Xinyan Yang

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Education

Northwestern University, Evanston, IL *09/2019 - 08/2024*
Ph.D. in Mechanics, Materials, and Structures (MMS); GPA: 4.0/4.0
- Terminal Year Fellowship recipient

University of California at Berkeley, CA *08/2017 - 05/2018*
M.S. in Structural Engineering, Mechanics and Materials (SEMM); GPA: 4.0/4.0

Dalian University of Technology, China *09/2013 - 07/2017*
B.E. in Structural Engineering; GPA: 3.9/4.0
- National Fellowship recipient (1%)

Skills

- **Programming Languages:** Python, C, Matlab, R, Bash, Tcl, SQL, Java.
- **Software and Tools:** High performance computing (**HPC**) - MPI, CUDA; Molecular dynamics (**MD**) simulation - LAMMPS, NAMD, HOOMD-blue; Finite element modeling (**FEM**) - ABAQUS, FEniCS; Machine learning (**ML**) - Scikit-learn, TensorFlow, Torch; Visualization - VMD, Ovito; Structural design - ETABS; Solid modeling: AutoCAD, Autodesk Inventor; Building information modeling (**BIM**) - Revit and Revit API; Photoshop; Quarto.

Work Experience

- **Northwestern University, Evanston, IL** *09/2024 - Current*
  Postdoctoral Researcher in Mechanical Engineering
- **Northwestern University, Evanston, IL** *09/2019 - 08/2024*
  Teaching Assistant
  - **Courses**: Structural Dynamics, Mechanical Vibrations, Engineering Analysis II.
  - **Responsibilities**: Leading recitations and experiments; holding office hours; grading homework and exams.
- **KPFF Consulting Engineers, San Francisco, CA** *07/2018 - 05/2019*
  Entry-level Structural Engineer (Full-time)
  - **Design project (steel)**: Google Caribbean Campus, Sunnyvale, CA. Participated in the torsional analysis, lateral system design (collectors, details), and feature design (hanging mezzanines) of two office buildings.
  - **Seismic retrofit project (composite)**: INSPUR, Milpitas, CA. Designed the anchorage for server racks and roof top units. Evaluated and strengthened the existing roof framing.

Research Projects

- **Designing Robust Self-assembled Self-healing Magneto-elastic Networks** (Thesis)
  - Developed particle dynamics simulators for magneto-elastic units with **Python** and MPI (**mpi4py**) acceleration.
  - Implemented replica exchange Monte Carlo (**REMC**) simulations to achieve low-energy stable states.
  - Investigated the mechanical properties of self-assembled magneto-elastic networks in **HOOMD-blue**.
- **Engineering Complex Energy Landscape of Magneto-Kresling Truss (MKT) Structures**
  - Designed the MKT unit by embedding magnets into the Kresling truss and developed the computational model.
  - Engineered complex energy landscapes of MKT units and visualized the folding paths with **matplotlib**.
  - Modeled a chain of MKT units in **LAMMPS** and tested wave propagation properties under harmonic excitations.
- **Sequence and Processing Condition Investigation of Spider Silk Protein**
  - Conducted dissipative particle dynamics (**DPD**) simulations on coarse-grained spider silk proteins in **LAMMPS**.
  - Wrote Python scripts to perform network analysis on semi-crystalline silk proteins obtained from DPD simulations.
  - Computationally studied the effect of silk processing conditions on protein crystallization and mechanical properties.
- **SARS-CoV-2 Spike Protein Head Protomer Opening and Closing Transitions**
  - Realized the glycosylated spike protein (S-protein) head protomer opening and closing transitions with the targeted molecular dynamics (TMD) simulations in **NAMD**.
  - Performed principal component analysis (**PCA**) to identify S-protein global motions along binding to human ACE2.
  - Investigated local conformational changes during the transition using **MDAnalysis** package in Python.
- **FEM and Data-driven Analysis in Investigating Thermal Conductivity of Heterogeneous Material**
  - Conducted **FEM** to study the heterogeneous material heat flux distribution and effective thermal conductivity.
  - Built a heat flux model to predict element-wise heat flux given a material thermal conductivity ratio using **PCA**-based data compression and feed-forward neural network (**FFNN**) regression.
  - Built a thermal conductivity model with a trained convolutional neural network (**CNN**) to directly output the effective thermal conductivity using the ABAQUS heat flux contour as the input.

Publications

- Journal: Yang, X., Leng, J., Sun, C., and Keten, S. (2024). "Highly Ordered 2D Open Lattices Through Self-Assembly of Magnetic Units." Adv. Funct. Mater. 2412326.
- Journal: Graham, J., Subramani, S., Yang, X., Zhang, F., and Keten, S. (2024). "Charting the envelope of mechanical properties of synthetic silk fibers through predictive modeling of the drawing process." (Under Review).
- Journal: Yang, X., and Keten, S. (2023). "Emergent Elasticity Relations for Networks of Bars with Sticky Magnetic Ends." Extreme Mech. Lett. 65: 102093.
- Journal: Yang, X., Leng, J., Sun, C., and Keten, S. (2023). "Self-assembled Robust 2D Networks from Magneto-elastic Bars." Adv. Mater. Technol. 2202189.
- Journal: Yang, X., and Keten, S. (July 29, 2021). "Multi-Stability Property of Magneto-Kresling Truss Structures." ASME. J. Appl. Mech. 88(9): 091009.

Conferences

- Conference: Yang, X. (June 6 - June 9, 2023). "Healable Magneto-elastic Networks from Self-assembly with Tunable Network Patterns and Mechanical Properties." Engineering Mechanics Institute Conference 2023, Atlanta, GA.
- Conference: Yang, X. (March 5 - March 10, 2023). "Healable Self-assembled Magneto-elastic Networks with Robust Mechanical Properties." American Physical Society's March Meeting 2023, Las Vegas, NV.
- Conference: Yang, X. (May 31 - June 3, 2022). "Engineering Complex Energy Landscapes with Magneto-Elastic Structures." Engineering Mechanics Institute Conference 2022, Baltimore, MD.

Certifications

- Passed **National PE Civil Structural** Exam, NCEES ID: 18-861-54 *08/2018*
- Engineer in Training (**EIT**), CA *02/2018*