

CURRICULUM VITAE

MOHAMMED ALNAGGAR, PhD.

Nuclear Structures and Construction Group, Advanced Reactor Engineering and Development Section

Nuclear Energy and Fuel Cycle Division, Oak Ridge National Laboratory

T: 865-341-1841, e-mail: alnaggarmg@ornl.gov, mglalnaggar@gmail.com

EDUCATION.

- PhD in Structural Engineering, Northwestern University, Evanston (IL), USA. 09/2011 – 06/2014
Thesis title: “*Multiscale Modeling of Aging and Deterioration of Reinforced Concrete Structures?*”.
- M.Sc. in Structural Engineering, Zagazig University, Zagazig, EGYPT. 02/2003 - 04/2009
Thesis title: “*Optimal Control of Structures Using Neural Networks?*”.
- B.Sc. in Civil Engineering, Zagazig University, Zagazig, EGYPT. 09/1997 - 05/2002

PROFESSIONAL EXPERIENCE)

Research:

- Senior Research Scientist, Oak Ridge National Laboratory, Oak Ridge (TN), USA. 08/2021 - to date
- Assistant Professor, Rensselaer Polytechnic Institute, Troy (NY), USA. 08/2014 - 08/2021
- Post-Doctoral research fellow, Northwestern University, Evanston (IL), USA. 06/2014 - 08/2014
- Research and Teaching Assistant, Northwestern University, Evanston (IL), USA. 09/2011 - 05/2014
- Research and Teaching Assistant, Rensselaer Polytechnic Institute, Troy (NY), USA. 08/2010 - 08/2011
- Assistant Lecturer, Zagazig University, Zagazig, EGYPT. 05/2009 - 07/2010
- Research and Teaching Assistant, Zagazig, EGYPT. 02/2003 - 04/2009

Industrial (Part time work in Cairo, Egypt):

- CDEC_ALZANATY DESIGN OFFICE: High-rise buildings design Group leader 02/2010 - 07/2010
- MEEMAR AL-MORSHIDY: Technical manager of structural design office. 02/2006 - 07/2010
- AAYAN CONSULTANTS: Structural design Group leader 01/2007 - 01/2009
- AL-AZHAR MALL MULTI STORY GARAGE: Designer and owner’s consultant 01/2005 - 01/2006

TECHNICAL SKILLS

- Mechanical modeling frameworks (Continuum mechanics, Finite Element Analysis, Discrete mechanics, Molecular dynamics, poro-mechanics, Fluid dynamics)
- Constitutive modeling of solids under static, dynamic and impact loading considering (Fracture mechanics, Damage mechanics, Elasticity, Plasticity, Visco-elasticity, Visco-plasticity)
- Multi-physics modeling of coupled electro-chemo-physical processes (Heat diffusion, moisture and charged ionic diffusion through porous media)
- Composite materials modeling (Particulate, fiber reinforced, and woven composites)
- Structural optimization and CAD software (Altair – Optistruct, NX, Solidworks, Fusion 360, AutoCad)
- Analysis software (Abacus, Ansys, LSDYNA, LAMMPS, LIGGGHTS, MARS, OpenFoam)
- Additive manufacturing/Data acquisition and control software (Mach3, Slicers, LabView)
- Scientific computing using (C, C++, Python, Fortran, Basic, Matlab, MPI, OpenMP)

RESEARCH INTERESTS

My research interests are in the broader field of developing sustainable and resilient infrastructures and materials. I focus on coupling multi-physics and multi-scale material modeling and experimental evaluation techniques to understand current infrastructure and material problems and devise scientifically informed novel solutions. In this pursuit, I utilize my wide range of expertise in Multi-physics and Computational Mechanics, AI-based Seismic Control, Experimental Mechanics, and professional structural engineering practice from industry and active involvement in professional societies.

I have been actively contributing to 4 main research areas as follows

1 – Infrastructure materials and structures aging and deterioration: Over the last 12 years, I have been developing multi-scale multi-physics computational models to represent various time-dependent deformations and deterioration mechanisms that affect infrastructure materials. My main contributions are in representing coupling between deterioration and harsh environmental conditions that is not accounted for in current practice. My work spans concrete (Creep, Shrinkage, ASR, chloride induced corrosion, sulfate attack, nuclear irradiation induced degradation) and steel structures (corrosion morphology effects on ductility and fatigue life). In all my modeling effort development I always perform full validation using experimental data that I personally produce in my group, acquire from collaborators, or gather from literature.

2 – Sustainable development of novel building materials: This thrust covers diverse novel materials development for construction. Here, a combination of advanced modeling and testing techniques are used to develop and understand the mechanical behavior of novel construction materials and systems. Investigations include creating multiple uses of a new type of interlocking plastic bottles to prevent them from being thrown in the ocean. Another work concerned the development of an Ultra-High Durable concrete class of materials that are engineered chemically to reduce radionuclides diffusion through increasing their chemical binding with the cementitious matrix. A third development synthesizes different bio-based cementitious composites that are carbon negative and utilize plant components as aggregate and short reinforcement (Hemp hurd and fiber) within a cementitious matrix. On the computational side, coupled micro-scale modeling techniques are being developed to enable complete understanding of eco-friendly alternative cementitious materials within a materials-by-design approach.

3 – Enabling large-scale 3D printing with reinforcement, supports, and functionally graded sustainable materials: In this thrust, the main barriers that prevent cementitious materials additive manufacturing from becoming a mainstream construction method are being systematically addressed. A novel support material has been developed and tested at small scales that will enable 3D printing using any currently available concrete even flowable ones. The method also provides support for multi-directional reinforcement. Another field of automation deals with optimal placement of UHPC to preferentially orient its fibers enabling a significantly larger tensile capacity. On the educational side, I have introduced 3D modeling in civil engineers design courses and developed one of the first Concrete 3D printing classes in USA.

4 – Multi-objective Structural optimization considering functionally graded cementitious materials. Here, the main objectives are to produce structures with optimal thermal and mechanical performance characteristics using 3D printable cementitious materials with variable properties and composition. The optimization process will result in structural shapes and elements with functionally graded material placement and topologically optimized shapes.

PUBLICATIONS AND PATENTS

Pending Patents

1. Provisional patent application No. 63/083,208, “Use of earth abundant materials as a support material in concrete additive manufacturing”, US filed on September 2020 by Rensselaer Polytechnic Institute.
2. Provisional U.S. Patent Application No 63/012,593, “Compact UVC Irradiation System.” R. F. Karlicek, M. Alnaggar, A. Tuzikas, filed on September 2020 by Rensselaer Polytechnic Institute.

Refereed Journal Publications¹

1. Xiaoying Pan, Bora Gencturk, Mohammed Alnaggar, Muazzam Ghaus Sohail, Ramazan Kahraman, Nasser Al Nuaimi, Debora F. Rodrigues, Yucel Yildirim, (2023) “Numerical simulation of the fracture and compression response of self-healing concrete containing engineered aggregates”, *Cement and Concrete Composites*, Volume 136,104858,ISSN 0958-9465
2. L. Yang, M. Pathirage, H. Su, M. Alnaggar, G. Di Luzio, and G. Cusatis, (2022) “Computational modeling of expansion and deterioration due to alkali–silica reaction: Effects of size range, size distribution, and content of reactive aggregate”, *International Journal of Solids and Structures*, 234-235, 111220.
3. M. Alnaggar, G. Cusatis, R. Wan-Wendner and G.Di Luzio (2021) “Mesoscale modeling of concrete time-dependent behavior”, *BETON I ŽELEZOBETON*. 2021(2). p.24-48
4. L. Yang, M. Pathirage, H. Su, M. Alnaggar, G. Di Luzio, and G. Cusatis, (2021) “Computational modeling of temperature and relative humidity effects on concrete expansion due to alkali-silica reaction”, *Cement and Concrete Composites*, 124, 104237, <https://doi.org/10.1016/j.cemconcomp.2021.104237>
5. Raveen Rathnasinghe, Robert F. Karlicek Jr., Michael Schotsaert, Mattheos Koffas, Brigitte Arduini, Sonia Jangra, Bowen Wang, Jason L. Davis, Mohammed Alnaggar, Anthony Costa, Richard Vincent, Adolfo Garcia-Sastre, Deepak Vashishth, Priti Balchandani, (2021) “Scalable, effective, and rapid decontamination of SARS-CoV-2 contaminated N95 respirators using germicidal ultra-violet C (UVC) irradiation device”, *Sci Rep* 11, 19970. <https://doi.org/10.1038/s41598-021-99431-5>
6. **S. Gomaa, T. Bhaduri**, and M. Alnaggar, (2021) “Coupled Experimental and Computational investigation of the interplay between discrete and continuous reinforcement in Ultra-High Performance Concrete Beams. I: Experimental testing”. *ASCE Journal of Engineering Mechanics*, 147(9). DOI: 10.1061/(ASCE)EM.1943-7889.0001948.
7. **T. Bhaduri, S. Gomaa**, and M. Alnaggar, (2021) “Coupled Experimental and Computational investigation of the interplay between discrete and continuous reinforcement in Ultra-High Performance Concrete Beams. II: Mesoscale Modeling”. *ASCE Journal of Engineering Mechanics*, 147(9). DOI: 10.1061/(ASCE)EM.1943-7889.0001941.
8. **Y. Zhang**, G. Di Luzio, and M. Alnaggar, (2021) “Coupled multi-physics simulation of chloride diffusion in saturated and unsaturated concrete”. *Construction and Building Materials*, Volume 292, ISSN 0950-0618, <https://doi.org/10.1016/j.conbuildmat.2021.123394>.

¹ Bold names are my students

9. **C. Sanon, S. Salem,** and M. Alnaggar, (2021) “Macroscopic moisture diffusion effects on Freeze-Thaw behavior of regular and air entrained concrete”. *International Journal of Damage Mechanics* (under review)
10. **M. Abdellatef,** and M. Alnaggar, (2020) “Energy-based Coarse Graining of the Lattice Discrete Particle Model (LDPM)”, *Journal of Engineering Mechanics*, 146(5):1-15. DOI: 10.1061/(ASCE)EM.1943-7889.0001743
11. **M. Abdellatef,** I. Boumakis, R. Wan-Wendner, and M. Alnaggar, (2019) “Lattice Discrete Particle Modeling of concrete coupled creep and shrinkage behavior: A comprehensive calibration and validation study.” *Construction and Building Materials*, Volume 211, Pages 629-645, ISSN 0950-0618
12. R. Rezakhani, M. Alnaggar and G. Cusatis, (2019) “Multiscale homogenization analysis of the Alkali-Silica-Reaction effect in concrete”, *Engineering*, 5(6), 1139-1154,
<https://doi.org/10.1016/j.eng.2019.02.007>
13. S. Khodaie, F. Matta, and M. Alnaggar, (2019) “Discrete Meso-Scale Modeling and Simulation of Shear Response of Scaled Glass FRP Reinforced Concrete Beams Without Stirrups”, *Engineering Fracture Mechanics*, Volume 216,ISSN 0013-7944,<https://doi.org/10.1016/j.engfracmech.2019.106486>
14. **M. Abdellatef,** J. Vorel, R. Wan-Wendner, and M. Alnaggar, (2018) “Predicting Time Dependent Behavior of Post-Tensioned Concrete Beams: A Discrete Multiscale Multiphysics Formulation.” *Journal of Structural Engineering* 145 (7), 04019060.
15. M. Alnaggar, D. Pellesone and G. Cusatis, (2018) “Lattice Discrete Particle Modeling of Reinforced Concrete Flexural Behavior.”. *Journal of Structural Engineering* 145 (1), 04018231.
[https://doi.org/10.1061/\(ASCE\)ST.1943-541X.0002230](https://doi.org/10.1061/(ASCE)ST.1943-541X.0002230)
16. M. Alnaggar and **N. Bhanot,** (2018) “A machine learning approach for the identification of the Lattice Discrete Particle Model parameters”. *Engineering Fracture Mechanics*, Volume 197, Pages 160-175.
17. Erol Lale, Roozbeh Rezakhani, M Alnaggar and G Cusatis, (2018) “Homogenization coarse graining (HCG) of the lattice discrete particle model (LDPM) for the analysis of reinforced concrete structures”. *Engineering Fracture Mechanics*, Volume 197, Pages 259-277.
18. M Pathirage, F Bousikhane, M D’Ambrosia, M Alnaggar and G Cusatis, (2018) “Effect of alkali silica reaction on the mechanical properties of aging mortar bars: Experiments and numerical modeling”. *International Journal of Damage Mechanics*, 1056789517750213
19. M. Alnaggar, G. Cusatis and G. Di Luzio, (2017) “Modeling Time-Dependent Behavior of Concrete Affected by Alkali Silica Reaction in Variable Environmental Conditions. ”. *Materials* 10, no. 5: 471.
20. A. Duan, D. W. Zhang, and M. Alnaggar (2015) “Microplane modeling of ASR effects on concrete structures”, *Zhejiang Daxue Xuebao (Gongxue Ban)/Journal of Zhejiang University (Engineering Science)*. 49: 1939-1945. DOI: 10.3785/j.issn.1008- 973X.2015.10.016
21. M. Alnaggar, M. Liu, J. Qu, and G. Cusatis, (2015) “Lattice Discrete Particle Modeling of acoustic nonlinearity change in accelerated alkali silica reaction (ASR) tests”, *Materials and Structures*, 1–23, doi:10.1617/s11527-015-0737-9.
22. M. Alnaggar, G. Cusatis and G. Di Luzio, (2013) “Lattice Discrete Particle Modeling (LDPM) Of Alkali Silica Reaction (ASR) Deterioration Of Concrete Structures”. *Cement and Concrete Composites* (41), 45-59. <http://www.sciencedirect.com/science/article/pii/S0958946513000802>
23. S. Abdel Salam, H. Soliman, A.E. Bakeri and M. Alnaggar. “Compensation of Time Delay Effect in Active Controlled MDOF Structures Using Neural Networks”, *Journal of American Science*, 8(7):717-724.
http://www.jofamericanscience.org/journals/am-sci/am0807/106_9774am0807_717_724.pdf

Conference Proceedings

1. Y. Le Pape, E. Tajuelo Rodriguez, A. Cheniour, M. Alnaggar, J. Arregui Mena, P. Bran Anleu, T. M. Rosseel, and A. Brooks, 2022. "Life Beyond 80: Can Concrete Degradation Synergistic Modes Become Showstoppers for Light Water Reactors?". United States.
<https://www.osti.gov/servlets/purl/1890330>.
2. M. Alnaggar, O. El Shafee, **M. Abdellatef**, and V. G. Bennett, (2020) "Immersive learning based introduction to engineering design", ASCE Structures Congress 2020, St. Louis, MO, April 5-8, 2020
3. A. Tsamis, A. Toledano, and M. Alnaggar (2020) "Towards Functionally Graded Bio-Composites in Additive Manufacturing", ACSA 108th Annual Meeting, March 13, 2020
4. **S. Gomaa** and M Alnaggar, (2019) "Transitioning from shear to flexural failure of Ultra High Performance Concrete Beams by varying fiber content", 2nd International Interactive Symposium on Ultra-High Performance Concrete, Albany, NY, June 2-5 2019
5. **T. Bhaduri** and M Alnaggar, (2019) "Modeling of Steel Reinforced Ultra-High-Performance Concrete (UHPC) Beams failure", 2nd International Interactive Symposium on Ultra-High Performance Concrete, Albany, NY, June 2-5 2019
6. S. Khodaie , F. Matta, and M Alnaggar, (2017) "Numerical Simulation of Shear Behavior of Scaled GFRP Reinforced Concrete Beams without Stirrups Using Lattice Discrete Particle Model", 6th Asia-Pacific Conference on FRP in Structures Proceedings (APFIS2017), Singapore, July 19-21 2017
7. **M. Abdellatef**, J. Vorel, R. Wendner, and M. Alnaggar, (2017) "Lattice Discrete Particle Modeling of Time Dependent Behavior of Prestressed Concrete Beams.", 2017 PCI Convention & National Bridge Conference in Cleveland, Ohio, Berkeley, February 28 - March 4, 2017
8. **M. Abdellatef, E. Salem, D. Lau, L. Stenroos** and M. Alnaggar, (2016) "Bond degradation of corroded reinforcement: an experimental and numerical study", 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures proceedings (FraMCoS9), Berkeley, CA, May 29-June 1 2016
9. S. Khodaie, F. Matta, and M. Alnaggar, (2016) "lattice discrete particle modeling of shear failure in scaled gfrp reinforced concrete beams without stirrups", 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures proceedings (FraMCoS9), Berkeley, CA, May 29-June 1 2016
10. R. Reza khani, M. Alnaggar and G. Cusatis, (2016) "Multiscale Homogenization Modeling Of Alkali-Silica-Reaction Damage In Concrete", 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures proceedings (FraMCoS9), Berkeley, CA, May 29-June 1 2016
11. M. Alnaggar and G. Cusatis, (2016) "Lattice Discrete Particle Modeling (LDPM) of Flexural Size effect in Over Reinforced Concrete Beams", 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures proceedings (FraMCoS9), Berkeley, CA, May 29-June 1 2016
12. G. Cusatis, M. Alnaggar, P. Gardoni, M. D'Ambrosia, J. Qu,(2015) "Aging and deterioration of concrete structures. Learning from the past, assessing the present, and predicting the future: science or magic?", proceedings of CONCREEP-10, September 21-23, Vienna, Austria (Plenary lecture)
13. **M. Abdellatef**, M. Alnaggar, I. Boumakis, G. Cusatis, G. Di Luzio, R. Wendner (2015) "Lattice Discrete Particle Modeling for coupled concrete creep and shrinkage using Solidification Microprestess Theory", proceedings of CONCREEP-10, September 21-23, Vienna, Austria
14. M. Alnaggar, G. Cusatis, J. Qu, and M. Liu, "Simulating Acoustic Nonlinearity Change in Accelerated Mortar Bar Tests: A discrete Meso-Scale Approach", Proceedings of Fourth International Symposium

on Life-Cycle Civil Engineering IALCCE 2014 November 16-19, Waseda University, Tokyo, Japan

15. G. Cusatis, M. Alnaggar, and R. Reza khani, "Multiscale Modeling Of Alkali Silica Reaction Degradation Of Concrete", Proceedings of RILEM International Symposium on Concrete Modelling, CONMOD 2014, October 12-14, Tsinghua University, Beijing, China
16. G. Cusatis, R. Reza khani, M. Alnaggar, X. Zhou and D. Pelessone, "Multiscale computational models for the simulation of concrete materials and structures". Computational Modeling of Concrete Structures - Proceedings of EURO-C 2014. 2014;1:23-38. (Plenary lecture)
17. M. Alnaggar, G. Cusatis and G. Di Luzio, "A Discrete Model For Alkali-Silica-Reaction In Concrete". 8th International Conference on Fracture Mechanics of Concrete and Concrete Structures proceedings (FraMCoS8), Toledo, Spain, March 10-14, 2013. <http://framcos.org/FraMCoS-8/p425.pdf>
18. G. Di Luzio, M. Alnaggar, G. Cusatis. "Lattice Discrete Particle Modeling Of Alkali-Silica-Reaction Effects To Concrete Structures", Proceedings of Numerical Modeling Strategies for Sustainable Concrete Structures (SSCS2012). Aix-en-Provence, France, May 29-June 1, 2012
19. M. Alnaggar, G. Cusatis. "Automatic Parameter Identification Of Discrete Mesoscale Models With Application To The Coarse-Grained Simulation Of Reinforced Concrete Structures", ASCE Structures Congress 2012, 20th Analysis and Computation Specialty Conference proceedings, Chicago, IL, March 29-31, 2012, 406-417. <http://dx.doi.org/10.1061/9780784412374.036>
20. S. Abdel Salam, H. Soliman, A.E. Bakeri and M. Alnaggar. "Compensating Time Delay Effect In The Active Controlled Structures Using Neural Networks", American Society Of Civil Engineers, 6th International Engineering and Construction Conference proceedings (IECC'6), Advances in Affordable Housing & Green Construction, Cairo, Egypt June 28-30, 2010

Research and Technical Reports

1. Members of the Nuclear Energy Agency Committee On The Safety Of Nuclear Installations. "Final Report on Phase 1 of the Assessment of Structures Subjected to Concrete Pathologies", Nuclear Energy Agency, Nuclear Safety, NEA/CSNI/R(2016)13, July 2017.
2. Members of the Nuclear Energy Agency Committee On The Safety Of Nuclear Installations. "Final Report on Phase 2 of the Assessment of Structures Subjected to Concrete Pathologies", Nuclear Energy Agency, Nuclear Safety, NEA/CSNI/R(2018)4/ADD1, January 2019.
3. M. Alnaggar, L. Kallipoliti, and J. Draper "Friendship interlocking plastic bottles as versatile building materials: Structural capacity, architectural ecology, and thermal behavior", Final Report. Friendship Products LLC. Grant No. J71842. October 2019. Department of Civil and Environmental Engineering, Rensselaer Polytechnic Institute, Troy, NY, USA.

Conference Presentations.

1. M. Alnaggar, O. El Shafee, **M. Abdellatef**, and V. G. Bennett, (2020) "Immersive learning based introduction to engineering design", ASCE Structures Congress 2020, St. Louis, MO, April 6, 2020.
2. M. Alnaggar, **T. Bhaduri** and R. Reza khani (2019) "Multi-scale Homogenization Modeling of Ultra High Performance Concrete", *Engineering Mechanics Institute conference, EMI 2019, June 19, CALTECH, Pasadena, CA, USA**
3. **S. Gomma** and M Alnaggar, (2019) "Transitioning from shear to flexural failure of Ultra High Performance Concrete Beams by varying fiber content", 2nd International Interactive Symposium on Ultra-High Performance Concrete, Albany, NY, June 3 2019

4. **T. Bhaduri** and M Alnaggar, (2019) "Modeling of Steel Reinforced Ultra-High-Performance Concrete (UHPC) Beams failure", 2nd International Interactive Symposium on Ultra-High Performance Concrete, Albany, NY, June 3 2019
5. M. Alnaggar and **N. Bhanot** (2018) "A Machine Learning Approach to the Identification of the Lattice Discrete Particle Model Parameters", *Symposium on Fracture Mechanics, Size Effect, and Aging Phenomena of Concrete Structures Celebrating Professor Bazant's 80th Birthday, ACI Fall convention 2018, October 15th, Las Vegas, NV, USA**
6. M. Alnaggar, G. Cusatis, G. Di Luzio, R. Rezakhani and, E. Lale, (2018) "Multi-scale modeling of reinforced concrete aging and deterioration: A discrete perspective", *Session on: Computational Modeling of Concrete Materials and Structures: Calibration, Validation, and State of the Practice, ACI Fall convention 2018, October 15th, Las Vegas, NV, USA**
7. M. Alnaggar, **S. Gomaa**, M. Marcon, and R. Wan-Wendner (2018) "Experimental evaluation of Anchor bond degradation in Alkali-Silica Reaction affected Concrete". *Engineering Mechanics Institute conference, EMI 2018, May 29 - June 1, MIT, Cambridge, MA, USA**
8. **Y. Zhang** and M. Alnaggar (2018) "Coupled multi-physics simulation of chloride diffusion in concrete : A discrete modeling approach". *Engineering Mechanics Institute conference, EMI 2018, May 29 - June 1, MIT, Cambridge, MA, USA*
9. **T. Bhaduri, S. Gomaa**, and M. Alnaggar (2018) "Shear Behavior of Ultra-high-performance Concrete Prismatic Beams with Various Fiber Contents : Experiments and Numerical Simulations". *Engineering Mechanics Institute conference, EMI 2018, May 29 - June 1, MIT, Cambridge, MA, USA*
10. **M. Abdellatif** and M. Alnaggar (2018) "Energy-Based Coarse Graining of the Lattice Discrete Particle Model". *Engineering Mechanics Institute conference, EMI 2018, May 29 - June 1, MIT, Cambridge, MA, USA*
11. M. Alnaggar, and G. Cusatis G. Di Luzio (2017) "Modeling Time-Dependent behavior of Concrete Affected by Alkali Silica Reaction in Variable Environmental Conditions". Keynote presentation at the *Engineering Mechanics Institute conference, EMI 2017, June 4-7, UC San Diego, San Diego, CA, USA**
12. M. Alnaggar*, G. Cusatis, G. Di Luzio, (2017) [Keynote] "Modeling Time-Dependent behavior of Concrete Affected by Alkali Silica Reaction in Variable Environmental Conditions". Engineering Mechanics Institute (EMI 2017) Conference, June 4-7 2017, San Diego, CA.
13. M. Pathirage, F. Bousikhane, K. Luo, M. D'Ambrosia, M. Alnaggar, G. Cusatis (2017), "Effect Of Alkali Silica Reaction On Aging Mortar Bars". Engineering Mechanics Institute (EMI 2017) Conference, June 4-7 2017, San Diego, CA.
14. M. Alnaggar* and G. Cusatis, (2017), "Numerical simulation of size-effect in reinforced concrete structures". ACI Spring Convention, March 25-28 2017, Detroit, MI.
15. G. Cusatis, M. Alnaggar R. Wendner and G. Di Luzio, (2017), "Simulation of coupled creep, drying, shrinkage and aging of concrete: model complexity and uniqueness of parameter identification". ACI FALL 2017 American Concrete Institute fall Convention Anaheim, October 17, CA, USA
16. S. Khodaie , F. Matta, and M Alnaggar, (2017), "Meso-scale Modeling of Shear Failure in Scaled GFRP Reinforced Concrete Beams without Stirrups". Engineering Mechanics Institute (EMI 2017) Conference, June 4-7 2017, San Diego, CA.
17. S. Khodaie , F. Matta, and M Alnaggar, (2017), "Meso-Scale Concrete Model for Numerical Simulation of Shear Behavior of RC Beams". ACI Spring Convention, March 25-28 2017, Detroit, MI.
18. S. Khodaie , F. Matta, and M Alnaggar, (2017) "Numerical Simulation of Shear Behavior of Scaled GFRP Reinforced Concrete Beams without Stirrups Using Lattice Discrete Particle Model", 6th Asia-Pacific Conference on FRP in Structures, Singapore, July 19-21 2017

19. **M. Abdellatef**, J. Vorel, R. Wendner, and M. Alnaggar, (2017) “Lattice Discrete Particle Modeling of Time Dependent Behavior of Prestressed Concrete Beams.”, 2017 PCI Convention & National Bridge Conference in Cleveland, Ohio, Berkeley, February 28 - March 4, 2017
20. M. Marcon, **L. Stenroos**, M. Alnaggar, and R. Wendner (2016) “Bonded Anchors in Concrete Structures suffering from ASR Damage”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA*
21. **M. Kubista**, D. Duquette, and M. Alnaggar, (2016) “Determining the Critical Chloride Threshold for Corrosion of Steel Reinforcing Rebars in Synthetic Concrete Pore Solution”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA*
22. **C. Sanon, M. Abdelatif, E. Salem**, G. Di Luzio, and M. Alnaggar (2016) “Freezing/Thawing Rate Effects on Concrete Strength with Different Moisture Contents”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA*
23. S. Khodaie, F. Matta, and M. Alnaggar (2016) “Lattice Discrete Particle Modeling of Shear Failure in Reinforced Concrete Beams without Stirrups”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA*
24. **M. Abdelatif**, G. Boumakis, R. Wendner, and M. Alnaggar, (2016) “Modeling of Aging Effects on Concrete Creep/ Shrinkage Behavior: A Lattice Discrete Particle Modeling Approach”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA**
25. **L. Stenroos, M. Abdelatif, E. Salem**, and M. Alnaggar (2016) “Rebar Concrete Bond Degradation Under Combined Effects of Alkali-Silica Reaction and Corrosion”. *Engineering Mechanics Institute conference, EMI 2016, May 22-25, Vanderbilt University, Nashville, TN, USA*
26. **M. Abdellatef, E. Salem, D. Lau, L. Stenroos** and M. Alnaggar, (2016) “Bond degradation of corroded reinforcement: an experimental and numerical study”, *9th International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS9), May 29-June 1, Berkeley, CA, USA*
27. S. Khodaie, F. Matta, and M. Alnaggar, (2016) “lattice discrete particle modeling of shear failure in scaled gfrp reinforced concrete beams without stirrups”, *9th International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS9), May 29-June 1, Berkeley, CA, USA*
28. M. Alnaggar and G. Cusatis, (2016) “Lattice Discrete Particle Modeling (LDPM) of Flexural Size effect in Over Reinforced Concrete Beams”, *9th International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS9), May 29-June 1, Berkeley, CA, USA**
29. M. Alnaggar, (2016) “Parameter Identification of the Lattice Discrete Particle Model (LDPM) using incomplete experimental data”, *ACI Spring Convention, April 19, Milwaukee, WI, USA**
30. S. Khodaie, F. Matta, and M. Alnaggar, (2016) “Calibration and Validation of LDPM for Shear Failure in GFRP Reinforced Concrete Beams without Stirrups”, *ACI Spring Convention, April 19, Milwaukee, WI, USA*
31. G. Cusatis, M. Alnaggar, P. Gardoni, M. D’Ambrosia, J. Qu,(2015) “Aging and deterioration of concrete structures. Learning from the past, assessing the present, and predicting the future: science or magic?”, *proceedings of CONCREEP-10, September 21-23, Vienna, Austria (Plenary lecture)*
32. **M. Abdellatef**, M. Alnaggar, I. Boumakis, G. Cusatis, G. Di Luzio, R. Wendner (2015) “Lattice Discrete Particle Modeling for coupled concrete creep and shrinkage using Solidification Microprestress Theory”, *proceedings of CONCREEP-10, September 21-23, Vienna, Austria*
33. M. Alnaggar and G. Cusatis (2015) “Intelligent identification of the lattice discrete particle model (LDPM) parameters”. *Engineering Mechanics Institute conference, EMI 2015, June 16-19, Stanford University, Stanford, CA, USA**

34. E. Lale, R. Rezakhani, M. Alnaggar and G. Cusatis (2015) "Homogenization-based coarse graining framework for the analysis of reinforced concrete structural elements", *Engineering Mechanics Institute conference, EMI 2015, June 16-19, Stanford University, Stanford, CA, USA*
35. G. Cusatis, M. Alnaggar, J. Qu, and M. Liu (2015) "Simulation of Alkali-Silica Reaction (ASR) Deterioration of Concrete and Interpretation of Nonlinear Ultrasound Measurements", *NEA/CSNI/LAGE CAPS, Assessment of Nuclear Structures Subject to Concrete Pathologies (ASCET) Workshop, National Institute of Standards and Technology (NIST), June 29- July 1, Portrait Gallery, Gaithersburg, MD, USA*
36. M. Alnaggar, **M. Abdellatef**, I. Boumakis, R. Wendner, (2015) "Explicit implementation of the Solidification Microprestress Theory within the Lattice Discrete Particle Model", *ACI Spring Convention, April 14, Kansas City ACI-209D**
37. R. Rezakhani, M. Alnaggar and G. Cusatis "MultiScale Homogenization Algorithm for Discrete Models with Rotational Degrees of Freedom: Application to Concrete", *Engineering Mechanics Institute conference, EMI 2014, August 5-8, McMaster University, Hamilton, ON, Canada 2014*
38. M. Alnaggar, G. Cusatis, and G. Di Luzio "Multiphysics Modeling of Concrete Degradation under Coupled Alkali Silica Reaction, Shrinkage and Creep effects", *Engineering Mechanics Institute conference, EMI 2014, August 5-8, McMaster University, Hamilton, ON, Canada 2014*
39. Z. Bazant, S. Aghdam, M. Alnaggar, G. Cusatis, and A. Duan "Continuum Modeling of Damage to Concrete Structures Caused by Alkali-Silica Reaction", *Engineering Mechanics Institute conference, EMI 2014, August 5-8, McMaster University, Hamilton, ON, Canada 2014*
40. M. Alnaggar and G. Cusatis "Multiphysics Modeling of Concrete Degradation under Coupled Alkali Silica Reaction, Shrinkage and Creep effects", *17th USNCTAM, Michigan State University, June 16th, 2014**
41. R. Rezakhani, M. Alnaggar and G. Cusatis "From Discrete Fine Scale Models with Rotational Degrees of Freedom to Cosserat Continuum through Mathematical Homogenization", *17th USNCTAM, Michigan State University, June 16th, 2014*
42. M. Alnaggar and G. Cusatis "Simulating Acoustic Nonlinearity Change in Accelerated Mortar Bar Tests: A discrete Meso-Scale Approach", *EMI 2013, Engineering Mechanics Institute Conference: Mechanics for Sustainable and Resilient Infrastructures, Northwestern University, August 4-7, 2013**
43. G. Di Luzio, M. Alnaggar and G. Cusatis, "Lattice Discrete Particle Modeling (LDPM) Of Alkali Silica Reaction (ASR) Deterioration Of Concrete Structures", *EMI 2013, Engineering Mechanics Institute Conference: Mechanics for Sustainable and Resilient Infrastructures, Northwestern University, August 4-7, 2013*
44. A. Duan, Z. P. Bažant, M. Alnaggar and G. Cusatis "Microplane Finite Element Analysis Of Alkali-Silica Reaction", *EMI 2013, Engineering Mechanics Institute Conference: Mechanics for Sustainable and Resilient Infrastructures, Northwestern University, August 4-7, 2013*
45. M. Alnaggar, G. Cusatis and G. Di Luzio, "Lattice Discrete Particle Modeling (LDPM) Of Alkali Silica Reaction (ASR) In Variable Environmental Conditions", *4th Advances in Cement-based Materials: Characterization, Processing, Modeling and Sensing University of Illinois at Urbana-Champaign, Urbana, IL, July 9, 2013**
46. M. Alnaggar, G. Cusatis and G. Di Luzio, "Lattice Discrete Particle Modeling (LDPM) Of Alkali Silica Reaction (ASR) Deterioration Of Concrete Structures", *Seventh M.I.T. Conference on Computational Fluid & Solid Mechanics, Boston, MA, June 14, 2013**
47. D. Pelessone, M. Alnaggar and G. Cusatis, "Lattice Discrete Particle Modeling of reinforced concrete beams", *Seventh M.I.T. Conference on Computational Fluid & Solid Mechanics, Boston, MA, June 14, 2013*
48. M. Alnaggar, G. Cusatis and G. Di Luzio, "A Discrete Model For Alkali-Silica-Reaction In Concrete". *8th International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS8), Toledo, Spain,*

March 10-14, 2013.

49. M. Alnaggar, G. Cusatis. “Automatic Parameter Identification Of Discrete Mesoscale Models With Application To The Coarse-Grained Simulation Of Reinforced Concrete Structures”, *ASCE Structures Congress 2012, 20th Analysis and Computation Specialty Conference, Chicago, IL, March 29-31, 2012**
50. G. Di Luzio, M. Alnaggar, G. Cusatis. “Lattice Discrete Particle Modeling Of Alkali-Silica-Reaction Effects To Concrete Structures”, *Numerical Modeling Strategies for Sustainable Concrete Structures (SSCS2012). Aix-en-Provence, France, May 29-June 1, 2012*
51. S. Abdel Salam, H. Soliman, A.E. Bakeri and M. Alnaggar. “Compensating Time Delay Effect In The Active Controlled Structures Using Neural Networks”, *American Society Of Civil Engineers, 6th International Engineering and Construction Conference (IECC'6), Advances in Affordable Housing & Green Construction, Cairo, Egypt June 28-30, 2010**

*Stared items are presented by me.

INVITED LECTURES

1. “Multi-Scale Computational Modeling of Concrete Infrastructure Aging and Deterioration”, Department of Civil, Architectural and Environmental Engineering (CAEE) Seminar, University of Texas at Austin, Austin, TX, April 4, 2019
2. “Predicting reinforced concrete aging and deterioration: experiments or modeling?”, Civil and Environmental Engineering Departmental Seminar, *University of Southern California*, Los Anglos, CA November 14, 2018
3. “Construction Additive Manufacturing: Needs and Challenges”, Center for Automation Technologies and Systems (CATS) research nucleation workshop, *Rensselaer Polytechnic Institute*, Troy, NY September 3, 2018
4. “Reinforced concrete aging, deterioration and the environment: Can we predict that?”, Civil, Structural and Environmental Engineering Departmental Seminar, *University at Buffalo*, Buffalo, NY, February 16, 2018
5. “Predicting concrete infrastructures long term behavior: Needs, Successes, and Challenges!”, Civil and Environmental Engineering Departmental Seminar, *Rutgers School of Engineering*, Piscataway, NJ, March 27, 2017

MEDIA PRESENCE

K12 outreach activities

1. RPI students teach engineering to local third graders - <https://www.news10.com/news/rpi-students-teach-engineering-to-local-third-graders/>
2. Grade 3 Students Explore Real-World Engineering Challenge - <https://www.northcolonie.org/grade-3-students-explore-real-world-engineering-challenge/>

Friendship products collaboration with RPI

3. Friendship Bottles MASTER film - <https://vimeo.com/290627063>
4. Humanitarian Shelter With RPI CASE - <https://www.friendshipproducts.com/gallery>
5. Art Pavilion - <https://www.friendshipproducts.com/copy-of-humanitarian-shelters-with->
6. The Friendship Bottle - What if a bottle had a long and important life AFTER you drink the contents? - <https://makerfaire.com/maker/entry/69117/>
7. After Bottles; Second Lives - <http://www.anacycle.com/AFTER-BOTTLES-Second-Lives>

8. Rensselaer Design Studio Reshapes Emergency Housing With Plastic Bottles - <https://everydaymatters.rpi.edu/how-this-rensselaer-design-studio-reshaped-emergency-housing-with-plastic-bottles/#.XmZq6GhKguU>
9. Building With Bottles - <https://news.rpi.edu/content/2018/05/03/building-bottles>
10. Rensselaer Research Wins Blue Ribbon at Annual New York Maker Faire - <https://eng.rpi.edu/news/10112018-0000/rensselaer-research-wins-blue-ribbon-annual-new-york-maker-faire>

UVC sterilization of masks

11. Unique System for Using UVC Light to Sterilize Masks in Bulk Developed at Rensselaer - <https://news.rpi.edu/content/2020/04/23/unique-system-using-uv-c-light-sterilize-masks-bulk-developed-rensselaer>
https://www.youtube.com/watch?v=NHIAyV0v8rg&ab_channel=RensselaerPolytechnicInstitute
12. RPI team develops UV-C medical mask disinfectant for Mt. Sinai - <https://www.ledsmagazine.com/specialty-ssl/article/14174962/rpi-team-develops-uv-c-medical-mask-disinfectant-for-mt-sinai>
13. RPI researchers develop machine to sterilize N95 masks - <https://wnyt.com/troy-new-york-news/rpi-researchers-develop-machine-to-sterilize-n95-masks-troy/5708982/>

RESEARCH STUDENTS MENTORING

1. Post-Doctoral Fellows:
 - a. M. Abdellatif (8/2018 – 12/2018)
 - b. S. Gomaa (10/2020 – 03/2021)
2. Visiting Scholars:
 - a. S. Gomaa (5/2016 – 5/2018)
 - b. E. Salem (10/2015 – 8/2017)
3. PhD students:
 - a. M. Abdellatif (8/2014 – 8/2018)
Thesis title “Multi-scale modeling of damage and time dependent behavior of reinforced and prestressed concrete structures”
 - b. S. Gomaa (8/2018 – 8/2020)
Thesis title “Corrosion of Steel Plate Girder Bridges and Rehabilitation using UHPC”
 - c. Y. Zhang (8/2017 – 8/2021)
Thesis title “Multi-Scale, Multi-Physics Computational Modeling of the Chemo-mechanics of Cementitious Materials and Their Effects on Strength and Mass Transport”
 - d. T. Bhaduri (8/2017 – 8/2021)
Thesis title “Multi-scale Computational Modeling of Ultra-High Performance Concrete in Fluid and Solid States”
4. MS/ME Students
 - a. N. Bhanot (2/2015 – 5/2016)
 - b. L. Stenroos (2/2016 – 5/2017)
 - c. C. Sanon (2/2015 – 12/2016)
 - d. P. Montolio (8/2018 – 05/2019)
 - e. T. Kaufman (8/2018 – 12/2018)

5. Undergraduate research assistants: An average of 4 students over academic semesters and 3 students over summer. Students participated in lab experiments.
M. Kubista, D. Lau, L. Stenroos, C. Sanon, T. Haddad, H. Fiorentino, Christopher Dearie, T. S. Williams, T. Kaufman, A. Heisler, J. Palmeri, S. Freter

SCIENTIFIC COMMITTEES

- Member of the Scientific Committee of the Second International Interactive Symposium on UHPC June 2-5 2019, Albany, NY, USA.
- Member of the Scientific Committee of PARTICLES 2017, V International Conference on Particle-Based Methods, Hannover, Germany, September 26-28, 2017.
- Member of the Scientific Committee of PARTICLES 2019, VI International Conference on Particle-Based Methods, Barcelona, Spain, October 28-30, 2019.
- Member of the Scientific Committee of EMI 2020, ASCE Engineering Mechanics Institute Conference, Columbia University, New York, NY, USA, May 26-29, 2020.
- Member of the following ACI technical committees

209 - Creep and Shrinkage in Concrete

209-0D - Numerical Methods and 3D Analyses

446 - Fracture Mechanics of Concrete--Joint ACI-ASCE

239 - Ultra-High Performance Concrete

239-0C - Structural Design on UHPC

REVIEWER FOR

- Journal of Engineering Mechanics.
- Journal of Engineering Fracture Mechanics
- Journal of Structural Engineering.
- Applied Mathematics and Computation.
- Engineering Science and Technology: an International Journal.
- Construction and Building Materials.
- Journal of Nanomechanics and Micromechanics
- Advances in Materials Science and Engineering
- Ocean Engineering
- U.S. Department of Energy's Consolidated Innovative Nuclear Research
- National Science Foundation (NSF)

HONORS

- 2019 School of Engineering Innovation in Education Award, Rensselaer, 2019 2019
- Egyptian Engineers Syndicate Honor for:
 - Outstanding Engineers for excellence in engineering Education (M.Sc.) 2009
 - Outstanding Engineers for excellence in engineering Education (B.Sc.) 2002
 - Outstanding Engineer's Sons for excellence in secondary education 1997

- 5 State Awards for Outstanding Undergraduate Students, Egypt.

1998 - 2002

TEACHING EXPERIENCE

Courses taught:

- CIVL 6940: Concrete 3D Printing, graduate course instructor, Rensselaer Polytechnic Institute, USA (Spring 2021)
- CIVIL 1100: Introduction to Civil Engineering, undergraduate course instructor, Rensselaer Polytechnic Institute, USA (Springs 2015-2021)
- CIVIL 4440: Matrix Structural Analysis, undergraduate course instructor, Rensselaer Polytechnic Institute, USA (Spring 2019, Spring 2020, Fall 2020)
- CIVIL 6310: Adv. Concrete Structures, graduate course instructor, Rensselaer Polytechnic Institute, USA (Falls 2014-2020)
- ENGR 2050: Introduction to Engineering Design, undergraduate course instructor, Rensselaer Polytechnic Institute, USA (Summer 2019, Summer 2020)
- ENGR 2530: Strength of Materials, undergraduate course instructor, Rensselaer Polytechnic Institute, USA (Spring 2016, Spring 2017)
- CIVIL 6960: Constitutive modeling, graduate course instructor, Rensselaer Polytechnic Institute, USA (Fall 2015)
- TA and Grading at Northwestern University, Evanston, IL, USA
 1. GEN_ENG 205-3- Engineering Analysis III. (Spring 2012)
 2. CIV_ENV 221-0 - Theory of Structures I. (Fall 2013)
- Assistant Lecturer in Zagazig University, Zagazig, Egypt
 1. Computer Aided Design of Structures. (Course implementation, teaching and grading). (Fall 2009)
 2. High Rise Buildings Design. (Course implementation, teaching and grading). (Spring 2010)
 3. Structural dynamics I. (Teaching 50% of class lectures, preparing and grading all exams). (Fall 2009)
 4. Introduction to Finite element analysis. (Teaching 30% of class lectures). (Spring 2010)
 5. Earthquake engineering. (Teaching all class lectures, preparing and grading all exams). (Fall 2009)
- TA at Zagazig University, Zagazig, Egypt (Average load of 25 hours per week)
 1. Design Of Steel Bridges. (Springs of 2003-2009)
 2. Theory of Structures I, II and III. (Falls of 2003-2008)
 3. Structural Mechanics I, II. (Springs of 2003-2009)
 4. Plates and Shells. (Springs of 2003-2009)
 5. Matrix Methods of Structural Analysis. (Falls of 2003-2008)
- Mentoring Graduation Project “*Computer Aided Analysis and Design of Structures*” for approximately 80 students (8-12 per year 2003-2010)