Weifan Chen

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Education

Boston University Computer Science Department Boston, MA

Ph.D Candidate in Computer Science *Jan 2021 - present*

- System(Focus): Cyber-physical system; Real-time computing; Heterogeneous platform development
- Software: Formal methods for high-assurance software engineering
- Theory: Advanced optimization algorithm; Randomized algorithm

Boston University Computer Science Department Boston, MA

MSc in Artificial Intelligence; GPA 3.9 *Sep 2019 - Dec 2020*

- Artificial Intelligence: Image and video computing; Machine learning; Natural language processing
- System: Computing and operating system; Embedded system development; Network; Database
- Software: Functional programming

University of Wisconsin Madison Physics Department Madison, WI

BS. In Physics; Math certificate; GPA 3.3 *Sep 2013 - Dec 2016*

- Mathematics: Linear Algebra; Calculus; College geometry;Statistics
- Physics: Classical mechanics and electrodynamics; Statistic; Quantum Mechanics; Thermal Physics

Research Experience

Research Assistant in Cyber Physical System Sep 2020 — Present

Boston University Cyber Physical System Lab *Boston, MA*

- The correctness of safety-critical systems depends on both their logical and temporal behavior. As the complexity of modern multi-core heterogeneous platforms grows, ensuring the temporal behavior of those platforms becomes an open challenge. We design and implement innovative solutions on commercial-off-the-shelf platforms.
- Theorize, implement, and test a paradigm in which a heterogeneous platform can achieve self-awareness in timeliness with near zero overhead. The work is in submission. During the process, I mastered debug techniques such as ARM® program trace, debug hardware from Lauterbach®, and skills in program control flow analysis. I also cultivate skills in heterogeneous embedded system development on platforms from AMD® Xilinx.
- Develop an on-chip debug system for ARM® Embedded Trace Macrocell on a Xilinx development board. Not only the system can partially replace an hardware tracer worthy 20,000$ on market, but also achieves better flexibility and functionality real-time environment.
- Co-develop a memory bandwidth regulator which can prevent timeliness violation by reducing multi-core program interference. The regulator also achieves significant low overhead compared with other state-of-the-art regulation mechanism. The work is in submission.
- Through various hardware designs and implementation on FPGA, developed skills in writing register-transfer-level code, such as Verilog.
- Through fixing abnormalities on computation platforms at different levels, accumulated decent amount of knowledge and intuition in debugging.
- Develop teamwork and communication skills through regular brainstorm sessions with advisors and team, and through mentoring other students.
- Teamwork with the principle investigator and participate the NSF grant application process.

Research Consultant Jan 2020 — present

Machine learning, Boston University Brain Image Lab *Boston, MA*

- Teach and mentor other student researchers in analyzing biomedical data via machine learning techniques.
- Adapt and implement a state-of-the-art reinforcement learning backed evolutionary algorithm to model Alzheimer's disease. The model can classify different stage of the disease via analyzing bio-markers.
- Magnetic resonance imaging produces a wealth of bio-markers. I developed a 3D deep learning framework to analysis the MRI of Gulf War illness patients. The result is published.
- Work with the principle investigator and researchers to frame problems and set plans.
- Search and review suitable literature. Design and implement suitable algorithms.
- Systematically conduct experiments and interpret results.

Student Research Assistant Sep 2019 — Sep 2020

Computer Vision, Boston University Image and Video Computing Group *Boston, MA*

- Focus on explainable AI. Investigate how deep learning models make predictions and decisions.
- Work on a deep neural network backed decision tree model to turn the deep learning model's inference process into a decision tree.
- Use deep learning to study human pose estimation and joint detection.
- Explore the potential of using artificial intelligence to help people with physical disabilities.
- Contribute to computer vision community by establishing a human exercise dataset.

Teaching Experience

Teaching Assistant Fall 2020

CS320 : Functional Programming Language and Design *Boston University*

Publication

- Guan Y.;Cheng C-H.; **Chen W**.;Zhang Y. et al. Neuroimaging Markers for Studying Gulf-War Illness: Single-Subject Level Analytical Method Based on Machine Learning. Brain Sci. 2020, 10, x; doi:10.3390/brainsci10110884
- Yi Guan, Seyed Amir Ebrahimzadeh, Chia-hsin Cheng, **Weifan Chen**, Tiffany Leung, Sherman Bigornia, Natalia Palacios, Mahdi O. Garelnabi, Tammy Scott, Rafeeque Bhadelia, Katherine L. Tucker, Bang-Bon Koo, Association of Diabetes and Hypertension With Brain Structural Integrity and Cognition in the Boston Puerto Rican Health Study Cohort Neurology Mar 2022, 10.1212

Selected Projects

System & Embedded

- A Real time trace for multi-core application on embedded Linux
- Time progress assessment paradigm that can handle execution negative slack, and conduct timely correction.
- A memory bandwidth controller that utilizes low power real-time core to prevent the main core from memory bus contention.
- A simulator for analyzing the performance of multi-server system
- Implementation of the back-end of database from SimpleDB.

Machine Learning & Deep Learning & Artificial Intelligence

- 3D convolutional neural networks specialized for brain MRI scan data
- A pipeline for key feature identification for neurological biomarkers via machine learning and evolution algorithm
- A static analysis on the performance of deep neural network via model parameter metrics
- Multiple cell detection and tracking via computer vision techniques
- Using reinforcement learning algorithm as controller for drones

Physical Science

- Discrete simulator on three-celestial-body movement under gravitational field.
- An analysis on 97D rubidium atom in magnetic fields via quantum perturbation theory.

Rewards

- Dean's List physics department at University of Wisconsin Madison, 2014
- Ingersoll Physics scholarship reward at University of Wisconsin Madison, 2014
- Beijing high school math competition 2nd reward, 2013
- Beijing high school physics competition 2nd reward, 2013

Selected Skills

Languages: Python, Java, C/C++, OCaml, Bash, SQL, MongoDB
Libraries: PyTorch, TensorFlow, Sklearn, Pandas, Networkx
Hardware/Framework: Verilog, Xilinx Vivado/SDK/PetaLinux