

# Siyuan Chai

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CONTACT INFORMATION	siyuanchai2021@u.northwestern.edu <a href="https://schai.me">https://schai.me</a>
RESEARCH INTERESTS	High-Performance Computing, Operating System, Systems for ML
EDUCATION	<b>Northwestern University</b> , Evanston, IL B.S. Computer Science, B.S. Electrical Engineering Expected: 2021 GPA: 4.0/4.0 <b>Washington University in St. Louis</b> , St. Louis, MO B.S. Computer Science, B.S. Electrical Engineering Transferred GPA: 4.0/4.0
RESEARCH EXPERIENCE	<b>Research Assistant</b> Apr. 2020 to Present Parallelism Group, Northwestern University Advisor: Prof. Peter Dinda <i>KARAT: Replacing Paging in the Kernel via the Compiler and Runtime</i> 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. <ul style="list-style-type: none"><li>• Implemented a competitive paging address space in Nautilus, an Areokernel maintained in Dinda's group</li><li>• Designed C-style polymorphism that supported data structures include red black tree and splay tree to track VA-PA mapping</li><li>• Introduced support for 1GB/2MB page and PCID; performance measured with Performance Monitoring Counter</li><li>• Designed runtime protection check with address mapping data structures</li></ul> <b>Research Assistant</b> June 2019 to Present Image and Video Processing Lab, Northwestern University Advisor: Prof. Aggelos Katsaggelos <i>DeepCOVID-XR</i> <ul style="list-style-type: none"><li>• Co-designed and implemented a CNN model to flag out positive COVID cases based on patients' chest X-ray images</li><li>• Outperformed experienced radiologists with an accuracy of 85% compared to 76 - 82% and AUC of 0.935 compared to 0.819 - 0.856</li></ul> <i>ValveNet</i> <ul style="list-style-type: none"><li>• ValveNet aims to replace manual-force calculation of mitral regurgitation flow on Doppler images with automatic CNN approach</li><li>• 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</li><li>• Working on designing and training of a CNN to predict the Mitral Regurgitation from in-vivo Doppler Images</li></ul> <b>Research Assistant</b> June 2018 to May 2018 XZ Group, Washington University in St. Louis Advisor: Prof. Xuan Zhang <ul style="list-style-type: none"><li>• Implemented position approximation algorithm in C++ for autonomous driving on a self-3D-printed platform</li><li>• Calculated heading from geomagnetic sensor readings and approximated displacement with accelerometer</li></ul>

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 radiographs trained and tested on a large us clinical dataset." *Radiology*. [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." *In preparation*.
3. **Siyuan Chai**, Jiayue Sheng, Ramsey M Wehbe, Aggelos K. Katsaggelos. "ValveNet: Mitral Regurgitation Flow Prediction with Convolutional Neural Network." *In preparation*.

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

PROJECTS

**TrustZone**

- Researched how OP-TEE implemented Trusted Execution Environment
- Explored deployment of OP-TEE on Raspberry Pi 3 and pin control in trusted application

**Ping-Pong shooting Car**

- 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

**Sunlight Alarm**

- 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

**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, AJAX