

# Jianwei Sun

## Curriculum Vitae

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### Education

- 2019 to Present **Ph.D. in Systems and Control**, University of California Los Angeles.  
Advised by Prof. Dr. Jacob Rosen
- 2017 to 2019 **M.Sc. in Electrical Engineering**, ETH Zurich.  
Cumulative GPA: 5.71/6
- 2012 to 2017 **B.A.Sc. in Engineering Science**, University of Toronto.  
Cumulative GPA: 3.79/4

### Research Experience

- Feb 2019 to Aug 2019 **Bionics Lab**, University of California Los Angeles.  
*"Improving Transparency in Physical Human-Robot Interaction for the EXO-UL8 Exoskeleton"*  
Project co-supervised by Prof. Dr. Jacob Rosen and Prof. Dr. Maryam Kamgarpour.
- Developed a Kalman Filter-based human torque estimator to improve the admittance control scheme of an 8 degree-of-freedom upper limb exoskeleton (C/C++)
  - Developed a sensor fusion method for achieving comparable human-exoskeleton transparency using only a subset of six-axis force/torque sensors
  - Implemented a safety controller for suppressing human-induced instabilities
  - Coauthored a paper for the 2019 IEEE International Conference on Rehabilitation Robotics
- Feb 2018 to Aug 2018 **Institute for Dynamic Systems and Control**, ETH Zurich.  
*"Vehicle Platoon Control with Virtual Path Constraints"*  
Project co-supervised by Rajan Gill and Prof. Dr. Raffaello D'Andrea.
- Designed and implemented a distributed feedback-linearized admittance controller to enable safe human-interaction with a path-constrained quadrotor platoon (C/C++)
  - Primary author of a paper submitted to the 2019 IEEE Conference on Control Technology and Applications, and awarded Outstanding Paper Award and selected as finalist for Best Student Paper
- Oct 2017 to Feb 2018 **Computer Engineering and Networks Laboratory**, ETH Zurich.  
*"DCF77 Based Long-Term Timer"*  
Project co-supervised by Roman Trüb and Prof. Dr. Lothar Thiele.
- Designed and implemented a radio clock-based ultra low power ( $\sim 10\mu W$ ) clock synchronizer capable of overcoming arbitrarily long clock drift for wireless network devices (MSP430, C)
  - Developed a benchmark device based on received timepulses from GPS for characterizing the timer device to nanosecond precision (MSP430, Raspberry Pi, C, Python)

- Sep 2016 to **Reconfigurable Antenna Laboratory**, University of Toronto.  
Jun 2017 *"Synthesis of a Multibeam Dual Reflectarray Beam Pattern Using Genetic Algorithms"*  
Project supervised by Prof. Dr. Sean V. Hum.
  - Developed a genetic algorithm-based multi-objective non-convex optimizer for beam synthesis on a Cassegrain reflectarray antenna system (MATLAB)
  - Coauthored a paper for the 2017 IEEE Antennas and Propagation Symposium
- May 2016 to **Institute for Dynamic Systems and Control**, ETH Zurich.  
Aug 2016 Project co-supervised by Rajan Gill and Prof. Dr. Raffaello D'Andrea.
  - Developed toolchains for automatic dynamic response characterization of nonlinear brushless motor systems for quadrotor vehicles (C/C++, MATLAB)
  - Developed a motor selection tool to automatically scrape off-the-shelf motor data from the web and suggest the best suited based on dynamic response requirements (Ruby)
- May 2014 to **Department of Mechanical Engineering**, National University of Singapore.  
Aug 2014 Project co-supervised by Goh Yu Feng and Prof. Dr. Koh Soo Jin Adrian.
  - Characterized dynamic responses of dielectric elastomers as soft actuators for use as artificial muscles (MATLAB)
  - Developed a waveform generator for a 5kV high voltage power supply to actuate elastomers (LabVIEW)

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## Work Experience

- Sep 2018 to **Apple, Wearable Systems**, Cupertino.  
Feb 2019
  - Designed a drop-in replacement system-in-package for the Apple Watch to measure coexistence issues only quantifiable in system form-factor (Cadence)
  - Developed software toolchain to automatically extract, process, and present data from the Apple Watch (Python)
  - Developed experiment setup to investigate a critical system coexistence issue between a power management IC and a MEMS sensor
- Jun 2017 to **Intel, Programmable Solutions Group**, San Jose.  
Sep 2017
  - Developed hardware interfaces based on Avalon-Streaming for an H.265/HEVC 4K video encoder on a PCIe accelerator card with the Intel Arria-10 FPGA (Verlog, VHDL)
  - Simulated and debugged hardware with ModelSim, VCS-MX simulators, and custom test scripts (Python)
- May 2015 to **Apple, Wearable Systems**, Cupertino.  
May 2016
  - Designed a multi-purpose hardware validation platform, including schematic entry, component selection, and PCB routing (Cadence)
  - Developed a fault-tolerant software API for a microprocessor to continuously stress-test (for 500 hours) a sensor subject to unpredictable device and digital interface failures in a high temperature/humidity environment (MSP432, C/C++)
  - Successfully identified a rare reliability failure mode and aided cross-functional teams in arriving at a mass-production solution

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## Publications

- [JP1] **J. Sun**, Y. Shen, J. Rosen, "Sensor Reduction, Estimation, and Control of an Upper-Limb Exoskeleton," in *IEEE Robotics and Automation Letters*, vol. 6, no. 2, pp. 1012-1019, April 2021, doi: 10.1109/LRA.2021.3056366.
- [CP3] Y. Shen, **J. Sun**, J. Ma, J. Rosen, "Admittance Control Scheme Comparison of EXO-UL8: A Dual-Arm Exoskeleton Robotic System," *2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR)*, Toronto, ON, Canada, 2019, pp. 611-617, doi: 10.1109/ICORR.2019.8779545.
- [CP2] **J. Sun** and R. Gill, "Vehicle Platoon Control with Virtual Path Constraints," *2019 IEEE Conference on Control Technology and Applications (CCTA)*, Hong Kong, China, 2019, pp. 456-461, doi: 10.1109/CCTA.2019.8920555. [Video](#).
- [CP1] C. Geaney, **J. Sun**, S. V. Hum, E. Martinez-de-Rioja, and J. A. Encinar, "Synthesis of a multi-beam dual reflectarray antenna using genetic algorithms," *2017 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, San Diego, CA, USA, 2017, pp. 1179-1180, doi: 10.1109/APUS-NCURSINRSM.2017.8072632.

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## Awards

- 2021 Grad Slam Top 10, University of California, Los Angeles.
- 2019 Best Student Paper Finalist, Outstanding Paper Award, 3rd IEEE Conference on Control Technology and Applications (CCTA).
- 2017 Dean's Honours List, University of Toronto, awarded for all academic years.
- 2016 University of Toronto, Center for International Experience Award, for funding summer research conducted at ETH Zurich.
- 2014 Nortel Institute Undergraduate Scholarship, University of Toronto.
- 2014 University of Toronto, Center for International Experience Award, for funding summer research conducted at the National University of Singapore.
- 2012 President's Scholars of Excellence entrance scholarship, University of Toronto.
- 2012 Alexander Rutherford Scholarship.

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## Conference Participation

- 2019 16th IEEE/RAS-EMBS International Conference on Rehabilitation Robotics. Podium presentation.
- 2019 IEEE/AIM Workshop on "Towards Soft Robotics for Biomimetics and Applications: Emerging Sensors, Actuators, and Methods". Poster.

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## Teaching and Mentoring Experience

- Apr 2021 to Jun 2021 **Teaching Associate**, ECE141 - Principles of Feedback Control, University of California Los Angeles (Spring Quarter).  
20 hours per week
- Jan 2021 to Apr 2021 **Teaching Associate**, LS30B - Mathematics for Life Scientists (Python), University of California Los Angeles (Winter Quarter).  
20 hours per week
- Sep 2020 to Dec 2020 **Head Teaching Associate**, M20 - Introduction to Computer Programming with MATLAB, University of California Los Angeles (Fall Quarter).  
20 hours per week
- Apr 2020 to Jun 2020 **Teaching Assistant**, LS30B - Mathematics for Life Scientists (Python), University of California Los Angeles (Spring Quarter).  
20 hours per week
- Jan 2020 to Apr 2020 **Teaching Assistant**, LS30B - Mathematics for Life Scientists (Python), University of California Los Angeles (Winter Quarter).  
20 hours per week
- Sep 2019 to Dec 2019 **Teaching Assistant**, M20 - Introduction to Computer Programming with MATLAB, University of California Los Angeles (Fall Quarter).  
20 hours per week
- Aug 2016 to Jun 2017 **Mentor**, IEEE Student Branch, University of Toronto.  
10 hours per week
- Mentored first and second year engineering students in hands-on electronics, design, and debugging (Arduino, C/C++)

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## Volunteering Experience

- Aug 2016 to Jun 2017 **Director of Events**, IEEE Student Branch, University of Toronto.  
10 hours per week
- Headed logistics and operations for a hardware Hackathon event with focus on wireless embedded technologies, resulting the largest participant turnout in recent years
  - Negotiated with suppliers and sponsors to ensure sufficient funding for the club's operations
- 2013 to 2014 **Volunteer Team Member**, Supermileage Club, University of Toronto.  
5 hours per week
- Designed the fuel pressurization system and engine dynamometer
  - Assisted in carbon fiber layups, development, and assembly of completely new vehicle
- 2011 to 2013 **Volunteer**, Telus Spark Science Center, Calgary.  
5 hours per week
- 2010 to 2011 **Volunteer**, Canadian Red Cross, Calgary.  
5 hours per week

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## Personal Projects

- Link **Website**, Personal website developed with Jekyll.
- Github **HarryPlotter**, open source plotting library for MATLAB.
- Video **Boomerang**, persistence of vision display.
- Implemented a dynamic self-calibrating algorithm to calculate frame flashing rates of LEDs in a high RPM rotating display

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## Technical Skills

### Software

- Languages {x86\_64, ARM, PIC} assembly, C/C++, Java, MATLAB, Python, Ruby, Bash
- Environments Windows, Linux, Qt, LabVIEW, Jekyll
- Tools Git, CMake, Make, NMake, GCC, Clang

### Hardware

- Embedded ATmega, MSP43x, PIC, STM32, {Cyclone, Arria 10} FPGA, Arduino, Raspberry Pi
- Lab Oscilloscopes, function generators, DC power supplies, DMMs, LCR meters, vector network analyzers, spectrum analyzers, logic analyzers, frequency counters
- Soldering Hands-on experience with DIP, SMT up to 01005, BGA, LGA, QFP packages

### Tools

- Simulation MATLAB, Simulink, PSpice, LTSpice, ModelSim, VCS-MX
- Design Cadence, Altium, KiCad, Eagle, SOLIDWORKS

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## Languages

- Native English
- Conversational Mandarin Chinese
- Intermediate German
- Basic French

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## Hobbies

- Mountain biking, and bike tuning
- Running
- Boxing