# JINGYUAN CHEN

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## EDUCATION

**Princeton University** 2022 -
*Master & PhD in Computer Science* *New Jersey, US*

**University of North Carolina at Chapel Hill** 2018 - 2022
*Bachelor of Science in Computer Science, Bachelor of Science in Mathematics* *Chapel Hill, US*

· Graduated with highest honor, GPA: 3.99/4.0

## RESEARCH INTERESTS

Decentralized Systems, Programming Languages, Security, Verifiable Computation

## RESEARCH EXPERIENCES

**LITMUS$^{RT}$ Kernel Development** Sep 2020 - Present
*Undergraduate Research* (advised by `James H. Anderson` and `F. Don Smith` )
Assisted the development and maintenance of LITMUS$^{RT}$, an extension of Linux designed for experimenting with real-time scheduling and synchronization protocols. Updated scheduling modules to make LITMUS$^{RT}$ compatible with recent Linux versions. Developed unit testing tools to verify the correctness of schedulers and fixed bugs in LITMUS$^{RT}$ kernel modules.

**Applying SMT to Real-time Systems** Sep 2020 - Present
*Undergraduate Research* (advised by `James H. Anderson` and `F. Don Smith` )
Worked to demonstrate the safety of employing simultaneous multithreading (SMT) in safety-critical real-time systems. As the only undergraduate on the team, I converted real-world benchmarks to LITMUS$^{RT}$ compatible tasks, implemented user-space functionalities to support SMT-enabled task sets, and successfully validated the safety of SMT-enabled multi-core mixed-criticality systems through case studies on LITMUS$^{RT}$. See publications below.

**Interpretable DNNs for Embedded Systems** Jan 2021 - Present
*Undergraduate Research* (advised by `Shahriar Nirjon`)
Aimed to improve the trustworthiness of deep neural networks (DNNs) in embedded systems through deep learning interpretability methods. Developed frameworks to output human-interpretable functional differences between DNNs for embedded systems. Constructed mechanisms to decompose large-scale DNNs into functionally interpretable subcomponents for resource-constrained embedded systems.

**Cache Eviction Kernels on NVIDIA GPUs** Jan 2021 - Present
*Undergraduate Research* (advised by `James H. Anderson` and `F. Don Smith` )
Worked with another graduate student on enabling reliable worst-case execution times (WCETs) estimation for real-time tasks on NVIDIA GPUs under cache contention. Reverse-engineered the hash-mapping function of the last-level cache of the GTX 1080 GPU following existing works. Implemented eviction kernels for generating cache interference for real-time GPU tasks. Conducted experiments to evaluate the influence of GPU cache contention on WCETs. See publications below.

**Evaluation of Interference Channels in NVDIA GPUs** Aug 2021 - Present
*Undergraduate Honor Thesis* (advised by `James H. Anderson` and `F. Don Smith`)

Targeted to accurately model and effectively mitigate inter-task and intra-task memory interference of tasks on NVIDIA GPUs. Developed tracing facilities based on NVidia Binary Instrumentation Tool (NVBit) to simulate memory behaviors of GPU kernels. Modified the NVIDIA driver to support fine-grained page coloring for cache and DRAM partitioning. Directed experiments to quantify memory interference between concurrent GPU tasks and within an individual GPU task.

## PROJECTS

**JOS64 Exokernel** Jan 2020 - May 2020
*Course Project* (advised by `Donald Porter`)
- `https://github.com/leochanj105/JOS64.git`
- An x86-based exokernel style operating system

**Distributed Object Replication Framework** Jan 2020 - May 2020
*Course Project* (advised by `Prasun Dewan`)
- `https://github.com/leochanj105/Distributed-replication-framework`
- A Java distributed object replication framework supporting consensus protocols

**2D Computer Graphics Library** Aug 2019 - Dec 2019
*Course Project* (advised by `Mike Reed`)
- `https://github.com/leochanj105/2D-Graphics-Lib`
- A 2D computer graphics rendering library in C++

## PUBLICATIONS

1. [**RTSS 2022**] Tyler Yandrofski, **Jingyuan Chen**, Nathan Otterness, James H. Anderson, and F. Donelson Smith. Making powerful enemies on nvidia gpus. In *2022 IEEE Real-Time Systems Symposium (RTSS)*, pages 383–395. IEEE, 2022
2. [**RTAS 2022**] Sims Hill Osborne, Joshua Bakita, **Jingyuan Chen**, Tyler Yandrofski, and James H. Anderson. Minimizing DAG utilization by exploiting SMT. In *2022 IEEE 28th Real-Time and Embedded Technology and Applications Symposium (RTAS)*. IEEE, 2022
3. [**JRWRTC 2021**] Tyler Yandrofski and **Jingyuan Chen**. Towards demystifying cache interference on NVIDIA GPUs. *JRWRTC 2021*, page 13, 2021. **Best workshop paper**.
4. [**RTAS 2021**] Joshua Bakita, Shareef Ahmed, Sims Hill Osborne, Stephen Tang, **Jingyuan Chen**, F. Donelson Smith, and James H. Anderson. Simultaneous multithreading in mixed-criticality real-time systems. In *2021 IEEE 27th Real-Time and Embedded Technology and Applications Symposium (RTAS)*, pages 278–291. IEEE, 2021

## TECHNICAL SKILLS

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|---|---|
| **Familiar with** | Java, C, Python, Javascript, x86 Assembly, SQL, Ocaml, CUDA |
| **Have worked with** | C++, Go, Rust, Haskell, Lisp, Coq, Julia, Prolog, Swift |
| **Other Tools** | Tensorflow, Pytorch, Git, MatLab, Verilog |