ZHANG, ZHIXUAN

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EDUCATION

Columbia University
Master of Science in Electrical Engineering, 3.75/4.0   Expected May 2025
- Main Courses: Internet of Things, Algorithm, Cloud Computing, Reinforcement Learning, Deep Leraning for NLP, Mathmetics of Deep Learning, Blockchain, Database, Advanced Research.

China Agricultural University
Bachelor of Engineering in Computer Science and Technology, 3.62/4.0   Jul 2023
- Main Courses: Computer Programming, Algorithms Design & Analysis, Computer Graphics, Computer Organization & Architecture, Operating Systems, Probability Theory & Mathematical Statistic, Software Engineering, Compiling Principle, Data Mining, Big Data Training.

RESEARCH PROJECT EXPERIENCE

Optimization of BTB Hierarchy for Data Center Applications   Mar 2024 - Present
ICELab, supervised by Prof. Tanvir Ahmed Khan, Columbia University
- Modeled and evaluated I-BTB, R-BTB, B-BTB, PDede, and BTBM structures using CACTI 7.0, measuring area, static/dynamic power consumption, access time, and cycle time.
- Scaled results from 90nm to 7nm and 14nm technology nodes using scaling factors, and validated the optimal BTB configurations for IBM z15 and AMD Zen 4.
- Modeled BTB architectures with the 2016 CBP-2016 infrastructure and Thermometer baseline, performing sensitivity analysis on size and associativity with 223 traces. Measured MPKI, miss ratio, access frequency, and unique branches, and calculated Pearson Correlation Coefficient (PCC) and Kullback–Leibler divergence for statistical insights.
- Simulated BTB hierarchies using Scarab, a cycle-accurate simulator for high-performance multicore chips, to evaluate IPC speed-up across 10 frontend-bound data center applications under varying latencies, sizes, and associativities.
- Developed a Bloom filter-based filtering mechanism in BTB hierarchies to hide the latency of identifying false speculative perceived misses and BTB1 capacity misses.

Multiple object Fish Tracking System based on Transformer   Jul 2022 - Feb 2023
Computer Vision Laboratory, supervised by Prof. Zhenbo Li, China Agricultural University.
- Designed and implemented a Transformer-based tracking model following the Joint Detection and Embedding (JDE) paradigm, enabling end-to-end multi-object fish tracking with real-time performance.
- Integrated Self-Attention mechanisms to enhance detection.
- Developed a Multiple Association (MA) method integrating IoU matching and the Hungarian algorithm to reduce identification switching and errors caused by fish deformation, improving tracking robustness.
- Constructed and expanded the MFT22 dataset with new scenarios and species, achieving an IDF1 score of 30.6%, the highest among models tested on the original dataset.
- Validated the model under varying lighting conditions, dense fish distributions, partial occlusions, and rapid movements to show strong generalization across different environments.

MineRL: Minecraft-playing agent based on Reinforcement Learning   May 2022 - Sep 2022
UCInspire Summer program, supervised by Prof. Xiaohui Xie, UC, Irvine
- Developed an AI agent to play Minecraft based on preference-based reinforcement learning method.
- Applied the Vedio PreTraining (VPT) model from OpenAI to predict actions based on video inputs.
- Trained an inverse dynamics model on a small, labeled dataset and fine-tuned it on a larger, unlabeled dataset using behavior cloning to improve the Minecraft-playing agent's accuracy.
- Integrated a 3D GAN architecture to generate diverse Minecraft world snippets, enabling richer training scenarios.

- Trained the model on 70,000 hours of IDM-labeled videos, achieving high accuracy in action prediction and environmental simulation within Minecraft.

COURSE PROJECT EXPERIENCE

32-bit Model Computer Based on Single-Cycle CPU.   Jul 2022 - Aug 2022
- Designed and implemented a 32-bit single-cycle CPU (Minisys-1) based on the MIPS architecture using Vivado, including instruction fetch, decode, control, execution, and memory modules, with integrated LED and DIP switch functionality for testing.
- Utilized EDA debugging tools to analyze system-on-chip (SoC) interfaces and built a cross-development environment to simulate and validate the MIPS soft core processor.
- Developed a language mapping mechanism to translate between P-code and MIPS instructions, leveraging structural rules and storage formats to ensure efficient program execution.

TEACHING

EECS 6894: Hardware/Software Co-Design for Data Center Processing   Sep 2024 - Present
Columbia University, Teaching assistant
- Assisted with project grading and held weekly office hours for the graduate-level course.

HONORS & AWARDS

- China Agricultural University, Academic Excellence Award   2022
- China Agricultural University, Academic Excellence Award   2021

SKILLS

- Languages: C/C++, Java, Python, C#, MATLAB, R, Verilog.
- Database Systems: MySQL, SQL Server, MongoDB.
- Development Tools: Linux, Git, Qt, Docker, ChampSim
- Machine Learning Framework: PyTorch, Tensorflow.
- Big Data & Cloud Platforms: Hadoop, Apache Spark, HBase, AWS, GCP, CloudLab.
- Markup/Typesetting Language: LaTeX.