Siyuan Chai

CONTACT
INFORMATION
siyuanc3@illinois.edu
https://schai.me

EDUCATION
University of Illinois, Urbana Champaign, IL
Computer Science Ph.D.   Start Aug. 2021
Advisor: Prof. Tianyin Xu

Northwestern University, Evanston, IL
M.S. Computer Science, B.S. Electrical Engineering   Graduated June 2021
GPA: 4.0/4.0 (Summa Cum Laude)

SKILLS
Programming languages:
C/C++, Python, Java, Go, JavaScript, MATLAB, mySQL, Racket
System-level Development:
Unix/Linux, QEMU, LLVM, OpenMP, Multi-threading, GNU Make, GDB
Artificial Intelligence:
Image Processing, Computer Vision, CUDA, Docker, PyTorch, Tensorflow, Keras

RESEARCH
EXPERIENCE
UIUC Xlab, Prof. Tianyin Xu   Aug. 2021 to Present
Support Linux Kernel for Elastic Cuckoo Page Table
- Adapting Linux kernel to support Elastic Cuckoo Page Table (ECPT), a hash page table that aims to replace paging by enabling memory-level parallelism
- Exploring the design space like page management, allocation and cache policy in linux running on ECPT

NU Compilers Group, Prof. Simone Campanoni   Jan. 2021 to July 2021
Enhance Parallelism by Utilizing Commutative Loop iterations
- Programmed with LLVM to tell if a strongly connected component within a loop iteration in program dependence graph is commutative
- Extend the idea to develop tools for loop iteration commutativity for further utilization of parallelism

NU Parallelism Group, Prof. Peter Dinda   June 2020 to May 2021
CARAT CAKE: Replacing Paging via Compiler/Kernel Cooperation
- Designed and implemented CARAT CAKE, an allocation level address space which aims to replace virtual memory and paging with protection checks inserted at compile time and allocations tracked in runtime
- Implemented a competitive paging address space with support for red black tree and splay tree data structures to track VA-PA mapping, Transparent Huge Pages, and PCID; performance measured with Performance Monitoring Counter
- Designed runtime protection check with address mapping data structures

Image & Video Processing Lab, Prof. Aggelos Katsaggelos June 2019 to July 2021
DeepCOVID-XR
- 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

PUBLICATIONS
AND WORKING
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 algorithmto detect covid-19 on chest radiographs trained and tested

on a large us clinical dataset." *Radiological Society of North America.* [Online]. Available: https://doi.org/10.1148/radiol.2020203511.

2. Brian Suchy, Souradip Ghosh, Aaron Nelson, Zhen Huang, Drew Kersnar, **Siyuan Chai**, Michael Cuevas, Gaurav Chaudhary, Alex Bernat, Nikos Hardavellas, Simone Campanoni, Peter Dinda. "CARAT CAKE: Replacing Paging via Compiler/Kernel Cooperation." *Submitted for ASPLOS 2022.*

WORK EXPERIENCE	**Research Intern**, Tencent Network Group June 2021 to Aug. 2021

Service Driven Network Verification tool
- Contributed to design a scalable network verification that supports quantitative query and covers all data plane with global formal modeling and local simulation
- Designed easy-to-use geo-based intent language for network verification

PROJECTS

C-style Language Compiler, CS 322 Compiler Construction
- Created, from scratch, a compiler to translate C-style language to x86_64 assembly
- Implemented features including graph-coloring register allocation, liveness analysis, instruction selection with tiling, control flow graph, and memory access checking

Middle End Analysis for a C-based API, CS 323 Code Analysis & Transformation
- Coded a LLVM pass to optimize program in a custom C-based API
- Implemented analysis including reaching-definition, constant propagation and folding, alias analysis for the specific API, function inlining, and dead code elimination

PROFESSIONAL ACTIVITIES

SOSP 2021: Artifact Evaluation Committee, Slack Co-chair

TEACHING EXPERIENCE

Peer Mentor (Undergraduate TA) - Northwestern University

Spring 2021	CS 336 - Design & Analysis of Algorithms	with Prof. Jason Hartline
Winter 2021	CS 343 - Operating Systems	with Prof. Peter Dinda
Winter 2020	CS 336 - Design & Analysis of Algorithms	with Prof. Konstantin Makarychev
Fall 2019	CS 336 - Design & Analysis of Algorithms	with Prof. Jason Hartline
Spring 2019	CS 336 - Design & Analysis of Algorithms	with Prof. Jason Hartline

Teaching Assistant - Washington University in St. Louis

Spring 2018	ESE 205 Introduction to Engineering Design	with Prof. James Feher

AWARDS AND HONORS

Dean's List, all quarters	2017 - 2021
ACM-ICPC, Mid-Central Regional, **Top 20%**	2018
VEX Robotics International Championship, **Top 4 Alliance**	2016