Hao Bai

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EDUCATION

Zhejiang University Hangzhou, China
Bachelor of Engineering in Electronic & Computer Engineering 09/2019- 05/2023
Honors: Dean's list of 2021

University of Illinois at Urbana-Champaign Champaign, IL
Bachelor of Science in Computer Engineering 09/2019- 06/2023
Courses: Computer Systems Engineering, Applied Parallel Programming, Probability with Engineering Applications, Digital Systems Laboratory, Database Systems.

CQF Institute Online
Certificate Holder of Quantitative Finance 08/2022- 07/2023
Courses: Quantitative Risk and Return, Equities and Currencies, Fixed Income and Credit, Data Science, Machine Learning and Deep Learning.

PUBLICATION

Bai, Hao. "A Training Method For VideoPose3D with Ideology of Action Recognition." 2021 International Conference on Signal Processing and Machine Learning (CONF-SPML 2021). IEEE, 2021.
Bai, Hao. "VSC-WebGPU: A Selenium-based VS Code Extension For Local Edit And Cloud Compilation on WebGPU." 2021 IEEE 3rd International Conference on Frontiers Technology of Information and Computer (ICFTIC 2021). IEEE, 2021.
Bai, Hao. "GoAutoBash: Golang-based multi-thread automatic pull-execute framework with GitHub webhooks and queuing strategy." International Conference on Automation Control, Algorithm, and Intelligent Bionics (ACAIB 2022). Vol. 12253. SPIE, 2022.
Bai, Hao. "Modern Distributed Data-Parallel Large-Scale Pre-training Strategies For NLP models." 2022 6th International Conference on High Performance Compilation, Computing and Communications (HP3C 2022). ACM, 2022.
Bai, Hao. "ICP Algorithm: Theory, Practice And Its SLAM-oriented Taxonomy." Preprint. Accepted by 2022 International Conference on Computing and Data Science (CONF-CDS 2022). Springer, 2022.
Bai, Hao. "Statistical and Geometric Views of Linear Algebra." Preprint. Accepted by 2022 International Conference on Modeling, Algorithm and Artificial Intelligence (MAAI 2022). IEEE, 2022.
Bai, Hao. "A Neuro-symbolic Approach To Fully Automated Programming." Accepted by International Conference of Machine Learning and Machine Intelligence (MLMI 2022). ACM, 2022.
Bai, Hao. "Modern Deep Learning Frameworks: A Top-down Approach." Book contracted with Tsinghua University Press (TUP), 2023.

PROFESSIONAL EXPERIENCE

Cloud Architecture Research Intern, Microsoft Research Asia Beijing, China
Research Intern, Advisor: Shilin He, MSRA DKI Group 11/2022- Present

- Cleaned, mined and visualized tabular data using techniques including the Azure KQL language and various Python libraries.
- Classified generated logs using GPT-based methods with real data supported by Microsoft.

Book Author, Tsinghua University Press Beijing, China
Contracted Treatise Author, Editor In Charge: Meiying Shen, TUP CS Department 08/2022- Present

- Developed the open-source software framework for deep learning *MedoFlow* from scratch, which is able to train and inference naïve networks on CPU and GPU, and described the design and implementation in the book.
- Surveyed and taxonomized popular existing deep learning frameworks and formed the book *Modern software frameworks for deep learning: A Top-down Appraoch*.

SELECTED RESEARCH EXPERIENCES

A Neuro-symbolic Approach To Fully Automated Programming Champaign, IL
Individual research project 07/2022 -08/2022

- Proposed a simple neuro-symbolic approach that integrates the natures of programming and the existing very large-scale language models to generate code fully automatically.
- Concluded empirically several prompt templates for generating better code using Codex and GPT-3.
- Profiled the performance of GitHub Copilot and GPT-3 on different tasks, and summarized their various capabilities.

Instance Segmentation with Rendering 3D Objects Champaign, IL
Summer research project, Advisor: Prof. Jooyoung Seo, NCSA SPIN Program 06/2022 -07/2022

- Built an image segmentation dataset for segmenting from scratch and classifying each brick in a Lego stack.
- Completed a script for rendering images of 3D Lego brick objects from different directions using Maya to construct an artifact dataset in addition to the real dataset.
- Implemented a three-phase pipeline for instance segmentation, including background elimination (image segmentation with U-Net), instance segmentation (with Mask R-CNN), and image segmentation (with GoogLeNet).

VS Code Extension for AT&T i386/IA32 Assembly Language Support Hangzhou, China
Research project, Advisor: Prof. Steve S. Lumetta, UIUC ECE Department 01/2022 -03/2022

- Implemented the language server and client of AT&T x86 Assembly language as a VS Code extension with help from Prof. Lumetta and Qi Li, which has been officially approved to be an auxiliary tool to use for students taking ECE 391.
- Developed keyword highlighting, snippet auto completion, and code linting (static syntax and semantic check) for the language server.

Distributed Data Parallel Training for Large Scale Deep Learning Models Champaign, IL
Individual research project, Advisor: Prof. Kindratenko Volodymyr, UIUC ECE Department 12/2021 -05/2022

- Reproduced the GPT-2 and RoBERTa models on the mini-supercomputer HAL at NCSA.
- Applied different data-parallel training strategies on the PyTorch version of GPT-2, like Single Parameter Server (DP), Distributed Parameter Server (DDP), Horovod and Apex.
- Profiled, visualized and compared the performance of each strategy in detail and completed a detailed technical report, which was accepted by the conference HP3C.

GoAutoExecuter: Golang-based Multi-Thread Automatic Pull-Execute Framework Hangzhou, China
Research project, Advisor: Prof. Steve S. Lumetta, UIUC ECE Department 10/2021 -02/2022

- Implemented the *GoAutoExecuter* framework inherited from Wenqing Luo's *GoAutoGrader* framework, which utilizes the GitHub WebHook to download students' repos, run the grading script, and pushes the results back to GitHub.
- Utilized Golang for the producer-consumer model and concurrent handling to improve the server throughput.

VSC-WebGPU: VS Code Extension for Local Edit & Online Submission Tasks Champaign, IL
Individual research project, Advisor: Prof. Volodymyr Kindratenko, UIUC ECE Department 09/2021 -10/2021

- Developed VS Code extension which utilizes Node JS and Selenium to help students write code locally and push the code to the course website with the extension, which helps students write better code on the course website.
- Utilized technics like blocking and waiting using Node JS to ameliorate user's experience when uploading the code.

Optimized Transformer SoC Design based on the Gemmini Architecture on Chipyard Framework Hangzhou, China
Summer Research Project, Advisor: Prof. Kejie Huang, Institute of VLSI Design, ZJU 06/2021 -10/2021

- Used CHISEL language to conduct FPGA system programming and improved Gemmini architecture to realize performance optimization module for the transformer.
- Adopted systolic array and PE weight to optimize some layers of the transformer and accordingly advanced the design of the chip to reduce power consumption and area.
- Operated simulation and debugging using Spike and sbt. Chose C as the model framework language.
- Utilized Docker as the working environment and mounted the working directories in the host machine with Git as the version control system.

Co-planar Data Enhancement of Human3.6M Hangzhou, China
Research Project, Advisor: Prof. Gaoang Wang, ZJU-UIUC ECE Department 03/2021 -02/2022

- Built a new dataset based on Human3.6M. Transformed the dataset from single-object to multi-object using rotation, shifting, and collision elimination, etc.

- Designed, implemented and optimized an algorithm to eliminate the collisions of the new dataset with multiple co-planar objects.

IntLife: Wechat applet development based on Vue.js and UniDB Hangzhou, China
Software Development Engineer, ZJU-UIUC Residential College 10/2020 -07/2021
- Developed an official efficient communication applet for the residential college that enables identity authentication, encryption communication, event announcement, lost & found, secondary market, grouping, etc.
- In charge of developing message list and message interchanging. Operated back-end systems.
- Constituted the front-end module using Vue.js. Used cloud functions provided by UniApp and cloud database by UniDB as an end-to-end communication method.

EXTRACURRICULAR EXPERIENCE

Workshop Attendee, Information Retrieval Workshop, NAACL'22 07/2022
- Translated the robust IE and multimodal IE presentations.
- Learnt unsupervised IE, robust IE, multimodal IE and transfer learning for IE.

Second Place, Hackathon of Ashby Prize'22 05/2022
- Implemented the 3D Conv-LSTM model to predict voxels using data in meteorology.
- Visualized results from models implemented by teammates, including MLP, 3D CNN, 3D Conv-LSTM, and the Swin Transformer.

Teaching Assistant, ZJU-UIUC Institute 09/2021-01/2022, 09/2022-11/2022
- Assisted Prof. Loskot and Lumetta in teaching students in the course ECE220.
- Arranged office hour to answer students' questions. Developed and maintained the GitLab tools for student submissions.

Honorable Mention, COMAP MCM Competition
- Leader of the team, and simulated the growth of fungi using Python.
- Implemented, and visualized the Random Forest algorithm to give predictions using Python and SPSS.

Co-founder, Hepta Workshop, Zhejiang University 07/2020-09/2022
- Established Hepta Studio to improve the IT service of the college community.
- Forward updates from course websites to mobile messengers. Constructed the portal website and email server of the studio.

Workshop Attendee, Computer Graphics Workshop, ASC Research 08/2021-10/2021
- Implemented and visualized the ICP algorithm utilizing point-point metric, point-line metric and line-line metric under guidance of Prof, Hao Li.
- Learnt rudimental knowledge in mesh processing, camera registration and calibration, the ICP algorithm, and SLAM.

SKILLS & Others

Computer: Python, C/C++, Golang, HTML, JavaScript, MySQL, MongoDB, Assembly (LC-3/Intel), LaTeX
Language: Chinese (Native), English (Proficient), Japanese (Rudimental)