

Feisi Fu

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SUMMARY

- A passionate **Machine Learning Ph.D. candidate** with a solid background in **Mathematics and Statistics**, strong proficiency in **Python**, experience in **open source project development**, and a publication at **top-tier Machine Learning conferences**.
- 4+ years research experience of machine learning: 1. Familiar with **data preprocessing techniques (Sklearn)**; 2. Build state-of-the-art neural network models with **PyTorch** and **Tensorflow** (i.e., VGG, ResNet, MobileNet, and GAN); 3. **Editing neural network structure** to improve the performance, reduce the memory usage, or boost the training efficiency. 4. Analysis and visualize results with **Matplotlib**.

SKILLS

- Areas of Study: **Machine Learning, Machine Learning Safety, Neural Networks Quantization**
- Industry Knowledge: **Deep Reinforcement Learning, Safe Reinforcement Learning**
- Coding: **Python, PyTorch, Tensorflow, C++, CUDA C, Matlab, Gurobi, L^AT_EX**

EXPERIENCE

- **Research Scientist Intern at Meta, PyTorch Architecture Optimization Term** **Monitor: Zafar Takhirov**
Engineering Part: We Create infrastructures of neural network quantization in PyTorch, e.g. extending the support of activation functions to quantized tensors and quantizing the saved buffers in the neural network forward step.
Research Part: Exploring uses of quantization in neural networks training process. We analyze the performance of quantizing the activation maps: for ResNet on ImageNet and VGG16 on CIFAR100, we get roughly the same performance while saving **40-50%** memory usage.
Aug. 2022 – Dec. 2022 (expected)
- **Graduate Teaching Fellow for Optimization Theory and Methods at Boston University**
Sep. 2019 – Sep. 2021

EDUCATION

Boston University

Ph.D of Systems Engineering, GPA: 4.0/4.0

Chinese Academy of Sciences, China

MS of Mathematics, GPA: 84.5/100

Sichuan University, China

BS of Applied Mathematics, GPA: 89.2/100

Advisor: Prof. Wenchao Li

2018 – May. 2023 (expected)

Advisor: Prof. Baohua Fu

2014 – 2018

2010 – 2014

PROJECTS & PAPERS

- **Sound and Complete Neural Network Repair with Minimality and Locality Guarantees**
Feisi Fu, Wenchao Li

International Conference on Learning Representations (ICLR), April 2022

We present the first neural networks repair methodology which applies only a localized change in the function space while guaranteeing the removal of the buggy behavior.

Experiment Performance: 1. Repair Rate 96% (ReTrain) \rightarrow guarantee 100% (ours); 2. Negative Side Effect 22.11% (Fine-Tuning) \rightarrow 0.12% (ours).

- **REGLO: Provable Neural Network Repair for Global Robustness Properties**

Feisi Fu, Zhilu Wang, Jiameng Fan, Yixuan Wang, Chao Huang, Xin Chen, Zhu Qi, Wenchao Li

Trustworthy and Socially Responsible Machine Learning (TSRML) at NeurIPS, December 2022

We present REGLO, the first work that enables provable repair of a neural network for global robustness properties.

Experiment Performance: REGLO makes a neural network on German Credit dataset **global robust with less than 1% accuracy drop** (PGD-Bound 1.31 \rightarrow 0.028 and Verification-Bound 12.5 \rightarrow 0.29).

- **TrojAI Competition by National Institute of Standards and Technology**

Feisi Fu, Jiameng Fan, Weichao Zhou, Penny Kiourti, Sabbir Ahmad, Wenchao Li

We train a neural network to analyze the eigenvalues of a given network's weights and detect if such network has a Trojan. Our approach achieves the top 5 ROC-AUC among all approaches.

- **OVLA: Neural Network Ownership Verification using Latent Watermarks**

Feisi Fu, Wenchao Li

We present a novel methodology for neural network ownership verification by decoupling a network's normal operation from its responses to watermarked inputs during ownership verification.

Experiment Performance: Add a watermark to a DNN for ownership verification with **less than 1% accuracy drop**.

- **A Tool for Neural Network Global Robustness Certification and Training**

Zhilu Wang, Yixuan Wang, Feisi Fu, Ruochen Jiao, Chao Huang, Wenchao Li, Qi Zhu

We propose a GPU-supported global robustness certification framework GRO CET which is more efficient than any previous optimization-based certification approaches.

- **A Study of Complement Problem for Plane Curves**

Feisi Fu, Baohua Fu

We will describe the isomorphisms between complements of irreducible closed curves in the complex affine plane C^2 , which do not extend to an automorphism of C^2 .

REVIEWER FOR JOURNALS & CONFERENCE ARTICLES

- Workshop on Trustworthy and Socially Responsible Machine Learning, NeurIPS, 2022
- AAAI Conference on Artificial Intelligence (AAAI), 2023
- Design Automation Conference (DAC), 2020, 2022
- Design Automation and Test in Europe (DATE), 2021, 2022
- International Conference on Dependable Systems and Networks (DSN), 2021, 2022
- Hybrid Systems: Computation and Control (HSCC), 2020
- International Conference on Computer-Aided Design (ICCAD), 2021
- International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2020

Honors and Awards

- Dean's Fellowship Award, Boston University
- 1st prize in 4th Mathematics Competition of Chinese College students
- 1st Prize in Mathematics Competition of Sichuan university
- 1st prize in 3th Mathematics Competition of Chinese College students
- 3rd Prize of Chinese Chemical Society National Chemistry Contest for High School