

HUANG, Xinyang

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EDUCATION

- Hong Kong University of Science and Technology** Hong Kong, China
• *Master of Philosophy - Computer Science Engineering; GPA: 3.50/4.0* Sept. 2021 - June 2023 (Expected)
Courses: Advanced Algorithms (A-), Computer Network (A-), Machine Learning (A-), Cryptography (A-)
- University of Electronic Science and Technology of China** Chengdu, China
• *Bachelor of Science in Network Engineering; GPA: 3.88/4.0* Sept. 2017 - June 2021
Courses: Graphic Theory, Principle of Communications, Mobile Communication Systems, TCP/IP Protocol, Access Network, etc.

SKILLS SUMMARY

- **Languages:** Python, C/C++, MATLAB, JAVA, CUDA, Verilog, etc.
- **Frameworks:** Spark, Hadoop, FATE, Tensorflow, Pytorch, YARN
- **Tools:** Docker, HDFS, Simulink, Keil, Wireshark, Altium Designer, Vivado
- **Platforms:** Linux, Windows, STM32, Raspberry

RESEARCH EXPERIENCE

- BatchPlan: Efficient Batch-wise Homomorphic Encryption for Secure AI** HKUST, Hong Kong
• *Researcher, Supervisor: Professor Kai CHEN* Dec. 2021 - Present
 - **Mitigate cross-datacenter communication overhead in Secure AI:** Design a batch-wise homomorphic encryption (HE) scheme (includes encoding and parallel encrypting) to compress ciphertexts by around 7x to 12x.
 - **Design an arithmetic evaluation framework over batch-wise HE:** To support Secure AI applications (federated learning and secure ML based on HE), BatchPlan designs a DAG-like computational typology to support arbitrary additive matrix evaluations over batch-wise HE numbers and prevent overflow during execution.
 - **Execute BatchPlan in parallel:** To optimize the performance of underlying accelerators (GPU, FPGA), BatchPlan introduces lazy operations to reduce the frequency of memory copy and the time of shift operation. In addition, BatchPlan designs parallel execution schemes for each operator (ADD, MUL, Shift, Scaling, etc.), which increases the performance by around 3x.
 - **Experimental results and progress:** Conduct experiments based on FATE (open-source federated learning framework) across two datacenters. Reduce the communication overhead by 7x and 12x, and increase end-to-end performance by about 50% and 70%, for Federated LR and Secure XGBoost, respectively. Currently preparing for the ASPLOS' 23 (1st author).
- HAFLO: GPU-Based Acceleration for Federated Logistic Regression** HKUST, Hong Kong
• *Researcher, Supervisor: Professor Kai CHEN* Mar. 2021 - Sept. 2021
 - **Developed GPU Acceleration library for Federated Learning:** Accelerate the encryption computing process of federated learning using GPUs. I was responsible for implementing GPU-based federated learning algorithms.
 - **Experimental results and progress:** The acceleration achieves a 49.9× speedup for heterogeneous LR and 88.4× for homogeneous LR. HAFLO has been accepted by FTL-IJCAI' 21 (3th author).
- Multi-mode Intelligent Sensing Terminal Autonomous Collaboration Technology** UESTC, Chengdu
• *Researcher, Supervisor: Professor Shizhong XU* May 2019 - Aug. 2020
 - **Designed a PSO-based cluster routing protocol for wireless sensor networks:** Compared to popular clustering protocols like LEACH and similar protocols like EC-PSO, our algorithm increases the network lifetime by 110.4% and 23.4%.
 - **Established a physical WSN simulation platform:** Implemented the routing protocol on a GD32-based wireless sensor cluster, and deployed the cluster to a physical environment.

INTERNSHIP

- Develop Distributed GPU Accelerating Engine for large-scale FL jobs** CLUSTAR, Shenzhen
• *Developer, Director: Doctor Junxue ZHANG and Doctor Shuihai HU* Mar 2021 - Present
 - **Tech:** Docker deployment, FATE, Spark, HDFS, Python, CUDA.
 - **Deployed cross-datacenter Spark-based FATE:** Use Spark framework within FATE to support large-scale distributed computing. Deployed and maintained a cross-datacenter FATE cluster based on docker.
 - **Developed distributed federated learning algorithms based on GPUs:** Successfully transformed Hetero-LR, Homo-LR, and SecureBoost algorithms to distributed GPU version using Spark API.
- 802.11 MAC Protocol Analysis** HUAWEI, Chengdu
• *Developer, Director: Chenggang JIANG* Aug. 2020 - Nov. 2020
 - **Researched the 802.11ax protocol:** Analyzed and summarized the authentication, key interaction methods, and survey for the MAC protocols in 802.11ax.

PROJECTS & COMPETITIONS

- **Small Raspberry Pi Cluster based on Hadoop — Undergraduate graduation design:** Deployed Hadoop framework on a raspberry pi cluster, and run distributed search or machine learning tasks in a using YARN. **Tech:** Java, Hadoop, HDFS, YARN, Raspberry Pi. (from Feb. 2021 to Jun. 2021)
- **Wearable Intelligent Guide Device — ”Internet +” Innovation Competition:** A embedded systems includes thermal imaging vision module, ultrasonic obstacle avoidance module and GPS navigation module. **Tech:** Python, C++, STM32, OpenMV. (from Oct. 2019 to Oct. 2019)
- **Internet-based Signal Transmission System — National Electronic Design Competition:** Designed a long-distance synchronous sampling system based on PTP and TCP/IP protocols using STM32 & DB83640. **Tech:** C, STM32, Keil (from Mar. 2019 to Aug. 2019)

PUBLICATIONS & PATENTS

- **Conference paper: HAFLO: GPU-Based Acceleration for Federated Logistic Regression:** 3th author, FTL-IJCAI’21, doi:10.48550/ARXIV.2107.13797
- **Patent: Heterogeneous acceleration method, device and system for vertical federated logistic regression learning:** 1st author, Patent ID: CN202110934507.4
- **Patent: A Wearable Intelligent Blind Guide Device:** 4th author, Patent ID: CN201910639192.3

HONORS AND AWARDS

- Outstanding Academic Scholarship of UESTC for full 3 academic years - 2017-2018, 2018-2019, 2019-2020
- Sichuan Innovation and Entrepreneurship Excellent Project twice - 2019-2020
- National Innovation and Entrepreneurship Excellent Project - 2018-2019
- Second prize in “Challenge Cup” Science and Technology Competition (Sichuan Division) - Jul. 2019
- Third prize in ”Internet +” Innovation Competition (Sichuan Division) - Oct. 2019
- Second prize in National Electronic Design Competition - Aug. 2018

TEACHING EXPERIENCE

- **Teaching Assistant of C++ Programming** HKUST, Hong Kong
Conducted tutorials, designed experiments and answered questions. Feb. 2022 - Jun. 2022