Mohamed Noureldin
Assistant Professor
Department of Civil Engineering
Structures – Structural Engineering, Mechanics and Computation
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Artistic and research interests

Focus Research Area and Expertise:
Artificial Intelligence (AI), Structural Health Monitoring (SHM), Structural Digital Twin, Generative AI, Predictive Maintenance of Structures, Automated LCA and LCC of Structures, and Seismic Retrofitting.
Current Research Work:
1. AI-Powered Sustainable Structural Design: I lead research on integrating AI (Large Language Models, Quantum Machine Learning, Reinforcement Learning, Causal AI, Explainable AI) into structural design workflows. This focusses on optimizing building sustainability through Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) methodologies.
2. Smart Retrofitting of existing structures: Within this domain, my research explores the application of Machine Learning (ML) and Deep Learning (DL) techniques for Data-Driven Retrofitting Strategies and Cost-Effective Retrofitting Optimization of structures.
3. Predictive Maintenance of structures: My research delves into harnessing the power of AI (including Deep Learning), Structural Health Monitoring (SHM), digital twins, and Augmented Reality (AR) to support predictive maintenance practices for structures and infrastructure.
4. Structural Material Innovation: I explore the application of Deep Learning and Computer Vision for investigating novel and "smart" structural materials. This research stream aims to unlock the potential of these materials for creating more robust and sustainable infrastructure.
5. Next-generation performance-based design of structures (Seismic and Wind). Our research is focused on the areas of next-generation performance-based seismic design, seismic life cycle cost, and application of machine learning and deep learning techniques in seismic design and retrofit.
My Lab webpage: https://sites.google.com/view/seismicdesignai/home
My YouTube channel: https://www.youtube.com/channel/UC4XZEI9i0oNdPtqiYZcmgkQ/playlists
Industrial experience:
Over 20 years of experience in both industry and academia have equipped me with a unique perspective on structural engineering. I'm passionate about pushing the boundaries of structural design and performance using cutting-edge tools like artificial intelligence, structural health monitoring, and data science. My goal is to create resilient, safe, and reliable structures that can withstand the harshest conditions.
My professional journey seamlessly integrates industrial experience with academic pursuit, enriching my understanding of structural engineering. As a Lead Structural Engineer at Hyundai Heavy Industries (HHI) in Seoul, South Korea, from June 2014 to September 2015, I specialized in offshore structures. Prior, at Samsung Engineering Co., Ltd (SECL), Seoul, South Korea, I served as an Engineering Manager from November 2007 to June 2014, focusing on onshore structures and petrochemical facilities. Additionally, in the Middle East, I contributed to steel structure design at Arab-Swiss Engineering Company (ASEC) from July 2006 to September 2007, and reinforced concrete structure design at Zuhair Fayez Partnership (ZFP) from July 2003 to July 2006. These roles synergized with my academic pursuits, shaping a holistic approach to structural engineering.
Academic Experience:
Transitioning to academia allowed me to share my expertise with the next generation. As an Assistant Professor at prestigious universities like Sungkyunkwan University (South Korea), from 2015 to 2022, and Aalto University (Finland), starting in 2022, I nurtured a passion for fostering future leaders in Structural engineering.
In my extensive tenure as an educator, I've had the privilege of teaching a diverse range of courses at these esteemed institutions. At Aalto University, I guide undergraduate students through the foundational principles of Solid Mechanics, while also delving into the intricacies of Reinforced Concrete Structures and Prestressed Concrete Structures with graduate students. During my time at Sungkyunkwan University, I've had the opportunity to share my expertise in graduate-level courses such as Earthquake Resistant Design of Structures and Dynamics of Structures, as well as undergraduate courses covering topics like Mechanics of Materials and Structural Analysis. My commitment to equipping students with practical skills is evident through the professional courses I've conducted at Cairo University, where I provided advanced training in structural analysis software. It's been a rewarding journey, and I look forward to continuing to inspire and empower the next generation of structural engineers.
Looking Forward:
Now, I'm excited to leverage this combined experience to develop groundbreaking solutions that enhance the safety and sustainability of our built environment.
Feel free to reach out to discuss potential research collaborations or student opportunities.

Artistic and research interests

PREVIOUS PROFESSIONAL INDUSTERIAL WORK EXPERIENCE:

June 2014 – Sep. 2015, Lead Structural Engineer, Hyundai Heavy Industries (HHI), Offshore structures, Seoul**,** South Korea.

2007 – June 2014, Senior Structural Engineer, Samsung Engineering Co., Ltd (SECL), Global Engineering Center (GEC), Onshore structures & petrochemical facilities, Seoul, South Korea.

2006 – Sep. 2007, Senior Structural Engineer, Arab-Swiss Engineering Company (ASEC), Steel structures, Cairo, Egypt.

2003 – Jul. 2006, Senior Structural Engineer, Zuhair Fayez Partnership (ZFP), RC structures design, Cairo, Egypt

Employment

Assistant Professor
Assistant Professor
Department of Civil Engineering
Aalto University
22 Sept 2022 → present

Assistant Professor
Assistant Professor
Structures – Structural Engineering, Mechanics and Computation
Aalto University
22 Sept 2022 → present

Research outputs

AI-based framework for concrete durability assessment using generative adversarial networks and Bayesian neural networks
Ragaa, A. B., Al-Neshawy, F. & Noureldin, M., 11 Apr 2025, In: Construction and Building Materials. 471, 18 p., 140722.

Explainable machine learning (XML) framework for seismic assessment of structures using Extreme Gradient Boosting (XGBoost)
Gharagoz, M. M., Noureldin, M. & Kim, J., 15 Mar 2025, In: Engineering Structures. 327, 21 p., 119621.

Data-driven model for seismic assessment, design, and retrofit of structures using explainable artificial intelligence
Shabbir, K., Noureldin, M. & Sim, S. H., 20 Jan 2025, In: Computer-Aided Civil and Infrastructure Engineering. 40, 3, p. 281-300 20 p.

Enhanced Random Fiber Generator for CFRP Microstructures
Gharagoz, M. M., Noureldin, M. & Niiranen, J., 2025. 1 p.

Explainable artificial intelligence framework for FRP composites design
Yossef, M., Noureldin, M. & Al Kabbani, A., 1 Aug 2024, In: Composite Structures. 341, 13 p., 118190.

Estimation of Prediction Intervals for Performance Assessment of Building Using Machine Learning
Shabbir, K., Umair, M., Sim, S. H., Ali, U. & Noureldin, M., Jul 2024, In: Sensors. 24, 13, 16 p., 4218.

Performance-based seismic design of a spring-friction damper retrofit system installed in a steel frame
Gharagoz, M. M., Chun, S., Noureldin, M. & Kim, J., 25 Apr 2024, In: Steel and Composite Structures. 51, 2, p. 173-183 11 p.

Machine learning-based design of a seismic retrofit frame with spring-rotational friction dampers
Gharagoz, M. M., Noureldin, M. & Kim, J., Oct 2023, In: Engineering Structures. 292, 116053.

Explainable probabilistic deep learning framework for seismic assessment of structures using distribution-free prediction intervals
Noureldin, M., Abuhmed, T., Saygi, M. & Kim, J., Aug 2023, In: Computer Aided Civil and Infrastructure Engineering. 38, 12, p. 1677-1698 22 p.

Seismic retrofit of steel structures with re-centering friction devices using genetic algorithm and artificial neural network
Noureldin, M., Gharagoz, M. M. & Kim, J., 25 Apr 2023, In: Steel and Composite Structures. 47, 2, p. 167-184 18 p.

The Effect of Soil-Structure Interaction on the Seismic Response of Structures Using Machine Learning, Finite Element Modeling and ASCE 7-16 Methods
Ali, T., Eldin, M. N. & Haider, W., 11 Feb 2023, In: Sensors. 23, 4, 2047.

Simplified Life Cycle Cost Estimation of Low-Rise Steel Buildings Using Fundamental Period
Noureldin, M. & Kim, J., 2 Feb 2023, In: Sustainability . 15, 3, 23 p., 2706.

Machine learning-based seismic assessment of framed structures with soil-structure interaction
Noureldin, M., Ali, T. & Kim, J., Feb 2023, In: Frontiers of Structural and Civil Engineering. 17, 2, p. 205-223 19 p.

RETROFIT DEVICE FOR STRUCTURE
김진구, J. (Inventor) & 모하메드엘딘 (Inventor), 3 Jan 2023, IPC No. F16F 15/ 02 A I, Patent No. KR20230000513, Priority date 24 Jun 2021, Priority No. KR20210082405

Fragility-based framework for optimal damper placement in low-rise moment-frame buildings using machine learning and genetic algorithm
Noureldin, M., Ali, A., Memon, S. & Kim, J., 15 Aug 2022, In: Journal of Building Engineering. 54, 24 p., 104641.

A machine learning procedure for seismic qualitative assessment and design of structures considering safety and serviceability
Noureldin, M., Ali, A., Sim, S.-H. & Kim, J., 1 Jun 2022, In: Journal of Building Engineering. 50, 101490.

Damage state probability estimation for seismic life cycle cost of retrofitted RC structures with self-centering system
Noureldin, M. & Kim, J., Dec 2021, *17th World Conference on Earthquake.* 11 p.

Self-centering steel slotted friction device for seismic retrofit of beam-column joints
Noureldin, M., Ahmed, S. & Kim, J., 10 Oct 2021, In: Steel and Composite Structures. 41, 1, p. 13-30 18 p.

Optimum distribution of seismic energy dissipation devices using neural network and fuzzy inference system
Noureldin, M., Ali, A., Nasab, M. S. E. & Kim, J., Oct 2021, In: Computer Aided Civil and Infrastructure Engineering. 36, 10

Seismic fragility of structures with energy dissipation devices for mainshock-aftershock events
Noureldin, M., Adane, M. & Kim, J., 25 Sept 2021, In: Earthquakes and Structures. 21, 3, p. 219-230 12 p.

Performance-based seismic retrofit of RC structures using concentric braced frames equipped with friction dampers and disc springs
Noureldin, M., Memon, S., Gharagoz, M. & Kim, J., 15 Sept 2021, In: Engineering Structures. 243, 21 p., 112555.

Parameterized seismic life-cycle cost evaluation method for building structures
Noureldin, M. & Kim, J., 4 Mar 2021, In: STRUCTURE AND INFRASTRUCTURE ENGINEERING. 17, 3, p. 425-439 15 p.

Seismic retrofit of a soft first story structure using an optimally designed post – tensioned PC frame
Dereje, J. A., Eldin, M. N. & Kim, J., 2021, In: Earthquakes and Structures. 20, 6, p. 627-637

Seismic Fragility Evaluation of Retrofitted Low-Rise RC Structures
Noureldin, M. & Kim, J., 2020, *Proceedings of the 3rd GeoMEast International Congress and Exhibition, Egypt 2019 on ustainable Civil Infrastructures – The Official International Congress of the Soil-Structure Interaction Group in Egypt (SSIGE).* Springer, 12 p. (Sustainable Civil Infrastructures).

Life-cycle cost evaluation of steel structures retrofitted with steel slit damper and shape memory alloy–based hybrid damper
NourEldin, M., Naeem, A. & Kim, J., Jan 2019, In: Advances in Structural Engineering.

Optimum distribution of steel slit-friction hybrid dampers based on life cycle cost
Eldin, M. N., Kim, J. & Kim, J., 2018, In: Steel and Composite Structures.

Seismic Retrofitting of Structures Using Steel Plate Slit Dampers Based on Genetic Algorithm
Noureldin, M., 2018. 1 p.

Seismic performance evaluation of a structure retrofitted using steel slit dampers with shape memory alloy bars
Naeem, A., Eldin, M. N., Kim, J. & Kim, J., Dec 2017, In: International Journal of Steel Structures. 17, p. 1627-1638

Optimal distribution of steel plate slit dampers for seismic retrofit of structures
Kim, J., Kim, M. & Eldin, M. N., 2017, In: Steel and Composite Structures.

Seismic Performance Evaluation of Fixed Steel Jacket Offshore Platforms with Buckling-Restrained Braces
Noureldin, M. & Kim, J., 2013, *Seventh International Symposium on Steel Structures, November 7-9, Jeju, S.Korea.* 2 p.