




Greg Cusack


Ph.D. Student and Graduate Research Assistant


Building software systems that make large-scale, networked applications and the underlying infrastructure efficient and simple to deploy, manage, monitor, and secure in multi-tenant environments


C, C++, Python, Bash, SQL 

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|------------------|---|-------------------------------|
| Education | University of Colorado, Boulder CO | Aug. 2017 - Present |
| | <ul style="list-style-type: none">• Ph.D. student in Computer Engineering, Computer Networks and Security (GPA: 3.87)• Graduate Research Assistant in the Network Systems and Security Research Lab | |
| | University of California, Los Angeles CA | Sept. 2016 - June 2017 |
| | <ul style="list-style-type: none">• M.S. in Electrical Engineering, Embedded Systems (Not completed – GPA: 3.91) | |
| | Santa Clara University, Santa Clara CA | Sept. 2012 - June 2016 |
| | <ul style="list-style-type: none">• B.S. in Computer Science and Engineering & B.S. in Electrical Engineering• <i>magna cum laude</i> (GPA 3.76), Tau Beta Pi, Upsilon Pi Epsilon, Alpha Sigma Nu, Dean's List• Research with Dr. Krishnan designing a low-cost, mobile device to detect arsenic in water (C) | |
| Research | Software-Defined Microservices <i>Project Lead</i> | April 2019 - Present |
| | <ul style="list-style-type: none">• Leading a four person team (3 Ph.D. students and 1 Masters student) in designing and building a distributed system manager for large scale cloud applications. We dynamically allocate compute resources based on real-time demands, improving hardware utilization and application throughput• Tools: C, C++, Linux Kernel's CFS, Kubernetes, Ansible, Docker• Result: poster published at ACM CoNEXT 2019 Posters | |
| | Cloud-Scale Packet-Level Network Analytics in Software | Sept. 2017 - Present |
| | <ul style="list-style-type: none">• Designing a general packet-level, network analytics system that processes up to 254 million packets per second (Mpps) per 16-core commodity server entirely in software by leveraging P4 switches and domain-specific optimizations• Built high performance (>10Mpps per two-core analytic pipeline) network analytic applications• Designed and built the back-end of the analytics platform for highly scalable packet-level data aggregation and visualization by moving data aggregation out of the processing pipeline• Tools: C++, P4, Python, Prometheus, gRPC• Results: full length paper currently in submission, poster published at NDSS 2018 (won best technical poster), and paper published at SDN/NFV Sec'18 | |
| | Adversarial Examples for Network Security | July 2018 - Sept. 2019 |
| | <ul style="list-style-type: none">• Analyzed how state-of-the-art neural network-based network intrusion detection systems (NIDSs) are vulnerable to adversarial examples (attacks) in order to improve security systems• Built an automation tool (Python) to manipulate packets to match target adversarial example network shape, which reduced neural network-based NIDS performance by up to 62%.• Result: papers published at AISeC'18 and ACM CoNEXT Workshop - Big-DAMA 2019 | |
| | Reconfigurable Secure Hardware | Sept. 2017 - Dec. 2018 |
| | <ul style="list-style-type: none">• On team that designed flexible, reconfigurable secure hardware that allows users to control secure hardware features and updates, while also allowing them to choose their root-of-trust.• Built password managers on SGX and our FPGA-based secure hardware for comparison• Tools: C, C++, SGX• Result: paper published at FPGA 2019 | |

Experience (Industry)	TransMarket Group <i>Software Engineer Intern</i> Chicago, IL <ul style="list-style-type: none"> Designed an automated testing framework in Python, C++, Robot Framework for exchanges around the world to manage catastrophic risk Dramatically improved developers ability to identify bugs quickly and effectively in a million-plus LOC trading platform 	June 2017 - Aug. 2017
	Texas Instruments <i>Applications Engineering Intern</i> Santa Clara, CA <ul style="list-style-type: none"> Developed software to streamline automation for new silicon validation and benchmarking 	June 2015 - Sept. 2015
Honors	Computer Engineering Outstanding Senior Award <i>SCU</i> <ul style="list-style-type: none"> “Presented to a senior by the faculty of the Computer Engineering Department based on academic standing, esprit de corps, and contribution to the department, school, and community.” 	June 2016
	Alpha Sigma Nu <i>Jesuit Honor Society</i> <ul style="list-style-type: none"> Accepts ~25 students in the top 15% of their class who distinguish themselves in scholarship and service to others. Among the highest honors bestowed at a Jesuit Institution 	May 2015
Side Projects	Recruiting Startup <ul style="list-style-type: none"> Employee #5 and the second engineer brought on board Although under NDA, I design and implement proprietary algorithms that the company’s product and success depend on (Python, REST, PostgreSQL) I set company goals, timelines, and requirements for each product release stage 	July 2019 - Present
Skills & Knowledge	Kubernetes Docker Ansible Distributed Systems Networked Systems ML/Neural Networks Linux CFS Scheduler Leadership Problem Solving Time Management Explaining complex concepts to both engineers and non-engineers	
Interests	Venture Capital Road/Mtn. Biking Trail Running Skiing Swimming Rugby Improv	
Classes	<u>CU</u> DevOps in the Cloud Adv. Computer/Network Systems Security Censorship Circumvention Security and Ethical Hacking Developing the Industrial IoT Natural Language Processing Venture Capital & Private Equity ²	<u>UCLA</u> Machine Learning Adv. Computer Networks Networked Embedded Systems Software Engineering Entrepreneurship and Venture Initiation ¹
	Nerd Night & Science Riot <ul style="list-style-type: none"> I present my research in a casual, standup-like fashion at bars and small venues around Boulder and Denver to help eliminate the notion that computer science is too hard to understand for those not in the field. Talk title: “<i>On My Way to Hack Your Bae: Exploiting Neural Network-based Security Systems</i>” 	April 2019 - Present

¹ UCLA Anderson School of Management

² CU Leeds School of Business/Law School – Only non-business or law student – Result: top 3 of >50 person class

Publications

(poster) Efficient Microservices with Elastic Containers

Greg Cusack, Maziyar Nazari, Sepideh Goodarzy, Prerit Oberai, Eric Rozner, Eric Keller, Richard Han

ACM CoNEXT (CoNEXT '19 Posters). December, 2019

Towards the Evaluation of NIDSs in Adversarial Settings

Mohammad J. Hashemi, Greg Cusack, Eric Keller

3rd ACM CoNEXT Workshop on Big Data, Machine Learning and Artificial Intelligence for Data Communication Networks (Big-DAMA 2019). December, 2019

Toccoa: Cloud-Scale Packet-Level Network Analytics in Software (In Submission)

Oliver Michel, John Sonchack, Greg Cusack, Maziyar Nazari, Eric Keller, Jonathan M. Smith

Breaking the Trust Dependence on Third Party Processes for Reconfigurable Secure Hardware

Michael Coughlin, Greg Cusack, Jack Wampler, Eric Keller, Eric Wustrow

27th ACM/SIGDA International Symposium on Field-Programmable Gate Arrays. February, 2019

Stochastic Substitute Training: A Gray-box Approach to Craft Adversarial Examples Against Gradient Obfuscation Defenses

Mohammad J. Hashemi, Greg Cusack, Eric Keller

ACM Workshop on Artificial Intelligence and Security (AISec) with the 25th ACM Conference on Computer and Communications Security (CCS). October, 2018.

Machine Learning-Based Detection of Ransomware Using SDN

Greg Cusack, Oliver Michel, Eric Keller.

ACM International Workshop on Security in Software Defined Networks & Network Function Virtualization (SDN-NFV Sec). March, 2018

(poster) Machine Learning-Based Fingerprinting of Network Traffic Using Programmable Forwarding Engines

Greg Cusack, Oliver Michel, Eric Keller

Network and Distributed System Security Symposium (NDSS). February, 2018. (won best technical poster)

(poster) Time Analysis of the Feasibility of Vehicular Blockchains

Joshua Joy, Greg Cusack, Mario Gerla

SMARTOBJECTS '17 Proceedings of the 3rd Workshop on Experiences with the Design and Implementation of Smart Objects