

# VATSAL V. PATEL

Department of Mechanical Engineering & Materials Science, Yale University

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## EDUCATION

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### 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

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Dexterous Manipulation, Robot Grasping, In-Hand Manipulation

Mechanism Design, Parallel Robots, Force Sensing, Optimization, Motion Planning

## WORK AND RESEARCH EXPERIENCE

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### 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
- Implemented sampling-based trajectory optimization algorithms for fast and dynamic mobile grasping
- Devised and evaluated methods to design tendon-driven controllable and passive adaptable mechanisms

### 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

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### 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

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### Journal Articles

**Patel, V. V.**, Seewald, A., Dollar, A. M. ([in review](#)) “See How You Feel: Simple Six-Axis Force-Torque Sensing 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

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**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

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**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.