

VATSAL V. PATEL

Department of Mechanical Engineering, Yale University
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EDUCATION

Yale University

2019 - Present

PhD in Engineering & Applied Sciences (Robotics)

Advisor: Prof. Aaron M. Dollar

University of California, Berkeley

2014 - 2018

BS in Mechanical Engineering (2017), MS in Mechanical Engineering (2018)

GPA: 3.92 (High Honors) in BS, 4.00 in MS

RESEARCH AREAS

Dexterous Manipulation, Robot Grasping, In-Hand Manipulation, Force Sensing
Mechanisms, Parallel Robots, Mechanics, Design Optimization, Motion Planning

RESEARCH AND WORK EXPERIENCE

Yale GRAB Lab, Graduate Researcher

Aug 2019 - present

- Designed and optimized parallel mechanism-based hands capable of dexterous in-hand manipulation
- Developed motion synthesis methods for unified manipulation planning with arms and dexterous hands
- Evaluated robot hands through workspace characterizations and real-world tasks demonstrations

Boston Dynamics AI Institute, Research Intern

June 2023 - August 2023

- Worked on the dynamic mobile manipulation team to advance the state of robot hand hardware
- Devised and evaluated methods to design tendon-driven controllable and passive adaptable mechanisms
- Implemented sampling-based trajectory optimization algorithms for fast and dynamic mobile grasping

Intuitive Surgical, Mechanical Engineer

Jan-Jul 2019, Intern: Summers '17 & '18

- Developed, tested, and refined designs of mechanical subsystems on new robotic surgery platforms
- Ran performance tests on full-scale system prototypes to inform subsequent design iterations
- Amplified mechanical performance of surgical instruments by 30% to improve their life and efficiency

Berkeley Automation Lab (AUTOLAB), Graduate Researcher

2017 - 2018

- Implemented intermittent sync autonomously on surgical robot and platform with 81% success rate
- Built a 6-DOF platform mimicking anatomical motions for surgical robotics experiments
- Developed shielded-implant mechanisms for safer radiation dose delivery in brachytherapy

HONORS AND AWARDS

Raymond John Wean Foundation Fellow in Engineering

2020 - present

Yale fellowship funding doctoral programs for high-performing students

Yale Ventures Graduate Fellow

2019 - 2020

Commercializing research innovations with Blavatnik Fellows and Entrepreneurs-in-Residence

Berkeley Mechanical Engineering Citation Award

2018

Distinguished honors at graduation for academic achievement and outstanding service

Outstanding Graduate Student Instructor Award

2018

Received for outstanding work in teaching Berkeley courses nominated by the department

Dean's Honors List and Term Honors at UC Berkeley

2015-2017

Academic distinction indicating top 10% engineering undergraduates

PUBLICATIONS

Journal Articles

Patel, V. V., Seewald, A., Dollar, A. M. (*in review*) “Re-envisioning Force-Torque Sensing: Simple Six-Axis Sensor with a Single Camera and Fiducial Markers.” 2024.

Patel, V. V., Dollar, A. M. (*in review*) “Not Twisting Your Arm: Combining Grasping and Rotation with a Spherical Robot Hand Mechanism.” 2024.

Patel, V. V., Liarokapis, M. V., Dollar, A. M. “Open Robot Hardware: Progress, Benefits, Challenges, and Best Practices.” *IEEE Robotics & Automation Magazine (RAM)*. 2023.

McCann, C. M.*, **Patel, V. V.***, Dollar, A. M. “The Stewart Hand: A Highly Dexterous, Six-Degrees-of-Freedom Manipulator Based on the Stewart-Gough Platform.” *IEEE Robotics & Automation Magazine (RAM), Special Issue on Emerging Paradigms for Robotic Manipulation*. 2021.

Conference Papers

Pan, C., **Patel, V. V.**, et al. “Fluxbot: The Next Generation-Design and Validation of a Wireless, Open-Source Mechatronic CO2 Flux Sensing Chamber” *ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies (COMPASS)*. 2024.

Patel, V. V., Rakita, D., Dollar, A. M. “An Analysis of Unified Manipulation with Robot Arms and Dexterous Hands via Optimization-based Motion Synthesis” *IEEE International Conference on Robotics and Automation (ICRA), London, UK*. 2023.

Patel, V. V., Dollar, A. M. “Robot Hand based on a Spherical Parallel Mechanism for Within-Hand Rotations about a Fixed Point.” *IEEE International Conference on Intelligent Robots and Systems (IROS), Prague, Czech Republic*. 2021.

Patel, V. V., Morgan, A. S., Dollar, A. M. “Highly Underactuated Radial Gripper for Automated Planar Grasping and Part Fixturing.” *IEEE International Conference on Intelligent Robots and Systems (IROS), Las Vegas, NV*. 2020.

McPherson, A. I. W., **Patel, V. V.**, Downey, P. R., Alvi, A. A., Abbott, M. E., Stuart, H. S. “Motor-Augmented Wrist-Driven Orthosis: Flexible Grasp Assistance for People with Spinal Cord Injury.” *International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*. 2020.

Thananjeyan, B., Tanwani, A., Ji, J., Fer, D., **Patel, V. V.**, Krishnan, S., Goldberg, K. “Optimizing Robot-Assisted Surgery Suture Plans to Avoid Joint Limits and Singularities.” *IEEE International Symposium on Medical Robotics (ISMR), Atlanta, GA*. 2019.

Ji, J., Krishnan, S., **Patel, V. V.**, Fer, D., Goldberg, K. “Learning 2D Surgical Camera Motion From Demonstrations.” *IEEE International Conference on Automation Science & Engineering (CASE), Munich, Germany*. 2018.

Patel, V. V.*, Krishnan, S.*, Goncalves, A., Goldberg, K. “SPRK: A low-cost stewart platform for motion study in surgical robotics.” *IEEE International Symposium on Medical Robotics (ISMR), Atlanta, GA*. 2018.

Patel, V. V.*, Krishnan, S.*, Goncalves, A., Chen, C., Boyd, W. D., Goldberg, K. “Using intermittent synchronization to compensate for rhythmic body motion during autonomous surgical cutting and debridement.” *IEEE International Symposium on Medical Robotics (ISMR), Atlanta, GA*. 2018.

LEADERSHIP AND SERVICE

Yale Graduate Engineering Community (GECO) Organizer *2020-present*
Organized monthly social and mentorship events for 300+ Yale engineering graduate students.

Yale Pauli Murray College Graduate Affiliate *2019-present*
Served as a graduate resource and organized programming for undergraduates in the residence college.

Yale Graduate & Professional Student Senate (GPSS) Senator *2020-2024*
Worked with the University to advocate for issues facing graduate student population representing the Graduate Sciences constituency.

Yale Mechanical Engineering & Materials Science (MEMS) Mentor *2023*
Mentoring incoming MEMS students and serving as a resource in their transition to Yale.

Yale Office of International Students & Scholars (OISS) Fellow *2021*
Organized and assisted programming for new international graduate students at Yale.

Yale Mentor for Minority Students in STEM (YMMSS) *2021*
Mentored 2 traditionally underrepresented students in science and engineering at Yale.

Yale Flipped Science Fair (FSF) Presenter *2021*
Presented my current research tailored to excite middle school students.

Yale Peabody Museum's Education Volunteer Docent *2019 - 2020*
Taught middle & elementary school student workshops with hands-on programs and tours.

Academic Service
Active reviewer for IEEE, ASME, ACM conferences (ICRA, IROS, Robosoft), and journals (RAL, TRO, JMR, JMD, SIGGRAPH).

TEACHING FELLOWSHIPS

Mechanical Engineering Capstone I & II *2023-24, 2021-22*
Teaching Fellow (Yale University). Advised project groups and led partnerships with external sponsors.

Sustainability and You / Sciences Distributional *Fall 2022*
Teaching Fellow (Yale University). Developed coursework and organized term assignments.

Mechanical Design *Spring 2021*
Teaching Fellow (Yale University). Led lab sections, tutored students, and organized term projects.

Feedback Control Systems *Fall 2018, Spring 2018*
Graduate Student Instructor (UC Berkeley). Led lab sections, guest lectured, and tutored students.

Mechanical Engineering Laboratory *Spring 2018*
Graduate Student Instructor (UC Berkeley). Supported lab group projects and graded team reports.