LINGXIAO YUAN

Boston, MA 02215 | +1 857-423-5004 | lingxever@gmail.com | LinkedIn | GitHub | Google Scholar

EDUCATION

- **Doctor of Philosophy** in Mechanical Engineering, Boston University, US | GPA=3.85 — Sep 2019 - May 2024 (Expected)
- **Master** in Mechanics, Xi'an Jiaotong University, China | GPA=3.60 — Sep 2017 - June 2019
- **Bachelor** in Mechanics, Xi'an Jiaotong University, China | GPA=3.65 — Sep 2013 - June 2017

SKILLS

- Programming: **Python, Java**, JavaScript, C++, Fortran, SQL, Matlab, LaTeX, Linux
- Tools: **PyTorch, Keras, Scikit-Learn, Numpy, Pandas**, TensorFlow, Scipy, HTML, CSS
- Knowledge: **Computer Vision, Causal Learning, Generative Models**, Bayesian Inference, NLP, Reinforcement Learning

RESEARCH

Diffusion model on optimizing the stiffness of metamaterial — *June 2022 - Present*

- Generated 10,000 chiral structures through different design functions and built the simulation model through Python
- Leveraging sparse regression to extract constitutive model of the metamaterials and classifying linear/nonlinear structures
- optimizing the geometry of structures to maximize the difference in compression/extension stiffness through diffusion models

Out-of-distribution generalization (OOD) for regression problems in mechanics| [Paper 1] [Code] — *Apr 2021 - May 2022*

- Identified three types of OOD problems in mechanics: Covariate Shift, Mechanism Shift, Sampling Bias
- Created an open source benchmark dataset for real-world OOD regression problems: **Mechanical MNIST - Distribution Shift**
- Implemented three popular OOD algorithms (Invariant Risk Minimization, Risk Extrapolation, Inter Gradient Alignment) and the traditional Empirical Risk Minimization on six out-of-distribution datasets using PyTorch
- Analyzed OOD generalization performance and limitations of OOD generalization algorithms compared to traditional methods

Conditional variational autoencoder (cVAE) for material inverse design — *Oct 2020 - Apr 2021*

- Embedded material properties into the latent space of cVAE model during the training process using cVAE
- Generated hundreds of new designs for each desired novel multifunctionality by decoding random sampled latent vectors adjacent to designs with mechanical property close to the desired property

Active learning (AL) on alleviating demand for labeled data of new design space — *Dec 2019 - Oct 2020*

- Examined the performance of AL algorithms (Greedy Sampling, Variational Adversarial Active Learning, Variational Autoencoder for AL, etc.) compared to passive learning using Keras on tasks that labeling data is time-consuming
- Reduced error by 80% for small training data size (less than 20) in the new design space by training together with available labeled data from old design spaces with different data distribution

PROJECTS

Python scripting modeling on commercial software Abaqus | [Paper 2] [Paper 3] [Code] — *Sep 2017 - May 2019*

- Applied Python scripting into software Abaqus for building models, running simulations, and post-processing output files
- Simulated the model of a sphere indenting a semi-infinite space with residual stress embedded in it, extracted relationships between residual stress and indenter features by fitting simulation data using piece-wised least squares regression
- Analyzed the results using Matlab and published 2 first-authored papers on peer-reviewed journals

Residential density predicting (team project) | [Code] — *Jan 2021 - May 2021*

- Approximated residential density near every MBTA rail station in Massachusetts by cleaning the unreliable, uncompleted, and duplicated data collections from different resources

Covid predicting on limited chest X-ray images — *Jan 2021 - May 2020*

- Leveraged a pre-trained VGG-16 model and data augmentation techniques, classified positive/negative Covid by training on 130 chest X-ray images, and achieved test accuracy of 93.75%
- Accomplished multi-classification task by access to 260 chest X-ray images through transfer learning and examined the model by representative learning (t-SNE), and achieved accuracy of 81.1%

OTHER EXPERIENCE

- **Graduate Teaching Assistant:** Mechanics of Materials, Spring & Fall Semester, 2020
- **Conference Talk:** Society of Engineering Science Annual Technical Meeting 2022 , Data Science & Machine Learning: "Towards out of distribution generalization for problems in mechanics"

SELECTED PUBLICATIONS

- **Lingxiao Yuan**, Harold S. Park, and Emma Lejeune. "Towards out of distribution generalization for problems in mechanics." Computer Methods in Applied Mechanics and Engineering 400 (2022): 115569. [Link]