Curriculum Vitae

Yohanna Mejia Cruz

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EDUCATION

Doctor of Philosophy, Civil Engineering, December, 2018
University of South Carolina
Dissertation: *Probabilistic Multilevel Constitutive Model of the Compressive Strength of Hardened Cement Paste Reinforced with MWCNTs.* Advisor: Juan M. Caicedo, D.Sc.

Verified International Academic Qualifications:
- *The National Council of Examiners for Engineering and Surveying (NCEES)*
- *World Education Services (WES)*

Master of Science, Civil Engineering, June, 2017
Universidad del Valle, Cali, Colombia
Thesis: *Structural Optimization of the Provisional Bridges of Smurfit Kappa Carton de Colombia Company (SKCC).* Advisors: Johannio Marulanda, Ph.D. and Juan M. Caicedo, D.Sc.

Bachelor of Science, Civil Engineering, July, 2012
Universidad del Valle, Cali, Colombia
Thesis: *Software for the Design of Connections in Steel Elements Based on the Colombian Seismoresistant Construction Regulations, NSR-10, CO.DE v 1.0.0.* Advisors: Daniel Gomez, Ph.D. and Diego Aguirre, Ph.D.

PROFESSIONAL APPOINTMENTS

2024 - Present	Assistant Professor, Montana Technological University
2021 - 2024	Research Assistant Professor, University of South Carolina
2020-2021	Postdoctoral Research Fellow, San Francisco State University
2018-2019	Postdoctoral Research Associate, University of South Carolina
2019-2019	Engineering Specialist, Advanced Smart Systems and Evaluation Technologies, LLC
2015-2018	Graduate Research Assistant, University of South Carolina.
2013-2013	Exchange Visitor, University of South Carolina.

HONORS AND AWARDS

1   *Trailblazers in Engineering Fellow; Trailblazers in Engineering Program*
    Purdue University   July - 2024

2   *NSF-sponsored Grant Proposal Writing, EMI 2022 ($600)*
    Johns Hopkins University   June - 2022

3	*M. Bert Storey Endowed Graduate Fellowship for Academic Excellence ($1400)*	
	University of South Carolina	March - 2018

4	*R.L. Sumwalt, Sr. Endowed Fund, International Conference Travel Grant Award* ($800)	
	University of South Carolina	March - 2018

5	*R.L. Sumwalt, Sr. Endowed Fund, Conference Travel Grant Award* ($500)	
	University of South Carolina	March - 2017

6	*Young Researcher Colciencias, Administrative Department of Science, Technology and Innovation* ($500/month/one year)	
	Universidad del Valle, Cali, Colombia	April 2014

RESEARCH GRANTS

1. National Institute of Health, NIH-SBIR Phase I, *Principal Investigator* (USC side). Company: ASSET-US. "Early Detection of Health Decline in Older Adults Through Life Space Patterns and Gait Analysis from Floor Vibrations", Budget $400.000. Pending.

2. University of South Carolina, Magellan Scholar Program, Undergraduate student Connor Madden, *Principal Investigator*. "Advancing Power Loss Prediction: Optimizing High-C Discharge Performance for Lithium-Ion Batteries through Bayesian Forecasting", Budget: $2.500. Awarded.

3. University of South Carolina ASPIRE II integration, February 2022, *Principal Investigator*. "Monitoring activities of daily living (ADL) in individuals with Alzheimer's Disease (AD) using floor vibrations", Budget $90.386. Awarded.

RESEARCH EXPERIENCE

University of South Carolina (USC), November 2021 - present
Research Assistant Professor: Smart and Connected Health, Inferring at-home gait parameters of older adults using floor vibrations

- Applied cutting-edge machine learning techniques, including Gaussian Process Regression, to enhance event localization accuracy. The event localization models developed learn from data in the frequency domain and adapt to different structural contexts, improving localization performance.

- Designed a multilevel probabilistic model to extract cadence and predict walking speed from walking-induced floor vibrations. This model enables monitoring changes in gait patterns for older adults living independently.

- Engineered data acquisition and gait parameter extraction algorithms for real-time implementation, ensuring seamless integration into practical applications.

San Francisco State University (SFSU), January 2020 - July 2021
Postdoctoral Research Fellow

- Developed advanced probabilistic models using Bayesian Stochastic modeling for event localization. These models are designed to accurately estimate the location of events based on complex data patterns, providing a robust framework for localization tasks.

- Enhanced floor acceleration analysis techniques to extract subtle human patterns, improving the accuracy and reliability of behavior detection algorithms. These advancements include signal processing methods to filter noise and isolate human-induced vibrations, as well as the development of novel algorithms for pattern extraction from complex acceleration data.

University of South Carolina (USC), Nov 2018 - Dec 2019
Postdoctoral Research Associate: Automatic Extraction of Vehicle, Bicycle, and Pedestrian Traffic

- Collaborated with the South Carolina Department of Transportation, Federal Highway (SC-DOT) to develop multimodal classification algorithms using Convolutional Neural Networks (CNNs). The algorithms were used to automate vehicle counting and classification for transportation planning and maintenance.

- Investigate image processing techniques like background subtraction and Gaussian mixture models for object extraction.

Advanced Smart Systems and Evaluation Technologies, LLC, Jan 2019 - Dec 2019
Engineering Specialist

- Employed machine-learning techniques to characterize human-induced vibrations on structures, including detecting different events and falls. This involved extracting features from the data to understand and model the impact of human activities on structural dynamics.

- Investigated methods to enhance the quality of data collected from structural sensors to reduce the impact of noise and other sources of interference, improving the reliability and accuracy of human-centered monitoring systems.

University of South Carolina (USC), Jan 2015 - Dec 2018
Graduate Research Assistant: Radionuclide Waste Disposal: Development of Multi-scale Experimental and Modeling Capabilities

- Conducted experimental characterization using Mercury Intrusion Porosimetry (MIP) to analyze pore size distribution in cement paste samples, including plain and reinforced with Multi-Walled Carbon Nanotubes (MWCNTs).

- Formulated a Probabilistic Multilevel Model to predict the compressive strength of cement paste samples reinforced with MWCNTs. This endeavor involved advanced statistical technique development and implementation, coupled with experiment design and execution to validate the model's accuracy and reliability.

- Developed cyber-infrastructure for comprehensive data management, curation, and archival using custom programming and web application development with Drupal/PHP PL. This system enhanced data organization and accessibility, facilitating efficient research workflows.

University of South Carolina (USC), Jul 2013 - Sep 2013
Exchange Visitor

- Conducted Finite Element Model Updating of wooden bridges using advanced optimization techniques, including Sequential Quadratic Programming (SQP), High Throughput MultiSolution Genetic Algorithms (HTMGA), and Bayesian Inference. This involved refining and validating numerical models to enhance the structural performance and safety of wooden bridges.

JOURNAL PAPERS

1   MejiaCruz, Y., Caicedo, J.M., and Matta, F. "Probabilistic comparison of compressive strength-porosity models using data for plain cement paste.", **ASCE Journal of Structural Engineering**, 2024.(Accepted-In production).

2   MejiaCruz, Y.,Caicedo, J.M.,Jiang, Z.,Franco, J."Probabilistic Estimation of Cadence & Walking Speed From Floor Vibrations". **IEEE Journal of Translational Engineering in Health and Medicine**,vol. 12, pp. 508-519, 2024, doi: 10.1109/JTEHM.2024.3415412.

3   Davis B., MejiaCruz Y., "Locating Impacts Through Structural Vibrations Using the FEEL Algorithm Without a Known Input Force", **Journal of Experimental Techniques**, 2023, `https://doi.org/10.1007/s40799-023-00662-0`.

4   MejiaCruz, Y., Caicedo, J.M., Jiang, Z., and Franco, J.M., "Probabilistic detection of impacts using the PFEEL algorithm with a Gaussian Process Regression Model", **Engineering Structures** 2023, `https://doi.org/10.1016/j.engstruct.2023.116255`

5   MejiaCruz Y., Davis B., "Event Reconstructing Adaptive Spectral Evaluation (ERASE) Approach to Removing Noise in Structural Acceleration Signals", **Journal of Experimental Techniques**, 2022, `https://doi.org/10.1007/s40799-022-00598-x`

6   MejiaCruz, Y., Jiang, Z., Caicedo, J.M. and Franco, J.M., "Probabilistic Force Estimation and Event Localization (PFEEL) algorithm", **Engineering Structures**, 2023, p.113535. `https://doi.org/10.1016/j.engstruct.2021.113535`

7   MejiaCruz, Y., Franco, J., Hainline, G., Fritz, S., Jiang, Z., Caicedo, J.M., Davis, B. and Hirth, V., "Walking Speed Measurement Technology: a Review", **Current Geriatrics Reports**, 2021, pp.1-10. `https://doi.org/10.1007/s13670-020-00349-z`

8   MejiaCruz, Y., Caicedo, J.M., and Matta, F. "Probabilistic Analysis of Mercury Intrusion Porosimetry (MIP) data using a Bayesian Framework", (In Preparation).

CONFERENCE PAPERS

1   Madden, Connor; Anthony, George; Ogunniyi, Emmanuel; Downey, Austin R.J.; MejiaCruz, Yohanna; James, Robin. "Inferring Battery Current Interrupt Device Activation in a 18650 Cell under High C Discharge using a Foil Strain Gauge." ASNT Research Symposium, June 2024, Pittsburgh, Pennsylvania.

2   MejiaCruz, Y., Caicedo, J.M., Jiang, Z., Franco, J.M. (2024)." Event Detection Using Floor Vibrations with a Probabilistic Framework." Model Validation and Uncertainty Quantification, Volume 3. SEM 2023. International Modal Analysis Conference (IMAC XLI), 2023 Conference, Austin TX. Conference Proceedings of the Society for Experimental Mechanics Series. Springer, Cham. `https://doi.org/10.1007/978-3-031-37003-8_4`

3   Franco, J.M., MejiaCruz, Y., Caicedo, J.M., Jiang, Z. (2024). "Feasibility of Using Accelerometers to Detect Human Footsteps for Cadence Estimation on Health Sciences." Dynamics of Civil Structures, Volume 2. SEM 2023. International Modal Analysis Conference (IMAC XLI), 2023 Conference, Austin TX. Conference Proceedings of the Society for Experimental Mechanics Series. Springer, Cham. `https://doi.org/10.1007/978-3-031-36663-5_9`.

4   MejiaCruz. Y, Caicedo J.M, Matta F, "Probabilistic comparison of existing compressive strength-porosity models using experimental data". ICVRAM-ISUMA-UNCERTAINTIES 2018, Florianopolis SC, Brazil, April 2018.

5   Matta F, Cuéllar-Azcárate M, Wylie M, MejiaCruz Y, Iffat S, Sikder M, Powell B, Serkiz S, Baalousha M, Caicedo J.M, "Nano-amended cement waste forms for nuclear waste storage", December 2018. Sixth International Symposium on Nanotechnology in Construction NICOM6, Hong Kong. (`NICOM6,2018`).

6   Narvaez N, Alvarez J, MejiaCruz Y, Marulanda J, "Experimental Identification of the structural behavior of temporary bridges (Phase 1)", May 2013. VI National Conference on Earthquake Engineering. Universidad Industrial de Santander, Bucaramanga Colombia, (`UIS,2013`).

SEMINARS & CONFERENCE PRESENTATIONS

1   MejiaCruz, Yohanna."Exploring Walking-Induced Floor Vibrations for Gait Parameter Extraction: A Probabilistic Approach Towards Health-Focused Monitoring", DESIGN Webinar, Dream Structures Lab, The Pennsylvania State University, October 16, 2023.

2   MejiaCruz Y., Caicedo J.M., Jiang Z., Franco J., "Event Detection using Floor Vibrations with a Probabilistic Framework", International Modal Analysis Conference (IMAC), 2023 Conference, Austin TX.

3   Franco J., Caicedo J.M., MejiaCruz Y., Jiang Z., "Feasibility of using Accelerometers to Detect Human Footsteps for Cadence Estimation on Health Sciences", International Modal Analysis Conference (IMAC), 2023 Conference, Austin TX.

4   MejiaCruz Y., Caicedo J.M., Jiang Z., Franco J., "Probabilistic Event Localization Using Floor Vibrations", Engineering Mechanics Institute (EMI) 2022 Conference, Baltimore MD, May 2022.

5   Franco J., MejiaCruz Y., Caicedo J.M., Jiang Z., "Classifying Acceleration Measurements for Gait Parameter Estimation", Engineering Mechanics Institute (EMI) 2021 Conference, Virtual.

6   Franco J., MejiaCruz Y., Caicedo J.M., Jiang Z., "Classifying Acceleration Measurements for Gait Parameter Estimation", IMAC 2022, Orlando, Florida.

7   Matta F, Cuéllar-Azcárate M, Wylie M, MejiaCruz Y, Iffat S, Sikder M, Powell B, Serkiz S, Baalousha M, Caicedo J.M, "Nano-amended cement waste forms for nuclear waste storage", Sixth International Symposium on Nanotechnology in Construction NICOM6, Hong Kong, December 2018.

8   MejiaCruz. Y, Mullen R. Huynh N, "Vehicle Detection and Classification using Cascade Classifiers and Convolutional Neural Networks", 6th Annual University Transportation Center Conference for the Southeastern Region, Madren Conference Center, Clemson University, Clemson SC, October 24 - 25, 2018.

9   MejiaCruz. Y, Caicedo J.M, Matta F, "Probabilistic comparison of existing compressive strength-porosity models using experimental data". ICVRAM-ISUMA-UNCERTAINTIES 2018, Florianopolis SC, Brazil, April 2018.

10   MejiaCruz. Y, Caicedo J.M, Matta F, "Bayesian Model Updating Of Compressive Strength Constitutive Models For Cement Paste". Engineering Mechanics Institute Conference 2017, San Diego, California, June 2017.

11   Baalousha M, Boateng L, Caicedo J.M, Cuéllar-Azcárate M, Flora J, Iffat S, Matta F, MejiaCruz Y, Powell B, Serkiz S, Sikder M, Wylie M, Xie Y, Ziehl P, "Multiwalled carbon nanotube amendments for cement waste forms", EPSCoR DOE All-hands Meeting, Clemson, SC. June 2017.

12   Flora JRV, Baalousha M, Boateng L, Caicedo JM, Cuéllar-Azcárate MC, Matta F, MejiaCruz Y, Powell B, Serkiz S, Sikder M, Wylie EM, Ziehl P, Zohhadi N, "Cement composites with graphitic nano-amendments for low-level nuclear waste storage". 5th Sustainable Nanotechnology Organization Conference, Solid Waste and E-waste Reduction and Recycling, Orlando FL, November 11, 2016.

13   Matta F, Baalousha M, Boateng L, Caicedo JM, Cuéllar-Azcárate MC, Flora JRV, MejiaCruz Y, Powell B, Serkiz S, Sikder M, Wylie EM, Ziehl P, Zohhadi N, "Nano-Amended Cement Composites for Nuclear Waste Storage". Nanotechnology for Improved Concrete Performance (ACI Committee 241), ACI Fall 2016 Convention, Philadelphia, PA, October 26, 2016.

14   MejiaCruz. Y, Caicedo J.M, Matta F, "Model Updating Of Compressive Strength Constitutive Models For Cement Paste." Engineering Mechanics Institute Conference 2016 (EMI 2016) and the Probabilistic Mechanics & Reliability Conference 2016 (PMC 2016), Nashville, Tennessee, May 2016.

15   MejiaCruz Y, Marulanda J, Caicedo J.M, "Static and dynamic experimental analyses for finite element model updating of temporary wood bridges". Sixth World Conference on Structural Control and Monitoring (6WCSCM), Barcelona Spain, July 2014.

16   MejiaCruz, Y, Marulanda J, Caicedo J.M, "Coupled static and dynamic experimental analyses for finite element model updating of temporary wood bridges using genetic algorithms". International Conference on Applied Mathematics and Informatics (ICAMI), Universidad del Valle, San Andrés Colombia, November 2013.

17   MejiaCruz, Y, Marulanda J, Thomson P, Garcia J.J, Caicedo J.M, "Characterization of the structural behavior of wooden bridges". Research Symposium, Universidad del Valle, Cali Colombia, November 2013.

18   Narvaez N, Alvarez J, MejiaCruz Y, Marulanda J, "Experimental Identification of the structural behavior of temporary bridges (Phase 1)"—VI National Conference on Earthquake Engineering. Universidad Industrial de Santander, Bucaramanga Colombia, May 2013.

TECHNICAL REPORTS

1   Huynh N., Mullen, R., MejiaCruz, Y., "Real-Time Classification of Vehicle Types and Modes using Image Analysis and Data Fusion". Center for Connected Multimodal Mobility, Clemson University. March, 2019. `https://rosap.ntl.bts.gov/view/dot/53604`

TEACHING EXPERIENCE

Computational Methods ECIV 201 (Undergraduate Level):

- Utilized Python programming language to implement computational methods in civil engineering.

- Focused on cooperative and active learning approaches to solving engineering problems.

- Covered numerical methods, including roots of equations, systems of linear equations, interpolation, and integration.

- Offered in Spring 2022, Fall 2022, and Fall 2023, providing multiple opportunities for students to enhance their computational skills in civil engineering.

Structural Vibrations ECIV 524 (Undergraduate Level):

- Implemented active learning and experiential learning strategies in "Structural Vibrations ECIV 524" to enhance student understanding.

- Covered the response of single- and multiple-degree-of-freedom systems to impact, harmonic, and seismic excitations.

- Taught students how to use Python for numerical analysis of structural response to arbitrary loads.

- Offered in Fall 2022 and Spring 2023, providing students with opportunities to deepen their understanding of structural vibrations over two semesters.

Engineering Risk and Reliability ECIV 708 (Graduate Level):

- The course focused on risk analysis within the framework of reliability in engineering. Practical case studies were utilized to illustrate concepts, with a particular emphasis on applications in infrastructure, transportation, and energy systems.

- Implemented a curriculum that exposed students to a variety of techniques and tools, with a strong emphasis on probabilistic methods. By the conclusion of the course, students had gained a comprehensive understanding of applying risk and reliability analysis to engineering challenges.

- Offered the course in Summer 2019, Summer 2023, and Summer 2024, providing students with the opportunity to enhance their understanding of risk and reliability analysis during these intensive summer sessions.

SERVICE ACTIVITIES

1. Member of the American Society of Civil Engineers (ASCE) Education Committee.   2024-Present.

2. Member of the University of South Carolina Committee on Professional-Track Faculty.   2023-2024.

3. *Discover USC*: Reviewed Graduate and Postdoctoral Scholars Posters.   April 2024.

4. *National Science Foundation (NSF)*: Served as a Panelist.   Oct 2023.

5. *College of Engineering and Computing Open House*: Coordinated the exhibit for Structural Dynamics for High-school and K-12 students.   April 2023.

6. *USC Science and Engineering Fair*: Served as a Juror for the Junior Division.   March 2023.

7. *European Journal of Physical and Rehabilitation Medicine, Edizioni Minerva Medica.*: Served as a Reviewer.   June 2022.

8. *Journal "Ingeniería y Competitividad", Universidad del Valle, Colombia*: Served as a Reviewer.   March 2023.

9. *Wiley Publishing Company* : Served as a Reviewer for the 6th edition of the book "Practical Reliability Engineering," invited by the Senior Commissioning Editor for Electrical & Computer Engineering Books.   July 2022.

MENTORSHIP ACTIVITIES

1. **Professor Luncheon with First Generation Students**: Spearheaded a mentorship luncheon that provided guidance and support to first-generation college students. Actively engaged in discussions, shared personal academic experiences, and offered strategic advice on navigating higher education challenges. University of South Carolina March 4, 2024.

2. **Research Mentoring:** Guided undergraduate student Connor Madden from the Mechanical Engineering department on a research project aimed at optimizing high-C discharge performance for lithium-ion batteries. Provided comprehensive project design and academic writing, resulting in an awarded research grant, a published abstract, and a conference presentation.

3. **Structural Dynamics Intelligent Infrastructure Laboratory Mentorship:** Mentored a team of three undergraduate students (Sam Pearsall, Macy Mekiliesky, and Trinity Collette) in advanced research techniques for analyzing structural vibrations. Facilitated their hands-on learning in the lab and helped them develop programming and research skills.

4. **Graduate Mentorship:** Served as mentor for Ph.D. student Jean M. Franco. Oversaw the research design, implementation, and analysis of a project focused on classifying floor accelerations for gait estimation. Fostered critical thinking and independent research skills, leading to peer-reviewed publications and several conference papers.

ORGANIZATIONS

1	Associate Member Engineering Mechanics Institute (EMI), ID 11301214	Jul 2022-2025
2	American Society of Civil Engineers Associate Member, ID 11301214	Jul 2022-2025
3	Society of Hispanic Professional Engineers: SCRC Professional ID 1141074	2023 - Present
4	Society of Women Engineers, ID 2127901	2024 - Present

PROGRAMMING AND MODELING SKILLS

Programming Languages: Python, MATLAB, LaTeX, PHP

Tools: MySQL, Git, GitHub, Atlassian Bitbucket

Modeling Skills: Bayesian Stochastic Modeling, Gaussian Mixture Models, Convolutional Neural Networks, Gaussian Process Regression, Bayesian Model Updating, Sequential Quadratic Programming, Genetic Algorithms

LICENSES & CERTIFICATIONS

1	South Carolina Department of Labor, Licensing and Regulation, Engineering In Training, EIT.21731 (NCEES FE Exam completion)	Oct 2022
2	CITI Program: Biomedical Investigators, ID 47149979	Feb 2022-2025
3	CITI Program: Researchers, ID 47148714	Feb 2022-2025
4	CITI Program: Responsible Conduct of Research for Engineers, ID 47148713	Feb 2022-2025
5	CITI Program Social and Behavioral Researchers, ID 47148712	Feb 2022-2025
6	World Education Services: Verified International Academic Qualifications	Oct 2021