

Siyuan Chai

CONTACT INFORMATION	siyuanc3@illinois.edu https://schai.me
EDUCATION	<p>University of Illinois, Urbana Champaign, IL Computer Science Ph.D. Start Aug. 2021 Advisor: Prof. Tianyin Xu</p> <p>Northwestern University, Evanston, IL M.S. Computer Science, B.S. Electrical Engineering Graduated June 2021 GPA: 4.0/4.0 (Summa Cum Laude)</p>
SKILLS	<p>Programming languages: C/C++, Assembly, Python, Java, Go, JavaScript, MATLAB</p> <p>System-level Development: Unix/Linux, QEMU, Docker, GDB, Make, Linker, LLVM, OpenMP</p> <p>Artificial Intelligence: CUDA, PyTorch, Tensorflow, Keras, Image Processing, Computer Vision</p> <p>Web Development: HTML, CSS, Flask, Django, React</p>
RESEARCH EXPERIENCE	<p>UIUC Xlab, Prof. Tianyin Xu Aug. 2021 to Present <i>Support Linux Kernel for Elastic Cuckoo Page Table</i></p> <ul style="list-style-type: none">Adapting Linux kernel, primarily the memory management portion, to support Elastic Cuckoo Page Table (ECPT), a hash page table that aims to replace paging by enabling memory-level parallelismExtensively modified memory translation portion of QEMU to simulate ECPT's hardware behaviorExploring the design space like page management, allocation and cache policy in linux running on ECPT <p>NU Compilers Group, Prof. Simone Campanoni Jan. 2021 to July 2021 <i>Enhance Parallelism by Utilizing Commutative Loop iterations</i></p> <ul style="list-style-type: none">Coded a LLVM pass to tell the commutativity of <load, ALU operation, store> triplet across loop iterationsExtend the idea to develop tools for loop iteration commutativity for further utilization of parallelism <p>NU Parallelism Group, Prof. Peter Dinda June 2020 to May 2021 <i>CARAT CAKE: Replacing Paging via Compiler/Kernel Cooperation</i></p> <ul style="list-style-type: none">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 runtimeImplemented 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 CounterDesigned runtime protection check with address mapping data structures <p>Image & Video Processing Lab, Prof. Aggelos Katsaggelos June 2019 to July 2021 <i>DeepCOVID-XR</i></p> <ul style="list-style-type: none">Designed and implemented a CNN model to flag out positive COVID cases based on patients' chest X-ray imagesOutperformed 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	<div><div>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>Radiological Society of North America</i>. [Online]. Available: https://doi.org/10.1148/radiol.2020203511.</div><div>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." <i>Submitted for ASPLOS 2022</i>.</div></div>		
WORK EXPERIENCE	Research Intern , Tencent Network Group <i>Service Driven Network Verification tool</i>	June 2021 to Aug. 2021 <ul style="list-style-type: none">Contributed to design a scalable network verification that supports quantitative query and covers all data plane with global formal modeling and local simulationDesigned easy-to-use geo-based intent language for network verification	
PROJECTS	C-style Language Compiler , CS 322 Compiler Construction <ul style="list-style-type: none">Created, from scratch, a compiler to translate C-style language to x86_64 assemblyImplemented 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 <ul style="list-style-type: none">Coded a LLVM pass to reduce calls to a custom C-based API by implementing analysis like 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 <ul style="list-style-type: none">Spring 2021 CS 336 - Design & Analysis of Algorithms with Prof. Jason HartlineWinter 2021 CS 343 - Operating Systems with Prof. Peter DindaWinter 2020 CS 336 - Design & Analysis of Algorithms with Prof. Konstantin MakarychevFall 2019 CS 336 - Design & Analysis of Algorithms with Prof. Jason HartlineSpring 2019 CS 336 - Design & Analysis of Algorithms with Prof. Jason Hartline Teaching Assistant - Washington University in St. Louis <ul style="list-style-type: none">Spring 2018 ESE 205 Introduction to Engineering Design with Prof. James Feher		
AWARDS AND HONORS	Dean's List , all quarters ACM-ICPC, Mid-Central Regional, Top 20% VEX Robotics International Championship, Top 4 Alliance	2017 - 2021 2018 2016	