JIAWEI LIU

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RESEARCH INTEREST

I am generally interested in *correctness*, *programmability* and *performance* in computer systems. Specifically, I am excited about using *fuzzing* to improve the correctness of Deep-Learning (DL) frameworks and compilers.

EDUCATION

University of Illinois at Urbana-Champaign, IL, US — Aug. 2021 - Present
Ph.D. in Computer Science; GPA: 4.0/4.0 — Advisor: Lingming Zhang

Tongji University, Shanghai, China — Sept. 2017 - Jul. 2021
B.Eng. in Computer Science

PUBLICATION

[1] ***ASPLOS'23*** | **NNSmith: Generating Diverse and Valid Test Cases for Deep Learning Compilers**
Jiawei Liu*, Jinkun Lin*, Fabian Ruffy, Cheng Tan, Jinyang Li, Aurojit Panda, Lingming Zhang. code artifact arXiv

[2] ***OOPSLA'22*** | **Coverage-Guided Tensor Compiler Fuzzing with Joint IR-Pass Mutation**
Jiawei Liu, Yuxiang Wei, Sen Yang, Yinlin Deng, Lingming Zhang. code artifact paper

[3] ***ACMMM'21 OSC*** | **Fast and Flexible Human Pose Estimation with HyperPose**
Yixiao Guo*, **Jiawei Liu***, Guo Li*, Luo Mai, Hao Dong. code paper

** denotes joint first authors.*

PROFESSIONAL EXPERIENCES

Intern at OctoML — May. - Aug. 2022
Advised by: *Dr.* Yuchen Jin, *Dr.* Sunghyun Park, *Prof.* Tianqi Chen — *Dataflow Pattern Language*

Research Assistant, UIUC — Apr. 2021 - Present
Advised by: *Prof.* Lingming Zhang — *Fuzzing*

Intern at DAMO Academy, Alibaba Group — Mar. - Aug. 2021
Advised by: *Dr.* Yuanwei Fang, *Prof.* Yuan Xie — *GNN Serving*

Research Assistant at NYU Systems Group — Jul. 2020 - Mar. 2021
Advised by: *Prof.* Jinyang Li — *Video Analytics*

Research Assistant at Peking University — Jan. - Aug. 2020
Advised by: *Prof.* Hao Dong, *Prof.* Luo Mai — *Fast Pose Estimation*

Intern at AI Lab, ByteDance Ltd. — Feb. - Jul. 2020
Advised by: Guanzhe Huang, *Dr.* Chuanxiong Guo — *DNN Model Serving*

NOTABLE ACHIEVEMENTS

Qidi Innovation Scholarship of Tongji University (Top *1%*)	2020
Selected Entrant for 2020 Google Machine Learning Winter Camp	2019
Winner of International Data Science Hackathon (Chinese Region), Covestro [news]	2019
National *2nd* Prize and Province-level *1st* Prize in RoboMaster, DJI Inc.	2019
National *2nd* Prize (0.75~3.84%) and Province-level *1st* Prize of Chinese Modeling Contest	2018

OPEN-SOURCE CONTRIBUTIONS

I embrace and grow with the open-source community.

Recently, I am leading the NNSmith project, a fuzzer to automatically find bugs in real-world Deep-Learning (DL) systems. I also actively contribute to TVM and implemented the dataflow pattern language of *Relax* IR to simplify graph optimization. Previously, I developed HyperPose (**1200+ stars**) for efficient computer vision.

My research facilitates the correctness and security of current DL systems. In 2021~2022, we found over 150 new bugs for TVM, PyTorch, TensorFlow, TensorRT, and ONNXRuntime. The bugs we found are often critical as they can lead to security violation, bad performance and user frustration. I am also proud that my work has inspired the PyTorch nvFuser team and NVIDIA TensorRT team in developing their own fuzzers.

PROFESSIONAL SERVICES

Artifact Evaluation Committee: OSDI'22, ATC'22.

Co-Reviewer: ICSE'23, FSE'22, ASE'22.

TALKS

Finding Deep-Learning Compilation Bugs with NNSmith

- Software Engineering Retreat, University of Illinois at Urbana-Champaign — Sept. 2022

Coverage-Guided Tensor Compiler Fuzzing with Joint IR-Pass Mutation

- SAMPL Lunch Talks, University of Washington — May 2022
- Software Engineering Seminar, University of Illinois at Urbana-Champaign — Apr. 2022

STUDENT MENTORING

Yuxiang Wei (Summer 2021) — Tongji Univ. → UIUC Ph.D.

Sen Yang (Summer 2021) — Fudan Univ. → Yale Ph.D.

SKILL STACK

I like building software with good taste. I code with modern C++ and Python, but am also open to use newer languages like Rust. My skill set covers program optimization/analysis, fuzzing, visualization and deep learning.

General: C++, Python, Rust, Docker,, Git, Grafana, GDB, etc.

High-Perf. Computing: LLVM, C++ Thread Library, CUDA, etc.

Machine Learning & Systems: PyTorch, TensorRT, TensorFlow, TVM, ONNX, etc.

System Correctness: libFuzzer, Z3, Dafny, Sanitizers, Valgrind, etc.