VATSAL V. PATEL

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

WORK AND RESEARCH 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
- 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

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

Tau Beta Pi (ΤΒΠ) and Pi Tau Sigma (ΠΤΣ) Scholar *2016-2018*
National Engineering and Mechanical Engineering Honor Societies

PUBLICATIONS

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

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.

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.