Binghang Lu

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EDUCATION

Purdue University, West Lafayette, IN — May 2026
Master of Science in Computer Engineering
Research focus on LLM and GenAI

Purdue University, West Lafayette, IN — December 2024
Bachelor of Science in Computer Science
Minor in Mathematics

TECHNICAL SKILLS

- **Languages:** C/ C++, Python 3/2, Java, SQL
- **Tools**: Git, Linux (Ubuntu, CentOS), Git, Keras, PyTorch, Scikit-Learn, Numpy, PySpark, MongoDB, Azure
- **Algorithms:** LLM, Stable Diffusion, Kalman Filter, PINN, Operator Networks, LSTM, YOLO

WORK EXPERIENCE

Purdue University, West Lafayette, IN, USA — Graduate Research Assistant — 2024 Winter - Present

- Research focuses on **Kalman-Filter** and **Deep Operator Learning Optimization**, Funded by **National Science Foundation**.
- Leveraged the **PyTorch** library to develop a specialized machine learning framework, **MOPINNEnKF**, for deep operator learning on high-noise training data, achieving a **60%** reduction in data noise.
- Utilized **Kalman Filter** and **evolutionary algorithms** to prove their feasibility and utility for **optimization**, demonstrating improved stability and performance through statistical analysis.
- Built and validated **MoPINNEnKF** prototype for solving partial differential equations (**PDEs**) and ensured the framework's stability under inverse edge cases, successfully demonstrating robustness in complex scenarios.

Purdue University, West Lafayette, IN, USA — Undergraduate Research Assistant — 2022 Spring- 2024 Winter

- Study on multi-term time-fractional mixed diffusion-wave equations (**TFMDWEs**) using **deep operator learning** method, Funded by **National Science Foundation**.
- Developed an $\boldsymbol{L_2}$ approximation with **Python** to efficiently solve fractional partial differential equations (**FPDEs**), reduced the prediction error to $\mathbf{10^{-3}}$.
- Built and validated **a fPINN-DeepONet** model use **PyTorch** library, dealt with high-dimensional fractional order cases and scenarios with noisy data, largely **improved the prediction accuracy to 90%.**
- Build **multi-objective optimization** framework for the effective training of physics-informed neural networks (PINNs), Founded by **National Science Foundation.**
- Built the **Physics-informed Neural Networks** (PINN) framework in **PyTorch** library to solve the complex Partial Differential Equations (PDE) in the Physics and Mathematics fields, greatly **reducing the 90% data cost** compared to the traditional numerical method.
- Conducted the research focus on using the Optimization method during the PINN training, applied the Non-dominated Sorting Genetic Algorithm (**NSGA-II**) in the PINN training, greatly improved the prediction accuracy when using PINN to solve inverse problems **by 90%.**

Wavelogix company, West Lafayette, IN — Machine Learning Group Intern — May. 2023 – Aug. 2023

- Worked as an intern applying ML to **world's first** smart real-time in-place concrete strength sensing solution, which enabled **data-driven decisions** to plan constructions schedules, eliminating the need for costly and time-consuming destructive testing.
- Built the data pipeline for the sensor data in **Python**. Implemented data extraction, visualization and ML data normalization and paddling pre-processing functionalities with **Mongodb and Python**.
- Implemented the Physics-informed Neural Networks framework (**PINN**) in **PyTorch** library, improved the prediction accuracy by 80%.

Carnegie Mellon University, Pittsburgh, PA, USA Summer Research Program Team Member May 2020 – Aug. 2020

- Implemented an existing state-of-art **YOLOv5** computer vision model for **mask-wearing recognition**, improved the prediction accuracy by **92.1%.**
- Learned and applied ML data analysis methods to build a comprehensive mask-wearing dataset, utilized **PyTorch** library implement data normalization and augmentation **pre-processing** functionalities.
- Published the paper "Research on the use of YOLOv5 Object Detection Algorithm in Mask Wearing Recognition."

Institute of Automation, Chinese Academy of China CV Research Group Member Sept. 2019 – Jan. 2020

- Built an automated object detection robot using **OpenCV** which involved integrating sensor data to enhance robot's detection capabilities and implementing the computer vision algorithms for object detection and tracking, improved the prediction accuracy by **90%**.
- Gained comprehensive insights into **big data**, **autonomous driving**, and **computer vision (CV)** through the practical training, engaged in hands-on projects that simulated real-world scenarios in autonomous driving.
- Was recognized as **the most outstanding person** and the second prize winner in the final automatic robot competition.

PUBLICATIONS AND PRESENTATIONS

(Google Scholar Citation: 157, h-index: 2, Accessed on 01/26/2025)

1. **Lu, B**., Moya, C., & Lin, G. (2023). "*NSGA-PINN: a multi-objective optimization method for physics-informed neural network training*" Algorithms, *16*(4), 194.

2. Liu, Y., **Lu, B**., Peng, J., & Zhang, Z. (2020). "*Research on the use of YOLOv5 object detection algorithm in mask wearing recognition*" World Sci. Res. J, *6*(11), 276-284.

3. **Lu, B**., Hao, Z., Moya, C & Lin, G. (2023). "*fPINN-DeepONet: An Operator Learning Framework for Multi-term Time-fractional Mixed Diffusion-wave Equations*". *Journal of Computational Physics*, 114184.
4.
5. **Lu, B**., Hong, C, & Lin, G. (2025). "*MoPINNEnKF: Inferring model on the fly using generic-PINN-based ensemble Kalman filter*". (Submitted to Journal of Computation Physics)

6. **Lu, B**., and Lin, G, "*Operator Learning Of Multi-Term Time-Fractional Partial Differential Equation By fPINN-DeepONet*", Brown University, virtual, 2025

7. **Lu, B**., and Lin, G, "*ICERM workshop on Nonlocality: Challenges in Modeling and Simulation*", Brown University, virtual, 2024

SCHOLARSHIP & AWARD

Undergraduate Research Scholarship 2024 – 2025 year (Top 5%). 2024

Spira Undergraduate Research Fellowship, Department of Mathematics, Purdue University (1/6000). 2024

Office of Undergraduate Research Scholarship, Purdue University (Top 5%). 2024

Dean's List and Semester Honors, Department of Computer Science, Purdue University (Top 5%). 6 semesters

Thomas Arai Scholarship, Department of Mathematics, Purdue University (Top 1%). 2022

Most Outstanding Person in Artificial Intelligence Recognition Program, Institute of Automation, Chinese Academy of China. 2020