


I'm a 2nd year Ph.D. student at the University of Michigan (advised by Prof. Satish Narayanasamy), working on confidential computing and trusted hardware, with a strong background in GPU architecture, memory systems and Out-of-Order CPU architecture. I'm looking for a research or engineering internship position during the summer of 2024.

My research seeks to advance confidential computing solutions for enabling privacy-preserving data analytics solutions ranging from population-scale genomic analysis to generative AI. My approach is to develop trustworthy hardware, and use it to efficiently guarantee privacy from the rest of system components, including the operating system and system administrators.

Please see next page for my CV and detailed background.

– Joy

# JUECHU DONG

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## SUMMARY

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Juechu (Joy) Dong is a 2nd year Ph.D. student with the Computer Engineering Lab at the University of Michigan, advised by Prof. Satish Narayanasamy. Her research seeks to advance confidential computing solutions for enabling privacy-preserving data analytics solutions ranging from population scale genomic analysis to generative AI. Her current work focuses on scaling trusted memory capacity from hundreds of MB to tens of TB and developing privacy-preserving genome-wide association study platform on Azure's confidential computing platform.

## EDUCATION

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### University of Michigan - Ann Arbor (exp.) 2027

*Computer Science and Engineering, PhD*

**Topics:** Computer System & Architecture, Trusted Hardware / Confidential Computing

**Advisor:** Prof. Satish Narayanasamy

**GPA:** 4.00/4.00

James B. Angell Scholar

2022-2023

Rackham International Student Fellowship

2023-2024

### University of Michigan-Shanghai Jiao Tong University Joint Institute Aug 2022

*Computer Engineering, Bachelor of Science*

John Wu & Jane Sun Outstanding Scholarship

2018-2022

Outstanding Academic Performance Scholarship

2018-2020

### University of Michigan - Ann Arbor Apr 2022

*Computer Engineering, Bachelor of Science in Engineering, Summa Cum Lauda*

**Selected Coursework:** Comp. Architecture A, Compiler A+, Operating System A

**GPA:** 3.99/4.00

Dean's List

2020-2022

University Honors

2020-2022

## PUBLICATION

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### VersionVault: Towards Large Capacity Trusted Memory with HW Protection ASPLOS 2024

*J. Dong, J. Rosenblum, S. Narayanasamy* *under submission*

- Scale trusted memory size from hundreds of MB to tens of TB by expanding the span of trusted from a single trusted processor to an entire platform including intelligent memories.
- Design a new scheme of freshness protection that reduces the space requirement by 50x.
- Reduce deployment cost by spacing sharing one intelligent memory device among multiple CPUs.

### mm2-long: Accelerating Accurate Ultra Long Genome Sequence Mapping on AMD GPU

*J. Dong, X. Liu, H. Sadasivan, G. Sitaraman, S. Narayanasamy* *on-going*

- Accelerate computational intensive chaining step in the state-of-art long sequence mapping tool minimap2 using AMD GPU by 5x.
- Optimize towards ultra long reads of 100k+ to accommodate genome sequencing technology trend.
- Develop adaptive GPU scheduling algorithm to balance highly heterogeneous workload.

## SECRET-GWAS: A Platform for Online Million-Patient Multi-institutional GWAS based on TEE Nature Methods

*J. Rosenblum, J. Dong, S. Narayanasamy* *under submission*

- Develop a thousand-core platform on Azure Confidential Computing to conduct multi-institutional GWAS on millions of patients in less than a minute.
- Adapt Spark-based Hail genomic analysis framework to run on TEE under obliviousness requirement.
- Parallelize GWAS computation on 1k cores to achieve near linear speedup.

## INDUSTRY EXPERIENCE

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### NVIDIA

May 2022 - Aug. 2022

*GPU Deep Learning Architect Intern*

- Model and analyze new memory features on next-gen GPUs such as distributed shared memory, asynchronous transaction barrier, etc.
- Analyze and optimize multi-GPU data movement for deep learning workloads using Tensor Memory Accelerator (TMA).

## TEACHING

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### Instructional Aide

2021FA, 2022WN

*EECS470 Computer Architecture*

- Primary Instructor: Prof. Ron Dreslinski / Prof. Mark Brehob

### Graduate Student Instructor

2023FA

*EECS471 Applied Parallel Programming with GPUs*

- Primary Instructor: Dr. Valeriy Tenishev

## SERVICE

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### Computer Engineering Lab Reading Group

2022 - present

*Coordinator*

- Organize weekly paper reading presentations and discussions.
- Host talks from visiting researchers and professors.

### UM-SJTU Joint Institute Alumni Association

2022 - present

*Founder & Vice President*

- **Alumni Engagement:** Organize alumni and student gatherings.
- **Relationship Building:** Involve in expanding SJTU - UM collaborations, connecting to JI sponsors, and building industry relationships.
- **Career Advising:** Organize students career development workshops.
- **Welcoming:** Host new student orientation events, organize airport pickups, and offer settle down help.
- **Student Support:** Support students during the stressful transition to start in a new university in a new country, and during urgent crisis.

## SKILLS

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**Programming Languages:** C/C++, CUDA, HIP, SIMD, (system) verilog, bash, Makefile

**Technologies/Frameworks:**

*GPU Tuning:* nsight-compute/nsight-sys, omniperf/omnitrace/rocprof

*Formal Verification:* Murphi,

*SIMD:* avx512, avx2 on Xeon Phi

*Simulation:* SniperSim, DRAMSim, pinplay

*Confidential Computing:* Open Enclave SDK, Intel SGX

**Architectures:** AMD CDNA2 Instinct GPU, NVIDIA Hopper GPU, Intel Xeon Phi, Out-of-order CPU