M. Mahdi Roozbahani
Georgia Institute of Technology
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Qualifications & Interests

- Machine Learning: Computational Data Analysis, Natural Language Processing
- Granular Material Simulation and Animation.
- Modeling and Simulation: Dynamic and Static Simulation, Sphere Packing
- Data analysis and Big Data: SQLite3, Hive, Pig
- Image analysis: Feature Analysis in 3D Voxelized Reconstructed Images

Positions

- **Lecturer PhD. Computational Science and Engineering** Jan 2019

Georgia Institute of Technology, Atlanta, Georgia

- **Founder and CTO in Filio** Jan 2018

Educational Records

- **PhD. Computational Science and Engineering** Jan 2019

Georgia Institute of Technology, Atlanta, Georgia

Specialization: Machine Learning and Modeling and Simulation

Research Topics: *Information Diffusion and graph analysis on local pore structure within the packed spheres. Sphere Packing Simulation. Applying Supervised and Non-supervised Machine Learning on Network of Spheres*

- **M.S. Computational Science and Engineering** May 2016

Georgia Institute of Technology, Atlanta, Georgia

- **M.S. Civil Engineering** May 2016

Georgia Institute of Technology, Atlanta, Georgia

- **Research Scientist, Civil Engineering** Feb 2012-Jul 2012

Johns Hopkins University, Baltimore, Maryland

Research Topics: *Modeling and Simulation* of *Pore structure and filtration characteristic within the packed spherical particles*

- **M.S. Geotechnical and Geological Engineering** October 2012

University Putra Malaysia, Kuala Lumpur, Malaysia

Research Topics: *Development of a computational method to determine maximum void ratio of sand-soil particles using gravitational sphere packing method*

- **B.S. Civil/Railroad Engineering** October 2009

Iran University of Science and Technology, Tehran, Iran

Research Topics: Image Analysis and *Experimental survey of Ground Penetration Radar application on the determination of ballast defects in railroad track*

Teaching

- CS 4641/7641 (Summer 2021), Machine Learning. large class. Class Website.
- CSE-6242 (Spring 2021), Data and Visual Analytics (online&campus). Extremely large class. Class Website
- CS 4641/7641 (Spring 2021), Machine Learning. Extremely large class. Class Website.
- CSE-6242 (Fall 2020), Data and Visual Analytics(online&campus). Extremely large class. Class Website
- CS 4641/7641 (Fall 2020), Machine Learning. Extremely large class. Class Website.
- CS 4641/7641 (Summer 2020), Machine Learning. Extremely large class. Class Website.
- CS 4641/7641 (Spring 2020), Machine Learning. Extremely large class. Class Website.
- CX 4240 (Spring 2020), Data and Visual Analytics. Medium size class. Class Website.
- CS 3300 (Sprint 2020), Intro to Software Engineering. Medium size class. Class Website.
- CSE-6242 (Spring 2020), Data and Visual Analytics. Extremely large class. Class Website.
- CX 4242 (Fall 2019), Data and Visual Analytics. Large class. Class Website.
- CX-4240 (Summer 2019), Computing for data analysis. Very large class. Class Website.
- CX-4240 (Spring 2019), Computing for data analysis. Very large class. Class Website.
- CSE-6242 (Spring 2019), Co-instructor, Data and Visual Analytics. Very large class.

Advisor

- Huili Huang, Co-advisor, PhD, 2021
- Ruijia Wang, Co-Advisor, PhD, 2021
- Rusty Utomo, Master's research, 2021
- James Hamilton, Master's research, 2021
- Jiayuan Bi, Advisor, Master Research, 2020
- Jaswanth Sai Pyneni, Advisor, Master Research , 2020
- Kevin Tynes, Advisor, Master Research, 2020
- Xingchi Li, Advisor, Master's thesis, 2020
- Huili Huang, Advisor, Master's thesis, 2020
- Christopher Fleisher, Advisor, Master's research problem, 2020
- Mehdi Azabou, Co-Advisor, Master's thesis, 2020
- Scott Clark, Co-advisor, Master's thesis, 2019
- Jason Zhou, Co-advisor, undergraduate research, 2019
- Nimisha Roy and Ming Liu, PhD Committee member

Funding

2021- In a final stage to receive funding donations from Allegheny Technologies Company to support a PhD student and/or a Post-doc. The funding will be extended to a phase 2 project as well.

Awards and Honors

- Spring 2021 Student Recognition of Excellence in Teaching: Class of 1934 CIOS Honor Roll
- Spring 2021- Received ten CTL *Thank a Teacher* for Machine Learning course CS4641\7641.
- Fall 2020- Received eight CTL *Thank a Teacher* for Machine Learning course CS4641\7641.
- 2020- Recipient of AASHTO Region 2 High Value Research Award for one of my PhD projects (Human Resource Data Tools)
- 2109 and 2020- Multiple Great Teacher certificates awarded by Center for Teaching and Learning at Georgia Tech in Summer 2019, Fall 2019 and Spring 2020.
- 2019- Jean-Lou Chameau Research Excellence Award in CEE department at Georgia Tech (awarded for the startup at Georgia Tech through Create-X).
- 2018- Accepted project in Create-X Startup Launch 2018 program.

▪ 2018- Outstanding research poster award – Center of Bio-mediated and Bio-inspired Geotechnics, NSF.
▪ 2017- Jean-Lou Chameau Research Excellence Award in CEE department at Georgia Tech (awarded for the pore segmentation analysis).
▪ 2017- Best Graduate Research Poster awarded by ASCE Geo-Institute.
▪ 2017- Selected as one of the five featured papers in Materials journal among 1483 papers in 2017
▪ 2017- Selected research paper as the issue cover of Volume 10-Issue 11 in Materials journal.
▪ 2017- Awarded NSF IRES fellowship, global internship program at Ecole des Ponts in Paris.
▪ 2017- Outstanding Volunteer Award – CBBG.
▪ 2013- Reviewer of the International Journal of Applied Nonlinear Science, INDERSCIENCE.
▪ 2013- Awarded full Assistantship in Georgia Institute of Technology for PhD program.
▪ 2012- Reviewer of the Powder Technology journal, Elsevier.
▪ 2012- Reviewer of the International Journal of GEOMATE
▪ 2009- Certificate of the premier bachelor project among 4000 undergraduate students.
▪ 2009- Iranian patent for "Design and construction of detection of the substructure's defects with GPR's image processing software (continues, non-destructive)".

Publications

▪ Frost, J. D., Roy. N, Roozbahani, M. M., Lu. Y., Cao, J., Vangla, P. (2019). Pores - The almost invisble part of soil. Frontiers in Geotechnical Engineering,1-14.

▪ Roozbahani, M. M., Borela, R., & Frost, J. D. (2017). Pore Size Distribution in Granular Material Microstructure. Materials, 10(11), 1237.

▪ Frost, J. D., Roozbahani, M. M., Jackson, K., Leonard, L., Yamamoto, K., Jones, M., & Martinez, A. (2017). Biologically-inspired insights into soil arching and tunnel stability from the topology of ant nests. Proc. 19th. Int. Conf. Soil Mech. and Geotech. Eng., pp. 1687-1690, Seoul, South Korea.

▪ Frost, J. D., Martinez, A., Mallett, S. D., Roozbahani, M. M., & DeJong, J. T. (2017). The Intersection of Modern Soil Mechanics with Ants and Roots. Geofrontiers 2017, pp. 900-909, Orlando, FL.

▪ Frost, J. D., Roozbahani, M. M., Peralta, A. F., Mallett, S. D., & Hanumasagar, S. S. (2017). The evolving role of materials in geotechnical infrastructure systems. Journal of Structural Integrity and Maintenance, 2(2), pp. 89-99.

▪ Roozbahani, M. M., Graham-Brady, L., & Frost, J. D. (2014). Mechanical trapping of fine particles in a medium of mono-sized randomly packed spheres. International Journal for Numerical and Analytical Methods in Geomechanics, 38(17), pp. 1776-1791.

▪ Fuggle, A.R., Roozbahani, M.M., and Frost, J.D., (2014), Size Effects on the Void Ratio of Loosely Packed Binary Particle Mixtures, Geo-Congress 2014, Atlanta, GSP 234, pp. 129-138.

▪ Koval, I., Roozbahani, M.M., and Frost, J.D., (2014), Comparison Between Geometrical and Dynamic Particle Packing, International Symposium on Geomechanics: From Micro to Macro Scale, Cambridge, Vol. 1, pp. 109-113.

▪ Roozbahani, M. M., Huat, B. B., & Asadi, A. (2013). The effect of different random number distributions on the porosity of spherical particles. Advanced Powder Technology, 24(1), pp. 26-35.

▪ Roozbahani, M. M., Huat, B. B., & Asadi, A. (2012). Effect of rectangular container's sides on porosity for equal-sized sphere packing. Powder technology, 224, pp. 46-50.

▪ Roozbahani, M.M., Huat, B.B.K. & Asadi, A., (2012). Gravitational Sphere Packing Method to Find the Porosity of the Soil Particles with the Identical Size inside the Cylindrical Container. First International Conference on Geotechnique, Construction Materials and Environment, Mie, Japan, Nov.21-23, 2011, ISBN: 978-4-9905958-0-7 C3051, pp. 76-78.

▪ Roozbahani, M.M., Esmaeili, Morteza., (2009). Detection of ballast pollution by means of interpretation of the GPR test results for safety of railway. 1st National Conference on Roadway and Railway Accidents and Fortuities.

Projects

- Java Servlet web-app and Mobile App Startup platform to manage mobile-images efficiently
- Human resource data tool software development for GDOT employees.
- Graph Analysis to predict potential Job Shadower and Shadowee in an organizational network
- Developing a Google Glass App taking advantage of Google image comparison and server communication
- Natural Language Processing combined by Machine Learning Approaches (Perceptron, Logistic Regression, Naïve Bayes) to find positive, negative and neutral words in instances of documents.
- Age-group detection using Principal Component Analysis developed by accompanying Linear Discriminant Analysis and Kernel methods.
- Influence Maximization and Information Diffusion in a graph.
- Simulation and Modeling of evacuation with cellular automata by Java Language (OOP).
- Data and visual analytic with d3.js such as Force Directed Graph.
- Big data analysis with Hadoop, Hive and Pig in Amazon Web Service.
- Data cleaning and Integration with SQLite3.
- Voxelization of the random packed bed in order to find porosity in different parts of a container.
- Unsupervised and supervised machine learning with fast fourier transform application to make a connection between 3D images.
- Developing a 2D discrete element model in Matlab Programming Language
- Effect of different random number distributions on the structure of loose sphere packing.
- Effect of rectangular containers on the structure of loose sphere packing

- **Internship** in at Ecole des Ponts in Paris under supervision Jean-Michel Perrira. Summer 2017

- **Research Scientists:** Johns Hopkins University,USA Feb 2012-Jul 2012

Visualization of 3-D microstructure
Simulation of filtration in packed spheres
Dynamic nearest neighbor searching in a dynamic sphere packing simulation

Graduate Courses at Georgia Tech

Machine Learning – Modeling and Simulation – Natural Language Processing – Artificial Intelligence – Computer Vision – High Performance Computing – Numerical Linear Algebra – Data and Visual Analytics – Computational Science and Engineering Algorithms – Object oriented programming - Soil Mechanic – Foundation Systems

Programming

Languages: Java (including swing, awt, servlet, android developing), Python Matlab, SQL (Structured Query Language), javascript, Cluster Parallel Programming (MPI).
Big Data Ecosystems: Hadoop, MapReduce, Hive, Pig
Programming Libraries: NLTK, NetworkX, JUNG
Productivity: TEX, LATEX, BibTEX, and Most Common Productivity Packages (for Windows and Linux Platforms).
Operating Systems: Windows, and Linux systems.