Siyuan Chai

Contact Information

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https://schai.me

Research Interests

High-Performance Computing, Operating System, Systems for ML

Education

Northwestern University, Evanston, IL

B.S. Computer Science, B.S. Electrical Engineering — Expected: 2021
GPA: 4.0/4.0

Washington University in St. Louis, St. Louis, MO

B.S. Computer Science, B.S. Electrical Engineering — Transferred
GPA: 4.0/4.0

Research Experience

Research Assistant — Apr. 2020 to Present
Prescience Lab, Northwestern University
Advisor: Prof. Peter Dinda
KARAT: Kernel Implementation of Compiler- and Runtime-Based Address Translation

- Implemented a competitive paging address space in Nautilus, an Areokernel maintained in Dinda's group
- Enabled paging with data structures include red black tree, splay tree and skip list to track VA-PA mapping
- Introduced support for 1GB/2MB page and PCID
- Proved validity of implement in performance test with PMC register

Research Assistant — June 2019 to Present
Image and Video Processing Lab, Northwestern University
Advisor: Prof. Aggelos Katsaggelos
DeepCOVID-XR

- Co-designed and implemented a CNN model to flag out positive COVID cases based on patients' chest X-ray images
- Outperformed experienced radiologists with an accuracy of 85% compared to 76 - 82% and AUC of 0.935 compared to 0.819 - 0.856

ValveNet

- ValveNet aims to replace manual-force calculation of mitral regurgitation flow on Doppler images with automatic CNN approach
- Proved feasibility of CNN approach by training transfer learning models of AlexNet and DRCNN on in-vitro data, which achieved less than 5% of MSE
- Working on designing and training of a CNN to predict the Mitral Regurgitation from in-vivo Doppler Images

Research Assistant — June 2018 to May 2018
XZ Group, Washington University in St. Louis
Advisor: Prof. Xuan Zhang

- Implemented position approximation algorithm in C++ for autonomous driving on a self-3D-printed platform
- Calculated heading from geomagnetic sensor readings and approximated displacement with accelerometer

Publications and Submitted Papers

1. Ramsey M Wehbe, Jiayue Sheng, Shinjan Dutta, **Siyuan Chai**, Amil Dravid, Semih Barutcu, Yunan Wu, Donald R. Cantrell, Nicholas Xiao, Hatice Savas, Rishi Agrawal, Nishant Parekh, Aggelos K. Katsaggelos. "DeepCOVID-XR: An Artificial Intelligence Algorithm to Detect COVID-19 on Chest X-rays." *Radiological Society of North America (Submitted to RSNA 2020)*

Work in Progress

1. KARAT: Kernel Implementation of Compiler- and Runtime-Based Address Translation
   with Brian Suchy, Souradip Ghosh, Drew Kersnar, Zhen Huang, Peter Dinda
2. ValveNet: Mitral Regurgitation Flow Prediction with Convolutional Neural Network
   with Jiayue Sheng, Ramsey M. Wehbe, Aggelos K. Katsaggelos.

Teaching Experience

Peer Mentor (Undergraduate TA) - Northwestern University

COMP_SCI 336 - Design & Analysis of Algorithms
Instructor: Konstantin Makarychev — Winter 2020
Instructor: Jason Hartline — Spring 2019, Fall 2019

Teaching Assistant - Washington University in St. Louis

ESE 205 - Introduction to Engineering Design — Spring 2018
Instructor: James Feher

Awards and Honors

Dean's List, all quarters — 2017 - Present
ICPC, Mid-Central Regional, **Top 20%** — 2018
VEX Robotics International Championship, **Top 4 Alliance** — 2016

Skills

Programming languages:
C/C++, Python, Java, JavaScript, MATLAB, Ruby, mySQL, Racket
System-level Development:
QEMU, VMware, Unix/Linux, Multi-threading, GNU Make, GDB, LLVM
Artificial Intelligence:
Image Processing, Computer Vision, Docker, PyTorch, Tensorflow, Keras
Hardware:
Raspberry Pi, Arduino, VHDL, 3D printing, SOLIDWORKS
Web Development:
HTML, CSS, Flask, React, Bootstrap, database