

# Tyler Sorensen – CV

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Department of Computer Science and Engineering  
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## Current Position

**July 2020 - Present**      UC Santa Cruz: Department of Computer Science and Engineering  
*Assistant Professor*

## Professional Memberships

**July 2019 - Present**      Khronos Group  
*Invited Individual Contributor*

## Prior Positions

**July 2018 - June 2020**      Princeton University: Department of Computer Science  
*Postdoctoral research associate*  
Supervisor: Margaret Martonosi

## Education

**Fall 2014 - Fall 2018**      PhD in Computer Science - Imperial College London, UK  
Thesis: *Device-wide Barrier Synchronisation on Graphics Processing Units*  
Supervisor: Alastair F. Donaldson

**Fall 2013 - Spring 2014**      MS in Computer Science - University of Utah, USA  
Thesis: *Testing and Exposing Weak GPU Memory Models*  
Supervisor: Ganesh Gopalakrishnan

**Fall 2010 - Spring 2012**      BS in Computer Science - University of Utah, USA  
Thesis: *Towards Shared Memory Consistency Models for GPUs*  
Supervisor: Ganesh Gopalakrishnan

**Fall 2010 - Spring 2012**      BS in Applied Mathematics - University of Utah, USA

**Fall 2008 - Spring 2010**      AA with engineering emphasis - Snow College (community college), USA

## Select Publications

### Conference and Journal Publications

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|-----|---|-----------------------|
| [1] | R. Levine, T. Guo, M. Cho, A. Baker, R. Levien, D. Neto, A. Quinn, T. Sorensen “MC Mutants: Evaluating and Improving Testing for Memory Consistency Specifications”. In: ASPLOS 2022. | <b>ASPLOS</b><br>2022 |
| [2] | T. Sorensen, L. F. Salvador, H. Raval, H. Evrard, J. Wickerson, M. Martonosi, A. F. Donaldson “Specifying and Testing GPU Progress Models”. In: OOPSLA 2021.                          | <b>OOPSLA</b><br>2021 |

- [3] D. Iorga, A. F. Donaldson, T. Sorensen, J. Wickerson “The Semantics of Shared Memory in Intel CPU/FPGA Systems”. In: OOPLSA 2021. **OOPSLA** 2021
- [4] A. Manocha, T. Sorensen, E. Tureci, O. Mathews, J. L. Aragón, M. Martonosi “GraphAttack: Optimizing Data Supply for Graph Applications on In-Order Multicore Architectures”. In: TACO 2021. **TACO** 2021
- [5] J. Kirkham, T. Sorensen, E. Tureci, M. Martonosi. “Foundations of Empirical Memory Consistency Testing”. In: OOPLSA 2020. **OOPSLA** 2020
- [6] D. Iorga, T. Sorensen, J. Wickerson, A. F. Donaldson. “Slow and Steady: Measuring and Tuning Multicore Interference”. In: RTSS. 2020. **RTSS** 2020
- [7] O. Matthews, A. Manocha, D. Giri, M. Orenes-Vera, E. Tureci, T. Sorensen, T. J. Ham, J. L. Aragon, L. P. Carloni, M. Martonosi. “MosaicSim: A Lightweight, Modular Simulator for Heterogeneous Systems”. In: ISPASS. 2020. **ISPASS** 2020. **Best paper nomination.**
- [8] T. Sorensen, S. Pai, A. F. Donaldson. “One Size Doesnt Fit All: Quantifying Performance Portability of Graph Applications on GPUs”. In: IISWC. 2019. **IISWC** 2019. **Best paper award.**
- [9] Tyler Sorensen, Hugues Evrard, Alastair F. Donaldson. “GPU Schedulers: How Fair is Fair Enough?”. In: *Int. Conf. on Concurrency Theory (CONCUR)*. 2018. **CONCUR** 2018
- [10] N. Chong, T. Sorensen, J. Wickerson. “The Semantics of Transactions and Weak Memory in x86, Power, ARM, and C++”. In: PLDI. 2018. **PLDI** 2018. **Artifact accepted. Industry collaboration (N. Chong at ARM). Distinguished paper award.**
- [11] T. Sorensen, H. Evrard, A. F. Donaldson. “Cooperative Kernels: GPU Multitasking for Blocking Algorithms”. In: FSE. 2017. **FSE** 2017. **Distinguished paper award.**
- [12] J. Wickerson, M. Batty, T. Sorensen, G. A. Constantinides. “Automatically Comparing Memory Consistency Models”. In: POPL. 2017. **POPL** 2017. **Artifact evaluated and accepted. Methodology used by Industry in defining the Vulkan GPU memory consistency model.**
- [13] T. Sorensen, A. F. Donaldson, M. Batty, G. Gopalakrishnan, Z. Rakamarić. “Portable Inter-workgroup Barrier Synchronisation for GPUs”. In: OOPSLA. 2016. **OOPSLA** 2016. **Artifact evaluated and accepted.**
- [14] T. Sorensen, A. F. Donaldson. “Exposing Errors Related to Weak Memory in GPU Applications”. In: PLDI. 2016. **PLDI** 2016
- [15] J. Alglave, M. Batty, A. F. Donaldson, G. Gopalakrishnan, J. Ketema, D. Poetzl, T. Sorensen, J. Wickerson. “GPU Concurrency: Weak Behaviours and Programming Assumptions”. In: ASPLOS. 2015. **ASPLOS** 2015. **HiPEAC Paper Award. Invited for fast-track submission to ACM Transactions on Computer Systems.**

### Workshop/Other Publications (Peer reviewed)

- [16] T. Sorensen, A. Manocha, M. Orenes-Vera, E. Tureci, J. L. Aragon, M. Martonosi. “A Simulator and Compiler Framework for Agile Hardware-Software Co-design Evaluation and Exploration: Invited Talk”. In: ICCAD. 2020. **ICCAD** 2020
- [17] T. Sorensen, S. Pai, A. F. Donaldson. “Performance Evaluation of OpenCL Standard Support (and Beyond)”. In: IWOCL. 2019. **IWOCL** 2019. **Best paper award.**
- [18] T. Sorensen, A. F. Donaldson. “The Hitchhiker’s Guide to Cross-platform OpenCL Application Development”. In: IWOCL. 2016. **IWOCL** 2016

- [19] J. Alglave, L. Maranget, D. Poetzl, T. Sorensen. “I Compute, Therefore I am (Buggy): Methodic Doubt Meets Multiprocessors”. In Tiny ToCS. 2015. **TinyToCS** 2015
- [20] T. Sorensen, G. Gopalakrishnan, V. Grover. “Towards Shared Memory Consistency Models for GPUs”. In ICS. 2013. **1st place ACM undergrad student research competition (SRC)**. **ICS** 2013

## Teaching

### Classes

Number	Name	Quarters Taught	Avg. Size	Class url
<b>CSE211</b>	<i>Grad Compiler Design</i>	F. 2021, F. 2020	20	<a href="https://tinyurl.com/UCSC-CSE211">https://tinyurl.com/UCSC-CSE211</a>
<b>CSE113</b>	<i>Parallel Programming</i>	W. 2022, S. 2021	75	<a href="https://tinyurl.com/UCSC-CSE113">https://tinyurl.com/UCSC-CSE113</a>
<b>CSE110A</b>	<i>Compiler Design 1</i>	S. 2022	70	<a href="https://tinyurl.com/UCSC-CSE110A">https://tinyurl.com/UCSC-CSE110A</a>

### Seminar

Since Fall of 2019, I have co-organized the UCSC Language, Systems, and Data (LSD) seminar with Prof. Lindsey Kuper. Every quarter we invite 10 speakers, with an emphasis on late-stage PhD students from under-represented groups.

The schedule can be found here: <https://lsd-ucsc.github.io/lsd-seminar/2021fa/>

## Student Supervision

### Current Students

Name	Starting Year	Program	Topic
Rithik Sharma	2022	PhD	Compiler Techniques for Heterogeneous Systems
Jessica Dagostini (co-advised)	2022	PhD	Graph Applications in HPC
Yanwen Xu	2020	PhD	HW/SW Co-design for Sparse Apps
Reese Levine	2020	PhD	Testing Consistency Models
Alec Siegel	2022	MS	Accelerating Sparse Convolutions
Sanya Srivastava	2021	UG	Accelerating Real-world Graphs on GPUs

### Alumni

*Some students were supervised during my Post Doc at Princeton*

Name	Year Finished	Program	Topic	Current Position
Christian Lei	2021	UCSC MS	Graph DNNs	Microsoft
Tianhao Guo	2021	UCSC UG	GPU Memory Model Testing	MS at NYU
Kiefer Selmon	2021	UCSC MS	Sparse Convolutions	Nvidia
Chris Lui	2021	UCSC UG	Graph Algorithms on GPUs	UCLA PhD program
Harmit Raval	2019	Princeton UG	GPU Forward Progress	Harvard MS program
Lucas F. Salvador	2019	Princeton UG	GPU Forward Progress	SE Microsoft
Jake Kirkham	2018	Princeton UG	GPU Memory Model Testing	SE Bloomberg

## Select Service

- **Co-organizing PLDI SRC 2021, 2022:** working to create a hybrid track to encourage participation from students who may not be able to attend the physical conference.

- **Full Program Committee Service:** ASPLOS 2022, PACT 2021, PLDI 2020
- **External Program Committee Service:** MICRO 2021 and 2020, OOPSLA 2020, ASPLOS 2020
- **Additional:** Served on 1 NSF panel 2020

## Funding

- **Investigating the Potential for Undefined Code as an Attack Vector in WebGPU Platforms**

*June. 2022 - June 2023*

*Google: \$60K*

*Main PI*

*Current*

We are investigating if undefined behavior can be used as an attack vector in WebGPU using fuzzed wgsL kernels along with a novel undefined behavior injector.

- **DECADES: Deeply-Customized Accelerator-Oriented Data Supply Systems (phase 3)**

*Sept. 2021 - May 2023*

*DARPA: \$154K*

*subcontract; main PI is Prof. David Wentzlaff at Princeton University*

*Current*

We are developing hardware/software co-design features to increase computational efficiency of data science applications, e.g. graph traversals.

- **DECADES: Deeply-Customized Accelerator-Oriented Data Supply Systems (phase 2)**

*July. 2021 - Oct 2021*

*DARPA: \$26K*

*subcontract; main PI is Prof. David Wentzlaff at Princeton University*

*Finished*

Characterized several scientific and data intensive application to understand if they would be good candidates to accelerate on the new architecture being developed as part of the DECADES program.

- **WebGPU Memory Model Consistency Testing**

*July. 2021 - Oct 2021*

*Google: \$20K*

*Main PI*

*Finished*

We developed a web application for testing the memory consistency of GPUs executing in the new WebGPU framework. We proposed a set of tests for the official WebGPU conformance test suite.