

# MATTHEW ALI SOTOUDEH

matthew@masot.net

## EDUCATION

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### University of California, Davis

Davis, CA

*BS Computer Science, BS Mathematics; Regents Scholar;*

*GPA: 4.0*

Grad: Jun 2021

### Lynbrook High School

San Jose, CA

*GPA: 3.9*

Grad: Jun 2017

## EXPERIENCE

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### Davis Automated Reasoning Group

Davis, CA

*Student Researcher*

December 2018 — Present

- Working on a variety of research topics related to automated reasoning, verification, and deep learning under Professor Aditya Thakur with the Davis Automated Reasoning Group (DARG).
- Published at NeurIPS, SAS, and SPLASH/OOPSLA “Onward!” [Sotoudeh and Thakur, 2019a,b, 2020a,b].
- Won second place at the POPL SRC [Sotoudeh, 2020].

### Intel AIPG, Office of the CTO

San Diego, CA

*Research Intern*

Jun 2018 — Sep 2018

- Fully automatic lowering of arbitrary linear algebra computations onto fixed-function heterogeneous accelerators by pairing (i) equational rewrite system, (ii) efficient sub-graph isomorphism solver, and (iii) unified heuristics interface.
- 3-5X faster execution times vs hand-optimized kernel libraries.
- Published at ACM Computing Frontiers [Sotoudeh et al., 2019].

### Intel Labs

Santa Clara, CA

*Research Intern*

Jul 2016 — Jan 2018

- Developed state-of-the-art ML parameter compression method. Up to 60% accuracy improvement over existing work after compressing models up to  $1000\times$ .
- Hand-optimized compressed matrix-multiplication routine achieves  $15\times$  faster inference than MKL. Unified library simplifies implementation of multiple compression methods in TensorFlow by expressing each method as a weight-generating sub-graph.
- Published at DAC [Sotoudeh and Baghsorkhi, 2019].

### Develop Summer Academy

San Jose, CA

*Co-Founder & Instructor*

Feb 2016 — August 2017

- Taught over 50 local middle school students programming, leadership, and other life skills.
- Covered by the Mercury News [Myllenbeck] and recognized by our school, district, and House Representative Ro Khana.

### Action

San Jose, CA

*Co-Founder & Chief Software Engineer*

Nov 2014 — Jan 2016

- Improved the meeting follow-up experience for 1,000s of meetings at Google, Microsoft, UC Berkeley, and others. Featured on the Chrome Web Store.

## VOLUNTEERING

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Since 2018 I have volunteered hundreds of hours providing free tutoring for any students taking computer science courses at UC Davis. Since 2019 I have been the Chair of the UC Davis CS Tutoring Committee, where I have organized the department’s undergraduate tutoring efforts. I also participate in the UC Davis M-PACT program, which provides extracurricular math activities to disadvantaged middle school students in our area.

## INTERESTS

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I am broadly interested in understanding and explaining computational processes. My recent research has focused on exploring how ideas from the fields of programming languages and automated reasoning can help design safer and more efficient deep learning systems. Longer-term, I am interested in the development of new automated reasoning primitives for underspecified program analysis and manipulation problems. I intend to continue my research while sharing what I have learned through regular teaching.

## AWARDS

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### **2nd Place at the International Symposium on Principles of Programming Languages (POPL) 2020 Student Research Competition**

Jan 2020

Recognized for my work on Bounded Model Checking of Deep Neural Network Controllers. The award was accompanied by a financial award of \$800.

### **University of California, Davis Computer Science Department Undergraduate Travel Award**

Jan 2020

I won an award of \$300 from the UC Davis computer science department to attend the Symposium on Principles of Programming Languages (POPL) 2020 Student Research Competition, where I presented my work on Bounded Model Checking of Deep Neural Network Controllers (and won second place).

### **NeurIPS Travel Award**

Nov 2019

I won an award of \$1,000 from the NeurIPS Foundation to attend the 2020 International Conference on Neural Information Processing Systems, where I presented my work on Computing Linear Restrictions of Deep Neural Networks.

### **University of California, Davis Undergraduate Research Center Travel Award**

May 2019

I won the competitive UC Davis Undergraduate Research travel award (\$500) to support my travel to the International Conference on Computing Frontiers, where I presented my work on a compiler system for modern Deep Learning hardware.

### **Rep. Ro Khanna Congressional Award**

I was officially recognized by House Representative Ro Khanna for my role in founding the innovative Develop Summer Academy.

### **1st Place FBLA State & National Competitions**

Jun 2014, Apr 2015

Won first place against hundreds of teams across the country for two e-business websites I built and presented.

### **1st Place Application at CodeDay SV**

Oct 2014

An early version of our meeting efficiency add-on Action beat dozens of other teams at the CodeDay SV hackathon.

### **Nokia Developer Wiki 1st Place Winner**

Jan 2013

I won two Nokia Developer Wiki competitions for instructional articles describing how to use new Windows APIs.

## References

- Matthew Sotoudeh and Aditya V Thakur. Computing linear restrictions of neural networks. In H. Wallach, H. Larochelle, A. Beygelzimer, F. d'Alché-Buc, E. Fox, and R. Garnett, editors, *Advances in Neural Information Processing Systems 32*, pages 14132–14143. Curran Associates, Inc., 2019a. URL <http://papers.nips.cc/paper/9562-computing-linear-restrictions-of-neural-networks.pdf>.
- Matthew Sotoudeh and Aditya V Thakur. Correcting deep neural networks with small, generalizing patches. In *Workshop on Safety and Robustness in Decision Making*, 2019b.
- Matthew Sotoudeh and Aditya V. Thakur. Abstract neural networks. In *27th Static Analysis Symposium (SAS)*, 2020a. To appear.
- Matthew Sotoudeh and Aditya V. Thakur. Analogy-making as a core primitive in the software engineering toolbox. In *Proceedings of the 2019 ACM SIGPLAN International Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software (SPLASH/OOPSLA "Onward!")*, 2020b. To appear.
- Matthew Sotoudeh. Bounded model checking of deep neural network controllers. In *International Symposium on Principles of Programming Languages (POPL) 2020 Student Research Competition*, 2020.
- Matthew Sotoudeh, Anand Venkat, Michael Anderson, Evangelos Georganas, Alexander Heinecke, and Jason Knight. Is a mapper: a compute and hardware agnostic deep learning compiler. In *Proceedings of the 16th ACM International Conference on Computing Frontiers*, pages 164–173, 2019.
- Matthew Sotoudeh and Sara S Baghsorkhi. C3-flow: Compute compression co-design flow for deep neural networks. In *Proceedings of the 56th Annual Design Automation Conference 2019*, pages 1–6, 2019.
- Kristi Myltenbeck. Lynbrook students lead summer camp for middle schoolers. <http://web.archive.org/web/20080207010024/http://www.808multimedia.com/winnt/kernel.htm>.