

College of Engineering Biographical Data

University of Illinois at Urbana-Champaign

Department (% appt):	Civil and Environmental Engineering (100%)	Updated:	July 2022
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1. Name:	Elbanna, Ahmed	Birth Date:	9/18/1981	Citizenship:	Egypt/USA
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2. Present Academic Rank:	Associate Professor	3. Tenure Status:	Tenured
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4. Administrative Title:

5. Degrees (*field, institution, year awarded*)

1. BSc. Civil Engineering Faculty of Engineering, Cairo University 2003
2. MSc. Structural Engineering Faculty of Engineering, Cairo University 2005
3. MSc. Applied Mechanics California Institute of Technology, USA 2006
4. PhD. Civil Engineering California Institute of Technology, USA 2011

6. Academic Positions at U of I and elsewhere (*rank, institution, field, inclusive dates*) (*show % if you hold multiple appointments*)

1. Postdoctoral Scholar, Department of Physics, University of California at Santa Barbara 2011-2012
2. Assistant Professor, Department of Civil and Environmental Engineering, University of Illinois Urbana Champaign 2013-2020
3. Associate Professor, Department of Civil and Environmental Engineering, University of Illinois Urbana Champaign 2020-present

7. Professional Activities

a. Other Professional Employment (*title, organization, location, inclusive dates*)

1. Teaching Assistant/Lecturer Structural Engineering Department Faculty of Engineering - Cairo University 2003-2005
2. Structural Engineer Taiba Consulting Center Cairo, Egypt 2003-2005
3. Structural Engineer Arab Consulting Engineers Cairo, Egypt 2003-2005

b. Major Consulting Activities (*past five years*) (*list organization and location*)

c. Professional Registrations (*field, location, date*)

8. Honors, Recognition, and Outstanding Achievements (*list year*)

n	Award Name	Citation	Date Awarded
1	National Center for Super Computing Applications Fellowship		2015-2016
2	National Science Foundation Faculty Early Career Award		2018
3	2019 Journal of Applied Mechanics Paper Award		2019
4	7th Arab American Frontiers of Science, Engineering, and Medicine - Invited Participant		2019
5	Donald Biggar Willet Faculty Fellow		2020

a. Teaching

n	Award Name	Citation	Date Awarded
1	Teachers ranked excellent by their students - CEE470		Fall 2018
2	Teachers ranked excellent by their students - CEE460		Fall 2019
3	Teachers ranked excellent by their students - CEE460		Fall 2021

b. Research

c. Public Service

d. Others

n	Award Name	Citation	Date Awarded
1	Outstanding Reviewer for Journal of Mechanics and Physics of Solids		Nov 2017
2	Outstanding Reviewer for International Journal of Solids and Structures		Feb 2018
3	Outstanding Reviewer for Medical Image Analysis		Mar 2018

9. Web pages

n	Full website URL	Text for link
1	http://cee.illinois.edu/faculty/ahmedelbanna	CEE at Illinois profile
2	https://publish.illinois.edu/mcslabuiuc/	Research Website

FACTUAL INFORMATION

A. Resident Instruction and Continuing Education (attach Teaching Activity reports, which covers 10 years)

1. Resident Instruction (verify the information on the appended page for sections in which you had primary responsibility; pencil in corrections)

1. CE470 - Spring 2013, Fall 2017, Fall 2018
2. CEE 460- Design of Steel Structures I - Fall (2013, 2014,2015,2016,2019,2020,2021)
3. CEE 572- Earthquake Engineering - Spring (2014, 2015,2016,2017,2018,2019,2020,2021,2022)
4. CEE 575- Fracture and Fatigue - Spring (2022)

2. Continuing Education (credit courses only) (year, course, # of students, delivery method)

3. Other Instructional Activities (prelim and final exams, course development, short courses, etc.)

a. Prelim and Final Exams

n	Doctoral Candidate	Prelim Exam Date	Final Exam Date	(Co-)Chair	(Co-)Director
1	Daniel Spring	04/26/2013	05/22/2015	Glaucio Paulino	
2	Arun Gain		08/26/2013	Glaucio Paulino	
3	Sofie Leon	11/20/2013	12/10/2014	Glaucio Paulino	
4	Piyush Gupta	12/05/2013	04/07/2016	Armando Duarte	
5	Harishanker Gajendran	05/16/2014	06/23/2016	Arif Masud	
6	Jie Luo	01/29/2015	08/09/2016	James LaFave	
7	Joseph Harmon	08/18/2015	11/08/2016	Youssef Hashash	
8	Michael Musgrove	01/21/2016		Youssef Hashash	
9	Ozgun Alp Nomanuglo	01/28/2016	07/11/2019	Youssef Hashash	
10	Maryiam Eidini		09/29/2015	Iwona Jasiuk	
11	Vanish Nishwala		11/18/2016	Martin Ostojca-Starzweski	
12	Sohan Kale		12/01/2016	Martin Ostojca-Starzweski	
13	Qianli Chen	02/12/2018	07/19/2019	Ahmed Elbanna	
14	Ashraf Idrkaidek	04/11/2018	11/16/2018	Iwona Jasiuk	
15	Donghyuk Jung	04/03/2018	10/01/2018	Bassem Andrawes	
16	Ankit Verma	05/02/2018		Ahmed Elbanna	
17	Xiao Ma	10/19/2018	08/21/2019	Ahmed Elbanna	
18	Ilhan Okan	12/05/2018	09/2020	Youssef Hashash	
19	Ahmed Ghareeb	04/25/2019		Ahmed Elbanna	
20	Darin Peetz	04/30/2019		Ahmed Elbanna	
21	Hyungwi Song	08/20/2019		Mariana Kersh	
22	Bingyang Zhang	10/2019		Shelby Hutchens	
23	Shabnam Zahra Bonyadi	10/2019	10/2020	Alison Dunn	

b. Course Development

1. CEE 572: Earthquake Engineering (a) Incorporation of materials on Source Mechanics and Wave Propagation Dynamics (25% of the course). (b) Incorporation of team projects (50% of the grade) and methods for guidance throughout the semester. Each group selects a topic and the TAs and I follow on their progress on weekly basis. The projects cover topics beyond the scope of the lectures and encourage students to explore frontiers in engineering and computation.
2. CEE 470: Structural Analysis (a) Incorporation of two lectures on Programming with Python. (b) Incorporation of a class-wide project on coding the finite difference method for solving indeterminate structures. (c) Incorporation of a class-wide project on modifying a Matlab code for solving planar and space trusses as well as planar and space frame elements. Applying the code to analyze a realistic factory structure.
3. CEE 460 (Fall 2020): Implement an open book exam policy. No proctoring required. Then I carry out individual grading session (~15 min) with each student to go over their solution, discuss possible sources of confusion, and ask questions to make sure their solution reflects their own understanding. I also give them second chances to correct their mistakes in some cases. I have found this procedure to be more engaging, less stressful, and more effective communication wise

c. Short Courses

1. Earthquake Engineering (16 hours) Offered during Summer 2016 to visiting senior students from South China University of Science and Technology.

4. Undergraduate Advising

a. Academic Advising (*student name, term, and activity description*)

1. 13

b. Student Organizations (*list past five years*)

c. Design Teams (*past five years*)

d. Other (*individual projects, engineering open house, etc. past five years*)

B. Research, Creative, and Other Scholarly Activities

1. Publications

List publications in print or accepted, with authors' names ordered the way they appear on the publications. Provide inclusive page numbers for papers in proceedings and journals. Follow the outline given below for the organization of the list of publications. Within each category place items in chronological order.

(*) has undergone stringent editorial review by peers

(**) invited and carries with it prestige and recognition

(S) based on work as a student

(W) co-authored with students you supervise

(!) represents most important contribution of the past decade

(P) derived from PhD thesis

(D) co-authored with post-docs

a. Books Authored or Co-Authored

1. Original Editions

2. Revisions

b. Books Edited or Co-Edited

1. Original Editions

2. Revisions

c. Chapters in Books

d. Monographs (*longer than an article, but shorter than a book*)

e. Articles

1. Articles In Journals

1. (*) (S) E. B. Mashaly, Safar S., & Elbanna, A. (2005). Finite element analysis of tapered haunched connections. *Journal of Engineering and Applied Science* 52(5), 921-940
2. (*) (S) E. B. Mashaly, Safar S., & Elbanna, A. (2005). Parametric analysis and design of tapered haunched connections. *Journal of Engineering and Applied Science* 52(6), 1103-1122
3. (*) (P) Elbanna A, and Heaton TH, (2012), A New Paradigm for Simulating Pulse-Like Ruptures: The Pulse Energy Equation, *Geophysics Journal International*, Volume 189, Issue 3, pages 1797–1806
4. (*) Elbanna AE, and Carlson JM (2013), Dynamics of Polymer Molecules with Sacrificial Bond and Hidden Length Systems: Towards a Physically-Based Mesoscopic Constitutive Law, *PLoS ONE* 8(4): e56118. doi:10.1371/journal.pone.0056118 [10 pages] *PLoS ONE* 8(4): e56118. doi:10.1371/journal.pone.0056118
5. (*) Lieou CKC, Elbanna AE, and Carlson JM (2013), Sacrificial bonds and hidden length in biomaterials – a kinetic, constitutive description of strength and toughness in bone, *Phys. Rev. E* 88, 012703 [10 pages].
6. (*) (W) Wang, W., & Elbanna, A. (2014), Crack propagation in bone on the scale of mineralized collagen fibrils: role of polymers with sacrificial bonds and hidden length, *Bone*, 68, 20-31 [11 pages]
7. (*) Elbanna AE, and Carlson JM (2014), A two-scale model for sheared fault gouge: Competition between macroscopic disorder and local viscoplasticity, *Journal of Geophysical Research: Solid Earth*, 119(6), 4841-4859 [18 pages]
8. (*) Lieou CKC, Elbanna AE, Langer JS, and Carlson JM (2014), Shear flow of angular grains: acoustic effects and non-monotonic rate dependence of volume, *Phys. Rev. E* 90, 032204 [12 pages]
9. (*) Lieou CKC, Elbanna AE, and Carlson J. (2014), Grain fragmentation in sheared granular flow: weakening effects, energy dissipation, and strain localization, *Phys. Rev. E* 89, 022203 [14 pages]
10. (*) (W) Chen, Q., & Elbanna, A. (2015), Tension-induced tunable corrugation in two-phase soft composites: Mechanisms and implications, *Extreme Mechanics Letters*, 4, 26-37.
11. (*) Lieou, C. K., Elbanna, A. E., Langer, J. S., & Carlson, J. M. (2015), Stick-slip instabilities in sheared granular flow: The role of friction and acoustic vibrations, *Phys. Rev. E*, 92(2), 022209 [10 pages]
12. (*) (W) Ma X., & Elbanna, A. (2015), Effect of off-fault low-velocity elastic inclusions on supershear rupture dynamics, *Geophys. J. Int.* 203 (1): 664-677. doi: 10.1093/gji/ggv302
13. (*) (W) Yang, Z., Chen, Q., Elbanna, A. E., & Kim, S. (2016), Transfer printing enabled soft composite films for tunable surface topography, *Extreme Mechanics Letters*, 7, 145-153
14. (*) Lieou, C. K., Elbanna, A. E., and Carlson, J. M. (2016), Dynamic friction in sheared fault gouge: implications of acoustic vibration on triggering and slow slip, *Journal of Geophysical Research*, Volume 121, Issue 3, 1483-1496
15. (*) (W) Chen, Q., & Elbanna, A. (2016), Modulating elastic band gap structure in layered soft composites using sacrificial interfaces, *Journal of Applied Mechanics*, 83(11), 111009[8 pages].
16. (*) (W) Kothari, K., and Elbanna, A. (2017), Localization and instability in sheared granular materials: Role of friction and vibration, *Phys. Rev. E*. [Accepted 11 January 2017]
17. (*) (W) (!) Hajarolasvadi S. & Elbanna A. E. (2017), A new hybrid numerical scheme for simulating fault ruptures with near-fault bulk heterogeneities. *Geophysics Journal International*, 211, 873–886.
18. (*) (W) Chen Q., & Elbanna A. E., (2017) Emergent wave phenomena in coupled elastic bars: from extreme damping to realization of elastodynamic switchers. *Nature Scientific Reports* 7
19. (*) Lopez-Berganza, J. A., Song, R., Elbanna, A., & Espinosa-Marzal, R. M. (2017). Calcium carbonate with nanogranular microstructure yields enhanced toughness. *Nanoscale*, 9(43), 16689-16699.
20. (*) (W) Kothari K., Hu, Y., Gupta, S., and Elbanna A. E. (2017), Mechanical response of 2D polymer networks: role of topology, rate dependence, and damage accumulation. *Journal of Applied Mechanics. J. Appl. Mech* 85(3), 031008 (Jan 24, 2018) (11 pages) doi: 10.1115/1.4038883
21. (*) (W) Hyunh, P., Zhu, H., Chen, Q., & Elbanna, A. (2018). Data-Driven Estimation of Frequency Response from Ambient Synchronophasor Measurements. *IEEE Transactions on Power Systems*, doi: 10.1109/TPWRS.2018.2832838
22. (*) (W) Ma, X., and Elbanna, A. E. (2018), Strain Localization in Dry Sheared Fault Gouge: A Compactivity based approach. *Phys Rev E* 98,022906
23. (*) (**) (W) (!) Ghareeb A., & Elbanna A. E. (2018), On the role of the plaque porous structure on Mussel adhesion: Implications for adhesion control using bulk patterning. *Journal of Applied Mechanics* 85(12):121003-121003-11. doi: 10.1115/1.4041223
24. (*) (W) Ma X., Hajarolasvadi S., Albertini G., Kammer D., & Elbanna A. E. (2018). A Hybrid Finite Element-Spectral Boundary Integral Approach: Applications to Dynamic Rupture Simulations in Unbounded Domains. *Journal of Analytical and Numerical Methods in Geomechanics*, Volume 43, Issue 1, Pages 317-338 <https://doi.org/10.1002/nag.2865>
25. (*) (W) Ghareeb, A., & Elbanna, A. (2019). Extreme enhancement of interfacial adhesion by bulk patterning of sacrificial cuts. *Extreme Mechanics Letters*, 28, 22-30.
26. (*) (W) Mondal, A., Nguyen, C. Ma, X, Elbanna, A. & Carlson, J. (2019). Network models for characterization of trabecular bone. *Physical Review E*, 99(4), 042406.
27. (*) (W) Ghareeb, A., & Elbanna, A. (2019). Adhesion Asymmetry in Peeling of Thin Films with Homogeneous Material Properties: A Geometry-Inspired Design Paradigm. *Journal of Applied Mechanics*, 86(7), 071005.
28. (*) (W) (!) Chen, Q., & Elbanna, A. (2019). On the duality of complex geometry and material heterogeneities in linear elastodynamics. *International Journal of Solids and Structures*. *International Journal of Solids and Structures*, 168, 203-210.
29. (*) (W) Hajarolasvadi, S., & Elbanna, A. (2019). Dynamics of metamaterial beams consisting of periodically-coupled parallel flexural elements: A theoretical study. *Journal of Physics D: Applied Physics*, 52(31), 315101.

30. (*) (W) (!) Ma X., and Elbanna A. E. (2019), Dynamic Rupture Propagation on Fault Planes with Explicit Representation of Short Branches. *Earth and Planetary Science Letters*, 523, 115702.
31. (*) (W) Abdelmeguid, M., Ma, X., & Elbanna, A. E. (2019). A Novel Hybrid Finite Element-Spectral Boundary Integral Scheme for Modeling Earthquake Cycles: Application to Rate and State Faults with Low-Velocity Zones. *Journal of Geophysical Research*. Volume 124, Issue 12, December 2019. Pages 12854-12881
32. (*) (W) Ghareeb, A., & Elbanna, A. (2020). An Adaptive Quasi-Continuum Approach for Modeling Fracture in Networked Materials: Application to Modeling of Polymer Networks. *Journal of Mechanics and Physics of Solids*. Volume 137, April 2020, 103819
33. (*) (W) Nguyen C., Peetz D., Elbanna, A., and Jean M. Carlson (2019). Characterization of fracture in topology-optimized bioinspired networks. *Physical Review E* 100, 042402 Published 2 October 2019
34. (*) (W) Erickson, B. A., J. Jiang, M. Barall, N. Lapusta, E. M. Dunham, R. Harris, L. S. Abrahams, K. L. Allison, J.-P. Ampuero, S. Barbot, C. Cattania, A. Elbanna, Y. Fialko, B. Idini, J. E. Kozdon, V. Lambert, Y. Liu, Y. Luo, X. Ma, M. B. McKay, P. Segall, P. Shi, M. van den Ende, M. Wei, The community code verification exercise for simulating sequences of earthquakes and aseismic slip (SEAS), *Seismological Research Letters* (2020) 91 (2A): 874–890.
35. (*) (W) Peetz, D., & Elbanna, A. (2020). On the use of multigrid preconditioners for topology optimization. *Structural and Multidisciplinary Optimization*, 1-19.
36. (*) (W) Hajarolasvadi, S., Elbanna, A. (2021). Dispersion properties and dynamics of ladder-like meta-chains. *Extreme Mechanics Letters*. Volume 43, February 2021, 101133
37. (*) Wong, G. N., Weiner, Z. J., Tkachenko, A. V., Elbanna, A., Maslov, S., & Goldenfeld, N. (2020). Modeling COVID-19 dynamics in Illinois under nonpharmaceutical interventions. *Physical Review X*, 10(4), 041033.
38. (*) Tkachenko, A. V., Maslov, S., Elbanna, A., Wong, G. N., Weiner, Z. J., & Goldenfeld, N. (2021). Time-dependent heterogeneity leads to transient suppression of the COVID-19 epidemic, not herd immunity, *PNAS* April 27, 2021 118 (17) e2015972118; <https://doi.org/10.1073/pnas.2015972118>
39. (*) (W) Elbanna, A., Abdelmeguid, M., Ma, X., Amlani, F., Bhat, H. S., Synolakis, C., & Rosakis, A. J. (2021). Anatomy of strike-slip fault tsunami genesis. *Proceedings of the National Academy of Sciences*, 118(19).
40. (*) (W) Ghareeb, A., & Elbanna, A. (2021). Modeling fracture in rate-dependent polymer networks: A quasicontinuum approach. *Journal of Applied Mechanics*, 88(11).
41. Tkachenko, A. V., Maslov, S., Wang, T., Elbanna, A., Wong, G. N., & Goldenfeld, N. (2021). Stochastic social behavior coupled to COVID-19 dynamics leads to waves, plateaus, and an endemic state. *Elife*, 10, e68341.
42. Albertini, G., Elbanna, A. E., & Kammer, D. S. (2021). A three dimensional hybrid finite element spectral boundary integral method for modeling earthquakes in complex unbounded domains. *International Journal for Numerical Methods in Engineering*, 122(23), 6905-6923.
43. (*) (W) Ranao, D. R. E., Holland, R. L., Alnaji, F. G., Green, K. J., Wang, L., Fredrickson, R. L., ... & Burke, M. D. (2022). Mitigation of SARS-CoV-2 transmission at a large public university. *Nature communications*, 13(1), 1-16.
44. (*) (W) Mia, M. S., Abdelmeguid, M., & Elbanna, A. E. (2022). Spatio Temporal Clustering of Seismicity Enabled by Off Fault Plasticity. *Geophysical Research Letters*, 49(8), e2021GL097601.
45. (*) Faisal Amlani, Harsha S Bhat, Wim JF Simons, Alexandre Schubnel, Christophe Vigny, Ares J Rosakis, Joni Efendi, Ahmed Elbanna, Hasanuddin Z Abidin (2022), Supershear shock front contribution to the tsunami from the 2018 M w 7.5 Palu, Indonesia earthquake. *Geophysical Journal International*, 230(3), 2089-2097.
46. (*) (W) Abdelmeguid, M., & Elbanna, A. (2022). Sequences of seismic and aseismic slip on bimaterial faults show dominant rupture asymmetry and potential for elevated seismic hazard. *Earth and Planetary Science Letters*, 593, 117648.

2. Articles In Conference Proceedings

1. "Towards physics based seismic PRA." Ahmed Elbanna, Zahra Mohaghegh, Erbie Kee, Seyed Reihani, Reza Kazemi and Shawn Rodgers. Proceedings of 2013 ANS National Meeting, November 2013

3. Abstracts (in print or accepted)

1. (P) "Dynamics of self-healing slip pulses on frictional interfaces: Steady propagation, stability properties and interaction with stress heterogeneities" Elbanna, A. E., Lapusta, N., and Heaton, T. H. Proceedings of the 16 th National Congress on Theoretical and Applied Mechanics, Penn State, June 2010
2. (P) "Size dependence of strength and a model reduction technique for frictional systems failing at multiple length scales." Elbanna A., Heaton T. H. Proceedings of the 16th National Congress on Theoretical and Applied Mechanics, Penn. State, June 2010
3. (P) "Dynamics of Self-Healing Slip Pulses on Velocity-Weakening Interfaces: Formation, steady propagation and interaction with stress heterogeneity" Elbanna A. E., Lapusta N., and Heaton, T. H. AGU Fall Meeting, 2009
4. (P) "Size dependence of stress in materials with self-organized critical prestress" Heaton, T.H., A. E. Elbanna, and J. Marsden. AGU Fall Meeting, 2008

4. Book Reviews (in print or accepted)

5. Refereed Conference Papers and Presentations

f. Pending Publications

1. (*) (W) Abdelmeguid, M., & Elbanna, A. (2022). The Impact of Fault Zone Plasticity on Sequences of Earthquakes and Aseismic Slip: The Role of Stress Orientation and Bulk Cohesion. (Under Review in *Journal of Geophysical Research*)

g.i Invited Lectures and Invited Conference Presentations Since Last Promotion. For candidates for promotion to Professor, a full (career) list of events may be provided (in other section) or, in the interest of brevity, a list of only those events since the last promotion may be provided.

g.ii Other Invited Lectures and Invited Conference Presentations

n	Title	Conference	Location	Year
1	A physically-based constitutive law for granular materials in shear for multiscale dynamic fracture simulations	United States National Congress on Computational Mechanics	Raleigh, NC	2013
2	On the physical origin of some constitutive laws in biology and geophysics	Mechanical Science and Engineering seminar series	UIUC - Urbana	2013
3	A multiscale model for fault zone evolution: From grain fragmentation to secondary faults branching	Geology Department seminar series	UIUC- Urbana	2014
4	A multiscale model for shear flow in granular medium with breakable particles	Harvard Applied Mechanics Seminar	Harvard-Cambridge MA	2014
5	Non equilibrium thermodynamics of fault gouge: Effect of grain contact processes	Construction Materials Group Seminar	UIUC-Urbana	2015
6	Bone: Some mechanics and Inspiration	Bio-Interest Group - Mechanical Science and Engineering	UIUC-Urbana	2015
7	On the Self-healing rupture mode and some investigations on fault zone inelasticity	Mechanics, Materials and Computation group - Civil Engineering	Carnegie Melon University	2016 (Jan)
8	The different signatures of pulse like ruptures propagating on strong velocity weakening frictional interfaces	Geology Department seminar	University of Missouri (Columbia)	2016 (Feb)
9	On some bone-Inspired material design ideas: The sacrificial bond mechanism for enhancing toughness and heterogeneity patterning for novel functionality .	Mechanics of Materials group seminar	Drexel University	2016 (Feb)
10	On some problems in amorphous plasticity of granular media	Materials Interest Group - Mechanical Science and Engineering	UIUC-Urbana	2016 (March)
11	Bone: Some Mechanics and Inspiration	Mechanical Engineering Department	University of California Santa Barbara	2016(April)
12	To order or To disorder: Examples from bio-inspired architected composites	Hopkins Extreme Mechanics Institute	Johns Hopkins University	2016(April)
13	Crack Propagation in Bone: the Role of Sacrificial Bonds	SIAM Conference on Mathematical Aspects of Materials Science	Pennsylvania	2016(May)
14	Compaction, Dilation, and Strain localization in a model of sheared granular materials with an eye for elastodynamics	Warren Lecture Series, Department of Civil, Environmental, and Geo-Engineering	University of Minnesota	2016 (Sep)
15	Bone: Some Mechanics and Inspiration	MMAE Seminar Series	Illinois Institute of Technology, Chicago	2016 (Nov)
16	Shear and Vibrations in confined gouge - Implications of acoustic vibrations on localization, triggering and slow slip	Workshop on slow slip in crustal faults	Kyushu University, Japan	2017 (Feb)
17	Towards Dynamic Rupture Simulations with high resolution fault zone physics	Earth Science Seminar	Kyoto University, Japan	2017 (Feb)
18	Extreme Mechanics on the Surface of Our Planet	Smith Lecture	University of Michigan	2017 (Oct)
19	Modeling Dynamic Ruptures with High Resolution Fault Zone Physics	Geophysics Department Seminar	Stanford University	2018 (Nov)
20	Breaking Badly: Chasing Fractures from Tectonic to Tabletop Scales	Civil Engineering Department	Northwestern University	2019 (Jan)
21	Breaking Badly: Chasing Fractures from Tectonic to Tabletop Scales	Mechanical and Civil Engineering	Caltech	2019 (Jan)
22	Modeling Dynamic Rupture with High Resolution Fault Zone Physics	Earth Science Department	University of Southern California	2019 (Feb)
23	Peeling, Pulling, and Cracking: Probing the Toughness Landscape in Polymeric Materials	Mechanics Seminar	University of Wisconsin Madison	2019 (Feb)
24	A quasi-continuum approach for modeling fracture in networked materials	Disordered Networks: From Mechanical Properties to Failure (Invited)	American Physics Society March Meeting	2019 (March)
25	Topology, Geometry, and Fracture in Networked Materials: A tale of Scales	Penn Institute for Computational Sciences	University of Pennsylvania	2019 (April)

n	Title	Conference	Location	Year
26	Modeling Sequence of Seismic and Aseismic Slip in Complex Fault Zones.	Workshop on Mechanics and Geophysics	University of California San Diego	2019 (June)
27	A quasi-continuum approach for modeling fracture in networked materials: Application to Polymers	United States National Congress on Computational Mechanics	Austin, Texas	2019 (July)
28	An Asynchronous Spacetime Discontinuous Galerkin Approach for Modeling Earthquake Ruptures with High Resolution Fault Zone Physics	United States National Congress on Computational Mechanics	Austin, Texas	2019 (July)
29	Modeling Earthquakes with High Resolution Fault Zone Physics: From Single Ruptures to Sequences	Los Alamos National Laboratory Theoretical Division Seminar	Los Alamos, New Mexico	2019 (August)
30	A quasi-continuum approach for modeling fracture in networked materials : Applications to Rubber-like materials	Los Alamos National Laboratory Theoretical Division Seminar	Los Alamos, New Mexico	2019 (August)
31	Modeling Complex Fault Zones with High Resolution Physics: From Single Ruptures to Earthquake Cycles	International Workshop on Slow Earthquakes	Sendai, Japan	2019 (Sept)
32	Modeling Earthquake Ruptures with High Resolution Fault Zone Physics	Civil Engineering Department	University of Illinois, Chicago	2019 (Nov)
33	Beware of the Broken Faults	Seismological Laboratory	Caltech	2020 (Jan)
34	Topology, Geometry, and Fracture in Networked Materials: A Tale of Scales	Pierce Lab Seminar Series	MIT	2020 (Sep)
35	Modeling Sequence of Earthquakes and Aseismic Slip with High Resolution Fault Zone Physics	American Geophysics Union	Online	2020 (Dec)
36	Faults, Fluids, and Waves	Indian Institute of Technology-Hyderabad	Online	2021 (Feb)
37	Analysis and Design of tough soft materials	Indian Institute of Science	Online	2021 (Feb)
38	Modeling Covid-19 spread and mitigation in a university environment and beyond	George Mason University: Mason Online Pandemic MODELing Forum (MOP-MOD Forum)	Online	2021(April)
39	Elbanna, A. E., Abdelmeguid, M., Mia, M., & Ma, X. (2021, 08). Towards modeling sequence of earthquakes and aseismic slip (SEAS) with high resolution fault zone physics. Oral Presentation at 2021 SCEC Annual Meeting.	Southern California Earthquake Center Annual Meeting	Online	2021 (Sep)
40	Advanced Earthquake Cycle Simulations: Bimaterial Interfaces, LVFZ, and nonlinear bulk rheology	American Geophysics Union	Online	2021 (Dec)
41	Modeling the Spread and Mitigation of COVID-19 Epidemic in a Large Public University	COVID-19 Focus Workshop; 60th IEEE conference on decision and control	Online	2021(Dec)
42	Update on Omicron: Transmissibility, Severity, and Implications for Mitigation	Presentation to Presidents and Chancellors of Public Universities in Illinois	Online	2021(Dec)
43	Building the Earthquake Virtual Machine	Earthquake Science and Engineering in the next 50 years (A symposium in Honor of Professor Tom Heaton)	Caltech, Pasadena	2022 (March)
44	Modeling Sequences of Earthquakes and Aseismic Slip with High Resolution Fault Zone Physics	Warren Lecture University of Minnesota	Online	2022 (March)
45	Topology, Geometry, and Fracture of Networked Materials: A tale of Scales	2022 Boulder Workshop On Soft and Active Matter Mechanics	Online	2022 (April)
46	Topology, Geometry, and Fracture of Networked Materials: A tale of Scales	Indian Institute of Science 75TH Anniversary	Online	2022 (June)

h. Other Publications (*patents, bulletins or reports, magazine articles, etc.*)

1. Patents

2. Bulletins

3. Magazine Articles

4. Reports

- Weiner, Z., Wong, G., Elbanna, A., Tkachenko, A., Maslov, S., & Goldenfeld, N. (2020). Projections and early-warning signals of a second wave of the COVID-19 epidemic in Illinois. medRxiv.
- (W) Elbanna, Ahmed, George N. Wong, Zach J. Weiner, Tong Wang, Hantao Zhang, Zhiru Liu, Alexei V. Tkachenko, Sergei Maslov, and Nigel Goldenfeld. "Entry screening and multi-layer mitigation of COVID-19 cases for a safe university reopening." medRxiv (2020).
- Elbanna, Ahmed. "Estimation of the Ascertainment Bias in Covid Case Detection During the Omicron Wave." medRxiv (2022).

2. Grants, contracts and gifts (in chronological order up to past ten years)

a.i. Research Grants Received Since Last Promotion at Illinois.

a.ii. Other Research Grants Received at Illinois

n	#PI's and lead PI if not this prof	Source of Funds	Years (Inclusive)	Total Funding	Funds Allocated to this prof	Brief Title or Description
1	(3)Rosa Espinosa	CEE Innovation grant	2014	25,000	12,500	Investigation of the effect of Calcites on the mechanical properties of biofilms coating the walls of pipes carrying drinking water in the context of pathogen attachment and detachment. (Completed, Co-PI)
2	(2) Rosa Espinosa	NSF- CMMI	2014-2017	399,493	199,747	Biomimetic Composites With Amorphous Calcium Carbonate: Linking Microstructure to Mechanical Response (Completed, Co-PI)
3	(1)	NSF-EAR	2014-2017	78,000 (for UIUC portion)	78,000	Collaborative Research: Statistical Physics of Fault Behavior - Dynamic Friction, Strain Localization, Commintion, Heat Transfer, and Compaction (Completed)
4	(1)	SCEC	2015-2016	18,000	18,000	A New Paradigm for Modeling Fault Zone Inelasticity: A coupled granular-bulk framework incorporating spontaneous localization and grain fragmentation (Completed)
5	(1)	SCEC	2016-2017	20,000	18,000	A Continuum Model for Fault Zone Viscoplasticity: Compaction, Dilation, and Pore Fluids. (Completed)
6	(1)	Campus Research Board - UIUC	2017-2018	21,000	21,000	Layered Soft Composites: Linking topology, geometry and mechanics to open new pathways in manufacturability and tunable dynamic response. (Completed)
7	(4)John Popovics	Center of Geologic Storage of CO2-DOE	2016-2018	800,000	200,000	Induced Seismicity in formations with sequestered CO2. (Completed)
8	(2)Hao Zhu	Seibel Institute of Energy	2016-2017	50,000	25,000	A Data Driven Network Tomography Approach for Evaluating and Improving the Resilience of Power Grid (Completed). [This project hinges on a novel application of ambient noise correlation technique for extraction of Green's function in seismology to the characterization of similar linearized response in Electric power grids]
9	(4)Robert Haber	NSF-SPX	2017-2020	724,605	181,151	SPX: Collaborative Research: Asynchronous, Parallel-Adaptive Solution of Extreme Multiscale Problems in Seismology. (Current)
10	(1)	SCEC	2017-2018	24,000	24,000	A Novel Hybrid Numerical Scheme for Earthquake Cycle Simulation. (Completed)
11	(1)	SCEC	2017-2018	20,000	20,000	Thermal Pressurization in Dilatant Granular Materials: Investigations on Strength Evolution and Strain Localization. (Completed)
12	(1)	NSF-EAR	2017-2022	478,000	478,000	CAREER: Multiscale Mechanics of Fluid-Infiltrated Fault zones: An Integrated Research and Education Plan.(Current)
13	(1)	SCEC	2018-2019	23,842	23,842	Towards Dynamic Rupture Simulations with High Resolution Fault Zone Inelasticity (Completed)
14	(4) Scott Frailey (ISGS)	DOE-NETL	2018-2021	2,000,000	500,000	IDENTIFICATION OF FAULTS SUSCEPTIBLE TO INDUCED SEISMICITY: INTEGRATION OF FORWARD AND JOINT INVERSION MODELING, MACHINE LEARNING, AND FIELD-CALIBRATED GEOLOGIC MODELS (Current)
15		DOE-NETL	2019-2021	400,000	278,000	

n	#PI's and lead PI if not this prof	Source of Funds	Years (Inclusive)	Total Funding	Funds Allocated to this prof	Brief Title or Description
	(2) Sherilyn Williams Stroud (ISGS)					SMART Initiative for Science enabled Machine Learning application to induced seismicity in energy related applications (Current).
16	(N) Steve Whittaker (ISGS)	DOE-NETL	2020-2022	N/A	224,000	CarbonSafe-Phase III (Current)
17	(1)	SCEC	2020-2021	25,000	25,000	Modeling sequence of earthquakes and aseismic slip with off-fault damage. (Current)
18	(3) Larry Fahnestock	IDOT	2020-2023	500,000	230,000	Strength and Serviceability of Damaged Steel Girders (Current)
19	(2) Camilla Cattania	SCEC	2021-2022	48,000	12,758	Collaborative Project: Investigating properties of small and large earthquakes on geometrically heterogeneous faults (Current)
20	(3)	SCEC	2021-2022	50,000	24,672	Collaborative Proposal: A Comparative Investigation of Off-Fault Inelastic Processes: From Plasticity to Multiscale Damage (Current)
21	(1)	DOE-NETL	2021-2024	330,000	330,000	Role of fluids and temperature in fracture mechanics and coupled thermo-hydro-mechanical processes for enhanced geothermal systems (Current)

b.i. Instructional Grants Received Since Last Promotion at Illinois

b.ii. Other Instructional Grants Received at Illinois

3. Areas of Research (*brief description, key words are adequate*)

1. Mechanics and physics of earthquakes and granular matter
2. Mechanics and physics of networked and biological materials
3. Mechanical metamaterials.
4. Friction and fracture
5. Modeling Epidemics
6. Geomechanics
7. Engineering Seismology
8. Geohazards (Earthquakes, Landslides, Tsunamis)
9. Mechanics of Soft Materials
10. Mechanics of Biological Tissues
11. --Bone Mechanics
12. --Soft Tissue Mechanics
13. Inverse analysis and characterization of mechanical properties of imaged tissues
14. Nature-inspired Material and Structural Design
15. Topology and Shape Optimization
16. Friction, adhesion, and fracture mechanics
17. Mechanical Metamaterials
18. Deep learning in Mechanics and Structural Engineering
19. New frontiers in Structural Engineering:
20. --Algorithms for generative design
21. --Data-driven analysis
22. --Hybrid neural network- physics based modeling

4. Graduate Thesis Research Advising (*list co-advisor, if any*)

a. M.S. Thesis Students (*name and year granted or anticipated*)

n	Student Name	Year Graduated	Thesis Title	Placement
1	Darin Peetz	2016	Multi-objective topology optimization for trabecular bone-like structure: role of stability and surface area	Continued as a PhD student in my group
2	Wenyi Wang	2014	Crack Propagation in Bone at the Scale of Mineralized Collagen Fibrils: Effect of Polymers with Sacrificial Bonds and Hidden Length	Engineer at Foster and Partners Engineering Company

n	Student Name	Year Graduated	Thesis Title	Placement
3	Xiao Ma	2015	Effect of off-fault low velocity inclusions on supershear rupture dynamics	Continued as a PhD student in my group
4	Qianli Chen	2015	Tension-induced tunable corrugation in two-phase soft composites and its properties as a band gap structure	Continued as a PhD student in my group
5	Setare Hajarolasvado	2016	A new hybrid numerical scheme for simulating fault ruptures with near fault bulk inhomogeneities	Continued as a PhD student in my group
6	Konik Kothari	2017	Localization and instability in sheared granular materials: role of friction and vibration	Continued as a PhD student in the ECE department at UIUC
7	Yuyang Rao	2017	Scaling laws for stress and energy for interface with strong rate-weakening friction	Graduated and went back to China
8	Mohamed Abdelmeguid	2017	Ruga mechanics of composite media with soft inclusions	Continued as a PhD student in my group
9	Louis Vaught	2017	A preliminary formalization of scale in topology optimization	Continued as a PhD student in Prof. Bill Spencer's group

b. Ph.D. Thesis Students (*name and year granted or anticipated*)

n	Student Name	Year Graduated, if not yet graduated add expected date and prelim date if taken	Thesis Title	Placement
1	Qianli Chen	2019	Linear and nonlinear waves in soft composites	Data Scientist at Amazon Headquarters (Seattle, Washington)
2	Ankit Verma	Expected (2022)	Hierarchical Meta Lattices	Passed his prelim exam on 05/02/2018 and continues towards defense
3	Xiao Ma	2019	Modeling Earthquake Ruptures With High Resolution Fault Zone Physics	Research Scientist in Exxon Mobil Research Center (Houston, Texas)
4	Ahmed Ghareeb	2021	Adhesion and Fracture of Soft Material: Multiscale modeling and design framework	Apple headquarters (San Francisco)
5	Darin Peetz	2021	Topology Optimization for controlling dynamic response of porous structures	Research Faculty in University of Wisconsin at Platteville- Research Computing Facility
6	Setare Hajarolasvadi	2021	Hierarchical Meta-structures for Seismic and other structural engineering applications	Facebook (Seattle)
7	Mohamed Abdelmeguid	Expected (2022)	Earthquake cycle simulation in complex fault zones	Passed his prelim exam (2021)
8	Md Shumon Mia	Expected (2024)	Multiscale modeling of earthquake ruptures and wave propagation in complex media	Passed his MechSE qualification exam (2021)
9	Chunhi Zhao	Expected (2025)	Multiscale modeling of coupled evolution of faults, earthquakes, and geohazards	Passed his qualification exam (2021)
10	Ahmed Ibrahim	Expected (2025)	Machine learning and computer vision for civil infrastructure	Passed his qualification exam (2022)

5. Editorships of Journals or Other Learned Publications (*list year*)

6. Post-doctoral Associates and Visiting Scientists (*>3 months stay in the past three years*) (*list name, year(s), country of origin, permanent employer*)

n	Name	Title (percent time)	Country of Origin	Permanent Employer	Years
1	David Hernandez	Visiting Post doc	Spain	No	(January-June 2014)
2	Xiyue Liu	Visiting PhD student	China	No	(February- August 2014)

7. Other Scholarly Activities in the past five years (*conferences organized or chaired, unpublished presentations, etc.*)

a. Conferences Organized or Chaired

1. Physics Based Seismic PRA. American Nuclear Society National Meeting. Washington D.C., November 10-14 [2013]
2. Friction, Fracture, and Adhesion: from microscale physics to macroscale response. USNCTAM. Michigan, June 15-20 [2014]
3. Co-Organizer, mini-symposium on Biomineralized tissues: Modeling, Experimental Characterization, and Design Optimization. Society of Engineering Sciences. Purdue University, Oct 1-3 [2014].
4. Organizer, mini-symposium on Friction, Fracture, and Damage: From Faulting to Gouge. Society of Engineering Sciences. Purdue University, Oct 1- 3 [2014].
5. Organizer, session on Influence of smaller-scale processes on larger-scale fault zone behavior and evolution: Towards development of physically sound models of the seismic cycle. American Geophysics Union, San Francisco, Dec 15-19 [2014].
6. Earthquake Processes and Multiscale Modeling and Characterization of Fragmentation and Damage Patterns in Fault Zones. Sesimological Society of America Meeting. Pasadena, April 21-23 [2015]
7. Friction, Fracture, and damage. USNCCM13. San Diego, CA, July 21-26 [2015]
8. First Midwestern Universities Workshop on Mechanics of Materials and Structures. UIUC, August 26th [2015]
9. Friction, Fracture, and Damage. Society of Engineering Sciences annual meeting. University of Maryland, College Park, October 2-5 [2016]
10. Second Midwest Universities Workshop on Mechanics of Materials and Structures. Northwestern University [2016]
11. Invited Session: Reinforced [By] Water. American Physical Society March Meeting. New Orleans. March 13-17 [2017].
12. Modeling and Simulation of Damage and Fracture in Brittle and Quasi-Brittle Materials. USNCCM14. Montreal, Canada. July 17-20 [2017]
13. Third Midwest Universities Workshop on Mechanics of Materials and Structures. Purdue University [2017]
14. Co-organizer, mini-symposium on Friction, Fracture, and Damage. USNCTAM18. Chicago, IL [2018] (Also Member of the Local Organizing Committee for the whole conference)
15. Fourth Midwest Universities Workshop on Mechanics of Materials and Structures. Illinois Institute of Technology [2018]
16. Member of the Scientific Committee for the Engineering Mechanics Institute Annual Meeting - Pasadena, CA [2019]

b. Unpublished Presentations

1. Fault zone evolution: From grain fragmentation to secondary fault branching. American Geophysics Union Fall meeting. San Francisco Dec. 2013
2. Sacrificial bonds and hidden length in biomaterials -- a kinetic, constitutive description of strength and toughness in bone. Society of Engineering Sciences 50th Annual Meeting. Providence. July 2013
3. Crack propagation in bone at the scale of mineralized collagen fibrils: Implications for bone toughness. Society of Engineering Sciences 50th Annual Meeting. Providence. July 2013
4. A model of sheared gouge layer with thermally varying material properties. Society of Engineering Sciences Meeting 50th Annual Meeting. Providence. July 2013
5. Potential within: topology optimization of the spine. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
6. Crack propagation in bone on the scale of mineralized collagen fibrils: role of polymers with sacrificial bonds and hidden length. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
7. Scaling laws for stress and energy for an interface with strong rate weakening friction. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
8. Earthquake nucleation and propagation on rate and state faults: single versus two state variables formulation and evolution by Kato Tullis law. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
9. Towards a unified framework for modeling fault zone evolution: From particles comminution to secondary faults branching. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
10. Sheared granular layers: Competition between flash heating and particle comminution. Society of Engineering Sciences 51st Annual Meeting. Purdue. October 2014
11. Linear and Nonlinear dynamic response of a liquid solid composite. Society of Engineering Sciences 53rd Annual Meeting. University of Maryland. October 2016
12. Brittle to ductile transition in a model of amorphous materials. Society of Engineering Sciences 53rd Annual Meeting. University of Maryland. October 2016
13. A new hybrid numerical scheme for accurate near field truncation of waves in elastodynamic simulations. Society of Engineering Sciences 53rd Annual Meeting. University of Maryland. October 2016
14. Modulating elastic band gap structure in layered soft composites using sacrificial interfaces. Society of Engineering Sciences 53rd Annual Meeting. University of Maryland. October 2016
15. Mechanics of polymer networks with sacrificial bonds and hidden length. Society of Engineering Sciences 53rd Annual Meeting. University of Maryland. October 2016
16. How We Learned to Stop Worrying and to Start Loving Dynamic Rupture Nonlinearities. Society of Engineering Sciences 54th Annual Meeting. Northeastern University. October 2017
17. Frictional Metamaterials. Society of Engineering Sciences 54th Annual Meeting. Northeastern University. October 2017
18. The Complex Optimum of Trabecular Bone Structure. United States National Congress of Computational Mechanics. San Diego. July 2015
19. Spacetime Simulation of Seismic Response. United States National Congress of Computational Mechanics. San Diego. July 2015

20. Non-Equilibrium Thermodynamics of Fault Gouge: Effect of Grain Contact Processes. United States National Congress of Computational Mechanics. San Diego. July 2015
21. A New Hybrid Numerical Scheme For Simulating Fault Ruptures With Near Fault Bulk Inhomogeneities. United States National Congress of Computational Mechanics. Montreal. July 2017
22. Towards a Unified Framework for Modeling Fault Zone Evolution: From Particles Comminution to Secondary Faults Branching. United States National Congress of Theoretical and Applied Mechanics. Michigan State University. June 2014
23. Ruga Mechanics of Composite Media with Soft Inclusions. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
24. On the Duality of Complex Geometry and Material Heterogeneity in Elastodynamics: From Topographic Reliefs to Mechanical Metamaterials. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
25. Emergent Wave Phenomena in Coupled Elastic Bars: from Extreme Attenuation to Realization of Elastodynamic Switches. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
26. Influence of Stability on Trabecular Bone Structure. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
27. Quasi-Continuum Analysis of Networked Materials. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
28. A New Hybrid Numerical Scheme for Modeling Elastodynamics In Unbounded Media with Near-Source Heterogeneities. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
29. Localization and Instability in Sheared Granular Materials: Role of Pore Fluids and Non-monotonic Rate Dependent Rheology. United States National Congress of Theoretical and Applied Mechanics. Northwestern University. July 2018
30. Modeling Of Spontaneous Multiscale Roughening And Branching of Ruptures Propagating On A Slip-Weakening Frictional Fault. American Geophysics Union Fall Meeting. San Francisco. 2013
31. Intersonic and Supersonic ruptures in a model of dynamic rupture in a layered medium. American Geophysics Union Fall Meeting. San Francisco. 2014
32. A Multiscale Model of Shear flow of Granular Materials with Breakable Particles: Role of Force Chain Instabilities and Implications for Strain Localization and Stability of Sliding. American Geophysics Union Fall Meeting. San Francisco. 2014
33. A New Paradigm For Modeling Fault Zone Inelasticity: A Multiscale Continuum Framework Incorporating Spontaneous Localization and Grain Fragmentation. American Geophysics Union Fall Meeting. San Francisco. 2015
34. Brittle to ductile transition in a model of sheared granular materials. American Geophysics Union Fall Meeting. San Francisco. 2016
35. A new hybrid numerical scheme for simulating fault ruptures with near fault bulk inhomogeneities. American Geophysics Union Fall Meeting. New Orleans. 2017
36. Localization and Instability in Sheared Granular Materials: Role of Pore Fluids and Non-monotonic Rate. American Geophysics Union Fall Meeting. New Orleans. 2017
37. The Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS): Initial Benchmarks and Future Directions. American Geophysics Union Fall Meeting. New Orleans. 2017
38. Modeling Dynamic Ruptures with High Resolution Fault Zone Physics. American Geophysics Union Fall Meeting. Washington DC. 2018
39. Dynamics of Self-Healing Slip Pulses on Strong Velocity-Weakening Frictional Interfaces: Formation, Steady Propagation, and Interaction with Stress Heterogeneity. American Geophysics Union Fall Meeting. Washington DC. 2018
40. A model for flash heating in sheared fault gouge. American Physics Society March Meeting. 2015
41. Topology optimization of trabecular bone in the human spine. American Physics Society March Meeting. 2015
42. Multiobjective topology optimization of trabecular Bone Structure in the spine and the femur: Implications for bio-mimicry. American Physics Society March Meeting. 2016
43. Tension-induced tunable corrugation in bio-inspired two-phase soft composite materials: mechanisms and implications. American Physics Society March Meeting. 2016
44. Quasi-Continuum Analysis of Networked Materials. American Physics Society March Meeting. 2018
45. A quasi-continuum approach for modeling fracture in disordered networked materials: Can small world architectures save the day? American Physics Society March Meeting. 2019
46. Quasi-continuum analysis of networked materials. Pan American Conference on Applied Mechanics. Ann Arbor, Michigan. 2019
47. Dynamics of One dimensional elastic bars on patio-temporally modulated elastic substrates. AmeriMech Meeting - USNCTAM special conference on non-reciprocal metamaterials. University of Missouri. Columbia. 2019
48. Modeling Dynamic Ruptures with High Resolution Fault Zone Physics. Engineering Mechanics Institute Meeting. Pasadena, CA. 2019
49. A New Hybrid Numerical Scheme for Modeling Earthquake Cycles. Engineering Mechanics Institute. Pasadena, CA, 2019
50. Dynamics of Metamaterial Structure Composed of Periodically Coupled Elastic Beams. Engineering Mechanics Institute. Pasadena, CA. 2019

c. Other Scholarly Activities

1. Reviewer for Journal of Applied Mechanics
2. Reviewer for Journal of Mechanics Research Communications
3. Reviewer for Geophysics Journal International
4. Reviewer for Journal of Geophysical Research
5. Reviewer for Journal of Lubricants
6. Reviewer for Geophysics Research Letters
7. Reviewer for Extreme Mechanics Letters

8. Reviewer for Journal of Pure and Applied Geophysics
9. Reviewer for Physics Rev E
10. Reviewer for Phys Rev Letters
11. Reviewer for Science Advances
12. Reviewer for Bulletin of Seismological Society of America
13. Reviewer for International Journal of Solids and Structures
14. Reviewer for Journal of Mechanics and Physics of Solids
15. Reviewer for Journal of Medical Image Analysis

C. Service

1. Professional Societies (*list membership; office held, with dates; major committees or boards*)

1. Member of American Geophysics Union (2007-present)
2. Member of Engineering Mechanics Institute -ASCE (2013-present)
3. Member of American Physics Society (2013-present)
4. Member of Society of Engineering Sciences (2013-present)
5. Member of United States Association of Computational Mechanics (2013-present)

2. University (*department, college and campus committees, administration, etc. for past five years*)

a. Department

1. Member of Graduate Admissions Committee (2014-2015)
2. Chair of Qualification Exam Committee (2015- now)
3. Member of Newmark Lecture Committee (2014-now)

b. College

1. Co-chair of the Named Faculty Appointments (NFA) (August 2021-now)

c. Campus

1. Computational Science and Engineering Program - Steering Committee Member (2017-now)
2. Member of the Faculty Senate (2020-now)
3. Co-leader of COVID-19 UIUC modeling group (March 2020-August 2021), Contributed to modeling and daily discussions of the COVID-19 epidemic in Illinois and provided advice for the governor on mitigation step. Co-lead of the modeling effort (with Prof. Nigel Goldenfeld) for COVID-19 spread in UIUC. Member of Shield Target working group in charge of real time data analysis for rapid response and mitigation of the pandemic on campus.
4. Leader of COVID-19 UIUC modeling group (August 2021-now). Leading modeling and data analysis for campus since August 2021. Provide input on current status of Covid and related science developments to the SHIELD Science team and the university leadership.
5. Member of Shield Science Advisory Team (August 2021- now)

3. Federal and State (*government commissions or panels, community, industrial extension, etc.*)

1. Illinois Center for Transportation Representative on the Structures, Hydraulics, and Geotechnical Technical Advisory Group [10/2014-07/2016]
2. Reviewer for NSF-Mechanics of Materials and Structures Program [Panelist - January, 2015]
3. Ad-hoc Reviewer for NSF- Geophysics Program [2015 - now]
4. Reviewer for NSF- Design of engineering material systems (DEMS) [Panelist-January, 2018]
5. Reviewer for NSF- Division of Earth Science [Panelist-February, 2018]
6. Member of SHIELD CU Steering Committee (August 2021- now)

4. Other Outside Service

1. Member of the code validation exercise group - Southern California Earthquake Center [2015-now]
2. Organizing Committee of Midwest Mechanics of Materials and Structures Annual Workshop [Co-chair, 2015; Steering committee member, 2016-now]. After its successful launching in 2015 at UIUC, the workshop rotates to other regional institutions. The following institutes took it over: Northwestern [2016], Purdue [2017] and Illinois Institute of Technology [2018]. UIUC is expected to host it again in 2019. In the previous workshops, I have been involved in planning, providing input on selected speakers, circulating announcements of the workshop, encouraging students to participate, and refereeing student presentations and posters.
3. Organizer for a recurrent session on: Friction, Fracture, and Damage in Society of Engineering Sciences annual meetings [2014-2018]; Organizer for a session on Friction, Fracture and Damage in USNCTAM [2014; 2018]; Co-organizer of sessions on earthquake physics [American Geophysics Union meeting 2015; Seismological society of America 2014]; Organizer for an invited session: Reinforced [by] Water in American Physics Society March Meeting [2017]

4. Reviewer for: Journal of Mechanics and Physics of Solids; Journal of Applied Mechanics; Extreme Mechanics Letters; Journal of Engineering Mechanics; Mechanics Research Communication; International Journal of Solids and Structures; International Journal of Fracture; Journal of Geophysical Research; Geophysics Journal International; Bulletin of Seismological Society of America; Pure and Applied Geophysics; Physical Review Letters; Physical Review E.
5. Invited contribution to imechanica Journal club, the primary web platform for researchers interested in theoretical and applied mechanics, with an entry titled: Extreme Mechanics on the surface of our planet - January 2016 (<http://imechanica.org/node/19288>). This contribution is part of my ongoing efforts for building bridges and facilitating cross-pollination of ideas between the mechanics and geophysics communities.
6. Co-Leader of the Computational Science Disciplinary Group within the Planning Committee of the Southern California Earthquake Center (SCEC) [2019 - now]

D. Improvement Activities (*list any specific programs in which you have participated it improve teaching and professional competence*)

1. Flipped Classroom Workshop, UIUC [07/11/2013]
2. Participation in several sessions of the Collins Scholars program, UIUC [Fall 2013; Fall 2014]
3. AISC Educators Workshop on teaching steel design courses for undergraduates. Chicago, IL [July 30th and 31st, 2014]
4. NIH grant writing workshop. Beckman Institute, UIUC [Fall, 2015]

E. Professional Highlights

F. Biography, Statements and Updates

Ahmed E. Elbanna holds a Ph.D. in civil engineering (2011) and an M.S. in applied mechanics (2006), both from the California Institute of Technology, and an M.S. in structural engineering (2005) and B.S. in civil engineering (2003) from Cairo University. He joined the faculty in 2013.

His honors include the National Science Foundation CAREER award, 2018, Fellowship of the National Center of Supercomputing Applications, 2015, the George Housner Fellowship, California Institute of Technology, 2005, and a Certificate of Honor, National Ceremony of Science, Egypt, 2004.

Our research focuses on problems in theoretical and applied mechanics of solids, in the presence and absence of pore fluids, with special emphasis on fracture, deformation and wave propagation. Currently, we have three major research thrusts: **MECHANICS AND PHYSICS OF EARTHQUAKES AND GRANULAR MATERIALS**: The long term objective of this research is to link small scale processes in fault zones with large scale dynamic rupture characteristics, wave propagation, seismic and aseismic slip, and long term earthquake cycle models to provide rigorous predictive tools for nonlinear fault dynamics that can ultimately inform next generation seismic hazard models. Our work is contributing to the development of micromechanical models of deformation and failure in granular materials, modeling dynamic ruptures in heterogeneous fault zones and branched fault systems, identification of hydro-thermo- mechanical weakening mechanisms specific to fault gouge, investigation of strain localization and stick-slip dynamics in sheared and vibrated granular layers with breakable particles, and establishment of novel hybrid numerical techniques for multi-scale fault zone dynamics. **MECHANICS AND PHYSICS OF NETWORKED AND BIOLOGICAL MATERIALS**: The long term objective of this research is to develop a rigorous understanding for the effect of micro-structure and local topology on deformation and failure of networked materials. Specific systems of interest include polymer networks as arising in hydrogels and soft tissues and trabecular networks in human bone. Current efforts focus on multi-scale constitutive modeling and fracture in soft materials including rate dependence, damage evolution, poro-mechanical effects and structure-function relations as well as the development of quasi-continuum models for domain decomposition in fractured lattice-like materials. **MECHANICAL METAMATERIALS**: The primary objective of this research is to design materials with adaptive, tunable and extreme elastodynamic properties using principles from biology and geophysics that will transform applications in impact resistance, wave modulation, and earthquake engineering. Current efforts focus on theoretical understanding of the nature of mechanical band gaps, elastodynamic response of layered systems, novel applications of transformation elastodynamics, and modeling of negative stiffness structural elements. To address these challenging topics we use a variety of theoretical techniques stemming from non-equilibrium statistical thermodynamics (shear transformation zone theory), computational mechanics (finite element and boundary integral methods), optimization theory (topology optimization), machine learning, and nonlinear dynamics (stability analysis, reduced order models and chaos theory).

G. Diversity, Equity, Inclusion, or Access

List any specific activities participated that promote or contribute to improving Diversity, Equity, Inclusion, Access, Climate, or Culture through your research, teaching, service, outreach, or public engagement..

- (@) Department Activity
- (%) College Activity
- (^) Campus Activity
- (=) UI System Activity
- (!) Represents most important activity
- (@@) External Local Activity
- (@%) State Activity
- (^^) Federal Activity
- (==) Professional Society Activity

1. INDIVIDUAL impacts

a. Undergraduate

b. Graduate

c. Postdoctoral or Professional Scholar

2. PROGRAMMATIC impacts

3. INSTITUTIONAL impacts

4. CLIMATE and CULTURE impacts

5. TRAINING

6. DIVERSITY STATEMENT