

# VATSAL V. PATEL

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## EDUCATION

<b>Yale University</b> <i>PhD in Engineering &amp; Applied Sciences (Robotics)</i> , Advisor: Prof. Aaron M. Dollar GPA: Honors (equivalent A) in all courses	<i>2019 - Present</i>
<b>University of California, Berkeley</b> <i>BS in Mechanical Engineering (2017), MS in Mechanical Engineering (2018)</i> GPA: 3.92 (High Honors) in BS, 4.00 in MS	<i>2014 - 2018</i>

## RESEARCH AREAS

Dexterous Manipulation, Robot Grasping, In-Hand Manipulation  
Mechanism Design, Optimization, Motion Planning, Parallel Robots

## WORK AND RESEARCH EXPERIENCE

<b>Yale GRAB Lab, Graduate Researcher</b>	<i>Aug 2019 - present</i>
• 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	
<b>Boston Dynamics AI Institute, Research Intern</b>	<i>June 2023 - August 2023</i>
• 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	
<b>Intuitive Surgical, Mechanical Engineer</b>	<i>Jan-Jul 2019, Intern: Summers '17 &amp; '18</i>
• 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	
<b>Berkeley Automation Lab (AUTOLAB), Graduate Researcher</b>	<i>2017 - 2018</i>
• 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

<b>Raymond John Wean Foundation Fellow in Engineering</b> Yale fellowship funding doctoral programs for high-performing students	<i>2020 - present</i>
<b>Yale Ventures Graduate Fellow</b> Commercializing research innovations with Blavatnik Fellows and Entrepreneurs-in-Residence	<i>2019 - 2020</i>
<b>Berkeley Mechanical Engineering Citation Award</b> Distinguished honors at graduation for academic achievement and outstanding service	<i>2018</i>
<b>Outstanding Graduate Student Instructor Award</b> Received for outstanding work in teaching Berkeley courses nominated by the department	<i>2018</i>
<b>Dean's Honors List and Term Honors at UC Berkeley</b> Academic distinction indicating top 10% engineering undergraduates	<i>2015-2017</i>

## PUBLICATIONS

### Refereed Journal Articles

**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: from the Lab to the Productive World*. 2021.

### Refereed Conference Papers

Pan, C., **Patel, V. V.**, et al. “Fluxbot: The Next Generation-Design and Validation of a Wireless, Open-Source Mechatronic CO<sub>2</sub> 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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<b>Yale Graduate Engineering Community (GECO) Organizer</b>	<i>2020-present</i>
Organized monthly social and mentorship events for 300+ Yale engineering graduate students.	
<b>Yale Pauli Murray College Graduate Affiliate</b>	<i>2019-present</i>
Served as a graduate resource and organized programming for undergraduates in the residence college.	
<b>Yale Graduate &amp; Professional Student Senate (GPSS) Senator</b>	<i>2020-2024</i>
Worked with the University to advocate for issues facing graduate student population representing the Graduate Sciences constituency.	
<b>Yale Mechanical Engineering &amp; Materials Science (MEMS) Mentor</b>	<i>2023</i>
Mentoring incoming MEMS students and serving as a resource in their transition to Yale.	
<b>Yale Office of International Students &amp; Scholars (OISS) Fellow</b>	<i>2021</i>
Organized and assisted programming for new international graduate students at Yale.	
<b>Yale Mentor for Minority Students in STEM (YMMSS)</b>	<i>2021</i>
Mentored 2 traditionally underrepresented students in science and engineering at Yale.	
<b>Yale Flipped Science Fair (FSF) Presenter</b>	<i>2021</i>
Presented my current research tailored to excite middle school students.	
<b>Yale Peabody Museum's Education Volunteer Docent</b>	<i>2019 - 2020</i>
Taught middle & elementary school student workshops with hands-on programs and tours.	
<b>Academic Service</b>	
Active reviewer for IEEE, ASME, and ACM conferences (ICRA, IROS, Robosoft), and journals (RAL, TRO, JMR, JMD, SIGGRAPH).	

## TEACHING FELLOWSHIPS

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<b>Mechanical Engineering Capstone I &amp; II</b>	<i>2023-24, 2021-22</i>
Teaching Fellow (Yale University). Advised project groups and led partnerships with external sponsors.	
<b>Mechanical Design</b>	<i>Spring 2021</i>
Teaching Fellow (Yale University). Led lab sections, tutored students, and organized term projects.	
<b>Feedback Control Systems</b>	<i>Fall 2018, Spring 2018</i>
Graduate Student Instructor (UC Berkeley). Led lab sections, guest lectured, and tutored students.	
<b>Mechanical Engineering Laboratory</b>	<i>Spring 2018</i>
Graduate Student Instructor (UC Berkeley). Supported lab group projects and graded team reports.	