Conference, Virtual *2020*
- VIRTUAL-2020 NIST Disaster Resilience Symposium *2020*
- International Conference on Autonomous Agents and Multi-Agent Systems, Auckland, New Zealand *2020*
- Cyber-Physical Systems and Internet-of-Things, Sydney, Australia *2020*
- Computer science, mathematics, and Statistics, Tripod Summer Conference, Oracle, AZ *2019*
- Invited speaker, Institute for Software Integrated Systems, Nashville, TN *2019*
- Workshop on Orange, Tucson, AZ (Certificate) *2019*
- Knovel and Engineering Village training sessions, Tucson, AZ *2019*
- Guest lecturer for course "Advance Quality Engineering": Model Selection with R *2019*
- Data Carpentry Workshop, University of Arizona, Tucson, AZ *2018*
- Institute for Operations Research and Management Sciences (INFORMS) Conference, Phoenix, AZ *2018*
- Computer science, mathematics, and Statistics, Tripod Summer Conference, Oracle, AZ *2018*
- Parallel Computing Workshop, University of Arizona, Tucson, AZ *2018*
- Responsible Conduct of Research by NSF, University of Arizona, Tucson, AZ *2017*
- Structural Engineers Association Conference, Tucson, AZ *2017*
- 7th International Conference of Seismology and Earthquake Engineering (SEE7), Tehran, Iran *2015*
- Management & Application of Spatial Data with GIS & Google, Spatial Academy), Tehran, Iran *2013*

PUBLICATIONS

Journal Articles

Journal Articles

[1] A. Mukhopadhyay et al., "Emergency Response Management Pipelines for Smart Cities," 2020

[2] A. Mukhopadhyay et al., "A Review of Emergency Incident Prediction, Resource Allocation and Dispatch Models," ACM Comput. Surv., 2020.(submitted)

[3] S. M. Vazirizade and A. Haldar, "Reliability Estimation of Jacket Type Offshore Platforms - A Kriging-Based Surrogate Modeling," KSCE J. Civ. Eng., 2020. (submitted)

[4] S. M. Vazirizade, H. Azizsoltani, and A. Haldar, "Reliability Estimation of Jacket Type Offshore Platforms against Seismic and Wave Loadings applied in time domain," Ships Offshore Struct., 2020. (accepted)

[5] S. M. Vazirizade, A. Haldar, and J. R. Gaxiola-Camacho, "Uncertainty quantification of sea waves - an improved approach," Oceanogr. Fish., vol. 9, no. 5, 2019.

[6] A. Haldar, J. R. Gaxiola-Camacho, H. Azizsoltani, F. J. Villegas Mercado, and S. M. Vazirizade, "Novel Geomechanics Concepts for Earthquake Excitations Applied in Time Domain," Int. J. Geomech., vol. 20, no. 9, p. 4020158, Sep. 2020.

[7] S. M. Vazirizade, A. Bakhshi, O. Bahar, and S. Nozhati, "Online Nonlinear Structural Damage Detection Using Hilbert Huang Transform and Artificial Neural Networks," Sci. Iran., vol. 26, no. 3, pp. 1266–1279, Mar. 2019.

[8] S. H. Seyyed Alangi, S. Nozhati, and S. M. Vazirizade, "Critical reliability slip surface in soil slope stability analysis using Monte Carlo simulation method," Int. J. Struct. Integr., vol. 9, no. 2, 2018.

[9] S. M. Vazirizade, S. Nozhati, and M. A. Zadeh, "Seismic reliability assessment of structures using artificial neural network," J. Build. Eng., vol. 11, pp. 230–235, 2017.

Books:

[10] J. R. Gaxiola-Camacho, H. Azizsoltani, A. Haldar, S. M. Vazirizade, and F. J. Villegas Mercado, "Novel Concepts for Reliability Analysis of Dynamic Structural Systems," in Handbook of Probabilistic Models for Engineers and Scientist, R. C. D. Pijush Samui, Dieu Tien Bui, Subrata Chakraborty, Ed. Elsevier, 2020, pp. 305–346.

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[11] Edited: S. Rogers and M. Girolami, A first course in machine learning. Chapman and Hall/CRC, 2016.

[12] Edited: H. Vafai and K. E. Lansey, Science and Technology Diplomacy: A Focus on the Americas with Lessons for the World. Momentum Press, 2018.

Conference Papers:

[13] A. Haldar, J. R. Gaxiola-Camacho, H. Azizsoltani, F. J. Villegas Mercado, and S. M. Vazirizade, "A Novel Geomechanics Concept for Earthquake Excitations Applied in Time Domain," in International Association for Computer Methods and Advances in Geomechanics (IACMAG), 2019.

[14] S. M. Vazirizade and A. Bakhshi, "Structural Health Monitoring by Using Artificial Neural Networks," in 7th International Conference of Seismology and Earthquake Engineering (SEE7), 2015, pp. 052-S.

[15] Edited: G. Pettet, A. Mukhopadhyay, M. Kochenderfer, Y. Vorobeychik, and A. Dubey, "On Algorithmic Decision Procedures in Emergency Response Systems in Smart and Connected Communities," in 19th Conference on Autonomous Agents and MultiAgent Systems (AAMAS), 2020.

Research Grants:

15] Edited: A. Dubey, A. Gokhale, and H. Baroud, "Integrated Optimization and Analytics for Community Emergency Management Systems for NSF Partnerships for Innovation Research Partnerships Grant(PFI-RP)," 2020.

[16] A. Mukhopadhyay, S.M. Vazirizade, A. Dubey, "An online Edge Computing Based Generative Anomaly Detection and Prognostics Solution for Networked Equipment at Customer Premises", $100K grant funded by CISCO, 2020

[17] Edited: A. Dubey, A. Mukhopadhyay, and H. Baroud, "SCC-IRG Track 1 : Principled Proactive Decision Making in Emergency and Disaster Response for Smart Communities empty page."

VOLUNTEERISM and ACTIVITIES

- Conference Paper Judge, cpsiotdata2021, Virtual *2021*
- Poster Judge, Grace Hopper Conference, Virtual *2020*
- Conference Paper Editor, On Algorithmic Decision Procedures in Emergency Response Systems in Smart and Connected Communities, 19th Conference on Autonomous Agents and MultiAgent Systems (AAMAS), Auckland, New Zealand *2020*
- Grant Editor: Integrated Optimization and Analytics for Community Emergency Management Systems for NSF Partnerships for Innovation Research Partnerships Grant(PFI-RP) *2020*
- Optimal Stochastic Scheduling of Restoration of Infrastructure Systems from Hazards, IBM Challenge *2019*
- Job shadowing, Charles Schwab *2019*
- Reviewer: Structural Engineering and Mechanics, International Journal of Reliability, Quality, and Safety Engineering; Telkomnika; Journal of Applied Research on Industrial Engineering; KSCE Journal of Civil Engineering *2017-Present*
- GPSC Travel Grant Judge *2017-2018*
- Cofounder of 20s (a Non-Profit Organization) *2016-Present*
- OpenSees Editor, University of California Berkeley *2015-Present*
- Scientific writer, parsky.com *2015-2016*
- Participated in "Behavioral Sciences and Transactional Analysis" *2013-2015*
- Host of Egg-fall Contest at Iran University of Science and Technology *2013*
- Soccer team member at Iran University of Science and Technology *2013*
- Amateur astronomer *2009-2013*