

Siyuan Chai

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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
Parallelism Group, Northwestern University

Advisor: [Prof. Peter Dinda](#)

KARAT: Replacing Paging in the Kernel via the Compiler and Runtime

KARAT is an allocation level address space implementation based on CARAT, which aims to replace virtual memory and paging with compile-time optimization on protection checks and runtime of tracking of allocations.

- Implemented a competitive paging address space in Nautilus, an Areokernel maintained in Dinda's group
- Designed C-style polymorphism that supported data structures include red black tree and splay tree to track VA-PA mapping
- Introduced support for 1GB/2MB page and PCID; performance measured with Performance Monitoring Counter
- Designed runtime protection check with address mapping data structures

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 Jan. 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	<ol style="list-style-type: none"> 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 radiographs trained and tested on a large us clinical dataset." <i>Radiology</i>. [Online]. Available: https://doi.org/10.1148/radiol.2020203511. 2. Brian Suchy, Souradip Ghosh, Drew Kersnar, Siyuan Chai, Zhen Huang, Aaron Nelson, Michael Cuevas, Gaurav Chaudhary, Alex Bernat, Nikos Hardavellas, Simone Campanoni, Peter Dinda. "KARAT: Replacing Paging in the Kernel via the Compiler and Runtime." <i>In preparation</i>. 3. Siyuan Chai, Jiayue Sheng, Ramsey M Wehbe, Aggelos K. Katsaggelos. "ValveNet: Mitral Regurgitation Flow Prediction with Convolutional Neural Network." <i>In preparation</i>. 		
TEACHING EXPERIENCE	<p>Peer Mentor (Undergraduate TA) - Northwestern University</p> <p>COMP_SCI 336 - Design & Analysis of Algorithms</p> <p>Instructor: Konstantin Makarychev Winter 2020</p> <p>Instructor: Jason Hartline Spring 2019, Fall 2019</p> <p>Teaching Assistant - Washington University in St. Louis</p> <p>ESE 205 - Introduction to Engineering Design Spring 2018</p> <p>Instructor: James Feher</p>		
AWARDS AND HONORS	<p>Dean's List, all quarters 2017 - Present</p> <p>ICPC, Mid-Central Regional, Top 20% 2018</p> <p>VEX Robotics International Championship, Top 4 Alliance 2016</p>		
PROJECTS	<p>TrustZone</p> <ul style="list-style-type: none"> • Researched how OP-TEE implemented Trusted Execution Environment • Explored deployment of OP-TEE on Raspberry Pi 3 and pin control in trusted application <p>Ping-Pong shooting Car</p> <ul style="list-style-type: none"> • Built a Ping-Pong shooting car from Raspberry Pi and 3D printed parts • Deployed server on Raspberry Pi with Flask to enable real-time wireless control • Installed a webcam on car to simulate first-person video streaming • Implemented facial recognition with OpenCV in streaming <p>Sunlight Alarm</p> <ul style="list-style-type: none"> • Designed, and programmed an Arduino-Raspberry Pi system that pleasantly wakes user up with sunshine by automatically lifting the window shades at preset time • Implemented a local time/weather reminder in C/Python which displays local weather 		
SKILLS	<p>Programming languages:</p> <p>C/C++, Python, Java, JavaScript, MATLAB, Ruby, mySQL, Racket</p> <p>System-level Development:</p> <p>QEMU, VMware, Unix/Linux, Multi-threading, GNU Make, GDB, LLVM</p> <p>Artificial Intelligence:</p> <p>Image Processing, Computer Vision, Docker, PyTorch, Tensorflow, Keras</p> <p>Hardware:</p> <p>Raspberry Pi, Arduino, VHDL, 3D printing, SOLIDWORKS</p> <p>Web Development:</p> <p>HTML, CSS, Flask, React, Bootstrap, AJAX</p>		