

# LINGXIAO YUAN

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**Summary:** A Self-motivated, problem-solving and collaborative Ph.D student looking for **machine learning engineer** intern role. Experienced in interdisciplinary subjects emphasizing on the application of machine learning methods to material design and physics discovery. Specialized in skills and knowledge on coding, statistics, math, and physics.

## EDUCATION

**Ph.D.** in Mechanical Engineering | GPA=3.85

*Boston University*

📅 Sep 2019 - May 2024 (Expected)

📍 Boston, US

**M.S.** in Mechanics | GPA=3.60

*Xi'an Jiaotong University*

📅 Sep 2017 - June 2019

📍 Xi'an, China

**B.S.** in Mechanics | GPA=3.65

*Xi'an Jiaotong University*

📅 Sep 2013 - June 2017

📍 Xi'an, China

## SKILLS

<b>Programming</b>	Python, Java, JavaScript, SQL, Matlab, Linux
<b>Framework</b>	PyTorch, Keras, Scikit-Learn
<b>Tools:</b>	HTML, CSS, LaTeX, Pandas, Scipy
<b>Knowledge:</b>	Statistics, Computer Vision, Causal Learning

## PROJECTS

**Python scripting modeling in Abaqus** [\[Paper 1\]](#) [\[Paper 2\]](#) [\[Code\]](#)

*Sep 2017 - May 2019*

- Built Python scripting on commercial software Abaqus for building models, running simulations, extracting and post-processing output data
- Created biased, fine and structured mesh using Python
- Obtained analytical expression on the relationships between material properties by fitting the modeling data using piecewise least squares regression
- Published 2 first-authored peer-reviewed papers associated with the application in the field of mechanics

**Predict residential density in MA - team project** [\[Code\]](#)

*Jan 2021 - May 2021*

- Collected data from different public resources (statewide assessors parcels, statewide emergency 911 addresses, etc.)
- Investigated on features of the data, cleaned the data by data imputation, merging and sorting data, removing duplicated data and irrelevant features
- Established the pipeline for residential density estimation based on clients needs

**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 with 260 chest X-ray images through transfer learning and examined the model by representative learning (t-SNE), achieved accuracy of 81.1%

## RESEARCH

**Diffusion model on optimizing the stiffness of metamaterial**

*June 2022 - Present*

- Create algorithms for automatic generation of 10,000 different structures and build the simulation model through Python
- Divide data based on the linearity of the structure and classify the imbalanced dataset using balanced focal loss
- Optimize the geometry of structures to maximize the desired property through generative models

**Out-of-distribution (OOD) generalization** [\[Paper 3\]](#) [\[Code\]](#)

*Apr 2021 - May 2022*

- Established three OOD regression problems (Covariate Shift, Mechanism Shift, Sampling Bias) in the field of mechanics and created an open source benchmark dataset: [Mechanical MNIST - Distribution Shift](#)
- Improved the predicting accuracy of ML models on OOD problems by four times through implementing OOD algorithms (Invariant Risk Minimization, Risk Extrapolation, Inter Gradient Alignment) using PyTorch
- Demonstrated the performance of OOD algorithms and analyzed the limitations of OOD generalization algorithms
- Published a peer-reviewed paper as the first author and Presented the work at the conference SES 2022

**Data-driven material inverse design**

*Dec 2019 - Apr 2021*

- Accelerated the design of new materials with multiple functionalities through conditional variational autoencoder (cVAE).
- Created Algorithms for sampling desired materials through manipulating the latent space of cVAE model
- Performed Active learning (AL) algorithms (Greedy Sampling, Variational Adversarial Active Learning, etc.) and compared to passive learning using Keras
- Reduced error by 80% for small training data size (less than 20) by expanding the dataset with accessible data from different data distribution

## OTHER EXPERIENCE

**Graduate Teaching Assistant:** Mechanics of Materials, Spring & Fall Semester, 2020

**Conference Talk:** Society of Engineering Science 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. [\[Link\]](#)