JIAWEI LIU

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RESEARCH INTEREST

I am generally interested topics related to *programmability*, *performance* and *correctness* in computer systems, esp. deep-learning (DL) systems. My recent research thread (i.e., Ph.D.) is test-case synthesis for DL compiler.

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

PAPERS AND TALKS

[1] NeuRI: Diversifying DNN Generation via Inductive Rule Inference.
Jiawei Liu, Jinjun Peng, Yuyao Wang, Lingming Zhang.
pre-print

[2] [**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 ◇ paper ◇ pre-print

- Systems & Software Engineering Seminar, UIUC — Mar. 2023

[3] [**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

- SPLASH/OOPSLA Conference Talk — Nov 2022
- SAMPL Lunch Talks, University of Washington — May 2022
- Software Engineering Seminar, UIUC — Apr. 2022

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

* *Co-primary.*

PROFESSIONAL EXPERIENCES

Intern at OctoML — May. - Aug. 2022
Advised by: Yuchen Jin, Sunghyun Park, Tianqi Chen — *Pattern Language*
Designed and implemented a declarative pattern language for simplifying graph optimizations in TVM's Relax IR (PRs: A, B).

Research Assistant at UIUC — Apr. 2021 - Present
Advised by: Lingming Zhang — *Fuzzing*
Doing research in applying PL and formal methods to synthesize Deep-Learning programs for fuzzing and beyond [1]–[3].

Intern at DAMO Academy, Alibaba Cloud — Mar. - Aug. 2021
Advised by: Yuanwei Fang, Yuan Xie (Univ. of California at Santa Barbara) — *GNN Serving*
Implemented multi-core graph sampling algorithms in C++ for GNN pre-processing, improving prior implementation by over 20×.

Research Assistant at NYU Systems Group — Jul. 2020 - Mar. 2021
Advised by: Jinyang Li — *Video Analytics*
Designed a programming model, *Compare-And-Skip*, for doing video analytic with programmable accuracy-efficiency trade-off.

Research Assistant at Peking University — Jan. - Aug. 2020
Advised by: Hao Dong, Luo Mai (Univ. of Edinburgh) — *Optimizing Pose Estim.*
Implemented a CPU-GPU scheduler for pose estimation and post-processing algorithms, with up-to 7.3× speedup over SOTA [4].

Intern at ByteDance AI Lab — Feb. - Jul. 2020
Advised by: Guanzhe Huang, Chuanxiong Guo — *DNN Model Serving*
Developed a model server with dynamic batching and a monitoring sub-system for debugging health/performance of model services.

NOTABLE ACHIEVEMENTS

Conference Presentation Award, UIUC	2023
ASPLOS Student Travel Award	2023
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.

I lead the NNSmith project, a random DNN synthesizer for testing Deep-Learning (DL) systems. I also have been actively contributed to TVM for the dataflow pattern language of *Relax* IR to simplify graph optimization, as well as bug fixes. Previously, I co-developed HyperPose (**1200+ stars**) for efficient pose estimation.

My research facilitates the correctness of DL systems. Since 2021, we found over 210 new bugs for TVM, PyTorch, TensorFlow, TensorRT, and ONNXRuntime. My work have impacted the testing tooling of real-world systems including nvFuser, TensorRT (privately acknowledged by NVIDIA developers) and TVM Relay.

PROFESSIONAL SERVICES

Artifact Evaluation Committee:	PLDI'23, OSDI'22, ATC'22.
Reviewer:	AAAI'23@DCAA

SKILL STACK

My general skill set covers program optimization/analysis, fuzzing, visualization and deep learning. Oftentimes, I code with modern C++ for efficiency with a Python front-end for interoperability.

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

Machine Learning & Systems: PyTorch, TensorRT, TensorFlow, TVM, ONNX, Pybind11, etc.

Correctness: Z3, libFuzzer, Sanitizers, Dafny, Spin, etc.

Parallel: C++ Thread Library, CUDA, gRPC, etc.