

# Ryan Julian

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## EDUCATION

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### PhD, Computer Science — Robotics and Machine Learning

University of Southern California

- Advisors: Prof. Gaurav Sukhatme (co-advised by Stefan Schaal 2017-18)
- **Thesis Topic:** Learning Representations for Continual Robot Learning

*Aug 2017-Present  
In Progress*

### B.S. Electrical Engineering and Computer Sciences

University of California, Berkeley

*Aug 2008-May 2012*

### International Baccalaureate Diploma

Cocoa Beach Jr./Sr. High School

*Aug 2004-May 2008*

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## EMPLOYMENT

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### PhD Research Assistant, University of Southern California

with Prof. Gaurav Sukhatme, [USC RESL](#)

with Prof. Stefan Schaal, [USC CLMC](#) (co-advised 2017-18)

- Performs peer-reviewed research on machine learning for robotics. See [Publications](#).
- **Maintainer** of [garage](#), and open source deep reinforcement learning framework
- Focus areas: multi-task learning, representation learning, scalable robotic learning, transfer learning and domain adaptation for learned robotic skills, deep reinforcement learning, robot imitation learning, unsupervised robot learning

*Aug 2017-Present*

### Software Engineer, Google Cloud Platform

- Implemented cloud backend software for an unreleased high-performance in-memory cache product
- Designed billing database, API hooks, and reporting pipeline for a per-second billing of a cloud service

*Jan 2017-Aug 2017*

### Robotics Software Engineer, [X \(formerly Google Robotics\)](#)

- Supported state-of-the-art robot learning work published by Google X and Google Brain, e.g.
  - [Deep Learning for Robots: Learning from Large-Scale Interaction](#)
  - [Teaching Robots to Understand Semantic Concepts](#)
  - [How Robots Can Acquire New Skills from Their Shared Experience](#)
- Designed programming environments, visualization tools, libraries, and associated on-robot software which make easy for non-experts to develop robotic behaviors
- Developed software components on the cloud, client/UI, and robot to allow for efficient teleoperation of mobile robots across the public internet. This involved novel visualization and control features to adapt to latency, bandwidth budgeting, and optimizing control and data communications architecture
- Designed and deployed high-precision robotic test stations for qualifying and calibrating electromechanical robot components such as brushless motors and load cells
- Developed and maintained a system for data collection, event tracking, and process flow on a complex robot manufacturing line, including robotics, automation, GUI, cloud, and data processing components. System was proven

*May 2014-Dec 2016*

over 1 year on a pilot-scale robot manufacturing line processing ~1000 parts/day

**Hardware Engineer, [LEAP Motion](#)**

*Aug 2013–April 2014*

- Developed hardware, firmware, and software for computer-based hand and body tracking sensing technology
- Researched and implemented novel algorithms for camera calibration and synchronization, sensor fusion, and perception. See [Patents](#).
- Brought up board and firmware for multiple CMOS image sensors and USB controllers
- Lead hiring effort for Firmware Engineering team; recruited and trained 3 new hires in 3 months

**Research Scientist, University of California, Berkeley**

*May 2011–May 2013*

with Prof. Ronald Fearing, [Biomimetic Millisystems Laboratory](#)

with Prof. Pieter Abbeel, [Robot Learning Lab](#)

*May 2011–May 2012 as*

- Lead robotics platform concept, design, and dissemination for [10-institution US Army robotics development consortium](#)
- Coordinated 5 undergraduate and 3 graduate students, collaborated with 10 universities
- Designed [two generations](#) of user-friendly robotics and computer vision controllers, in two one-year cycles. Both had the highest computing power per-mass of any robot in the world.
- [First generation](#) controller was 7g with 1 GHz TI OMAP processor; [second generation](#) was 40g with 4-core 1.7GHz Samsung Exynos processor, both include camera, IMU, radio, and 4 motor controllers integrated on custom circuit boards
- Maintained Linux software stack with Ubuntu, ROS, OpenCV, and custom kernel drivers.
- Performed peer-reviewed research on multi-agent control, computer vision, and perception. See [Publications](#).

*Undergraduate Research Apprentice*

**Embedded Software R&D Intern, National Instruments**

*May–Aug. 2011*

- Developed seamless heterogeneous computing product from concept to demo in 12 weeks
- Prototyped virtual machine for high-level languages on microcontrollers
- Created synthesis tool for automatic mapping between VM variables and FPGA registers

**Android GPS Software Intern, Qualcomm**

*May–Aug 2010*

**Launch Control System Software Intern, NASA Kennedy Space Center**

*Jun–Aug 2008/2009*

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## COMMUNITY SERVICE

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**Co-Founder and Board Member, [PiE Robotics](#)**

*Jan 2009–Present*

- Co-founded non-profit organization which unites college students interested in robotics and hands-on engineering, product design, and peer mentoring and education around a single mission: building a robotics competition for underserved Bay Area high schools
- PiE now comprises 2 universities, \$60,000+/yr. budget, 80+ college student staff members, 80+ college student mentors, and 300+ high school students from 25+ schools
- As Board Member and Adviser, helps craft long-term vision, mentors young staff on leadership and engineering, and established non-profit corporation for long-term finance and governance

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- As Director, established brand and organization structure; grew organization from 3 staff and 6 teams to 40 staff, 40 mentors, and 12 teams; raised and managed \$30,000 in 2 years
  - As Co-Founder, developed games and robotics platforms for use in competition
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## SKILLS, TOOLS, & CODE

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| <b>Programming</b>  | Python, C++, Java, C, Go, Bash, C#, Lisp  |
| <b>Design Tools</b> | TensorFlow, PyTorch, OpenAI Gym, Bazel, Git, Gerrit, GitHub, TravisCI, Jenkins, Google Cloud Platform, Amazon AWS, Docker, REST APIs, Protocol Buffers, gRPC, ROS, OpenCV, EAGLE CAD, SolidWorks, MATLAB, NI LabVIEW  |
| <b>Expertise</b>    | deep learning / deep reinforcement learning / imitation learning / generative adversarial networks (GAN) / robotics / artificial intelligence / machine learning / computer vision / imaging and sensor SoCs / automation / cloud computing / product development and project management / mentoring, outreach, education, and accessibility for technology / non-profit management and fundraising |
| <b>Coursework</b>   | robotics / deep learning / machine learning / computer vision / convex optimization / artificial intelligence / algorithms and computer science theory / linear algebra / probability and stochastic processes / control theory / operating systems / embedded systems / mechatronic design   |
| <b>GitHub</b>       | <a href="https://github.com/ryanjulian">github.com/ryanjulian</a> (personal projects and PhD research)<br><a href="https://github.com/rlworkgroup">github.com/rlworkgroup</a> (RL Workgroup - founder/lead maintainer)<br><a href="https://github.com/openai/baselines">github.com/openai/baselines</a> (Author of GAIL implementation)   |

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## PATENTS

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[Method for synchronizing operation of systems.](#) Ryan Julian, Hongyuan He, and David Holz. U.S. Patent Application 14/163,816 filed January 25, 2014.

[Dynamic, free-space user interactions for machine control.](#) Raffi Bedikian, Jonathan Marsden, Keith Mertens, David Holz, Maxwell Sills, Matias Perez, Gabriel A. Hare, and Ryan Julian. U.S. Patent Application 14/155,722 filed January 15, 2014.

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## PUBLICATIONS

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["Zero-Shot Skill Composition and Simulation-to-Real Transfer by Learning Task Representations."](#) Z. He, **R.C. Julian**, E.H. Heiden, H. Zhang, S. Schaal, J.J. Lim, G.S. Sukhatme, and K. Hausman. *Under review at Proc. 2019 Int. Conf. on Robotics and Automation (ICRA 2019).*

["Auto-conditioned Recurrent Mixture Density Networks for Complex Trajectory Generation."](#) H. Zhang, E.H. Heiden, **R.C. Julian**, Z. He, J.J. Lim, and G.S. Sukhatme. *Under review at Proc. 2019 Int. Conf. on Robotics and Automation (ICRA 2019).*

["Scaling Simulation-to-Real Transfer by Learning Composable Robot Skills."](#) **R.C. Julian**, E.H. Heiden, Z. He, H. Zhang, S. Schaal, J.J. Lim, G.S. Sukhatme, and K. Hausman. in Proc. 2018 Int. Symp. on Experimental Robotics (ISER 2018).

["Cooperative Control and Modeling for Narrow Passage Traversal."](#) **R.C. Julian**, C. J. Rose, H. Hu, and R.S. Fearing. In Proc. 12<sup>th</sup> Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS 2013).

["Performance Analysis and Terrain Classification for a Legged Robot Over Rough Terrain."](#) F.L. Garcia Bermudez, **R.C. Julian**, D.W. Haldane, P. Abbeel, and R.S. Fearing. In Proc. 2012 IEEE/RSJ Int. Conf. on Robots and Systems (IROS 2012).

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## AWARDS AND HONORS

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PhD Fellow, Max Planck Institute for Intelligent Systems  
UC Berkeley Regents' and Chancellor's Scholar

Amazon Research Award 2018  
National Merit Scholar