John F. Morrow IV, PhD

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Robotics Educator and Researcher. *John's educational focus is on developing practical, hands-on engineering skills in his students: from holistic systems debugging and integration to mechanical design and electronics. Leveraging his experience managing high-volume research labs and serving as an Instructor of Record, he excels at multi-medium pedagogy and 1-on-1 mentorship. His teaching seamlessly integrates his technical expertise in robotic manipulation, end-effector metrology, and haptic teleoperation to provide students with a comprehensive, modern engineering education.*

Formal Education

PhD in Robotics Engineering — *Corvallis, OR*

Oregon State University (OSU) — *Nov. 2022*

- Dissertation: Studying human object manipulation strategies using robot hands [7] and crafting metrics to quantify robot hand performance at in-hand manipulation [5] and tool use [7].

M.S. in Robotics Engineering — *Corvallis, OR*

Oregon State University (OSU) — *March 2018*

- Thesis: Direct 3D Printing of Elastomer Robots without Support [3, 2, 9].

B.S. in Robotics Engineering — *Worcester, MA*

Worcester Polytechnic Institute (WPI) | with Minor in Electrical and Computer Engineering — *May 2015*

- Senior Project (MQP) Topic: Improving Soft Pneumatic Actuator fingers through integration of soft sensors, position and force control, and rigid fingernails [8].

Teaching Experience

Teaching: Instructor, ME351 - Introduction to Instrumentation — *OSU*

Department of Mechanical Engineering — *Fall 2019, Spring 2022*

- Instructor of Record for course in Fall 2019 (120 students, in-person) and Spring 2022 (100 students, hybrid but primarily in-person).
- Course Topic: Sensors and Data Analysis. Also — taught Mechanical Engineering students coding and basic electronics (Arduino).
- Managed a team of 3 graduate TAs and 3 undergraduate assistants as instructor of record.
- Taught/Managed this course as a TA for four years - assisted instructor with grading and running labs.
- Rewrote lab curriculum and lectures to improve relevance to course objectives and to utilize arduinos as a TA.

Mentoring & Management of Research Projects — *OSU*

Robotics and Human Controls Systems lab — *2017-Present*

- Managed and mentored masters and undergraduate students (30 students, cumulatively) across 4 lab projects during PhD.
- Participated as mentor in REU program for 3 years — 10 students, cumulatively.
- Administrated research lab — ordered equipment, maintained existing robotic systems, and managed students.
- Completed coursework in management: Engineering Project Management (IE 582) and Systems Engineering (IE 584) courses. Systems Engineering training is in Peter Checkland's Soft Systems Methodology.

Research Experience

Postdoctoral Program at Amazon/Amazon Robotics — *North Reading, MA*

under Beth Marcus, Andy Marchese. Also advised by Prof. Ken Salisbury, Stanford — *Dec 2022 - Jan 2026*

- Led three-person team to complete early R&D zero-to-one style projects for internal teams.
- Developed early-stage prototype benchmarking procedures for characterizing suction + finger end effectors.
- Kick-started multi-robot picking initiatives using human pick and manipulation studies.
- Performed systematic evaluation of inventory to establish data-driven testing procedures and understanding, improving operational validation.
- Engineered a high-performance haptic teleoperation interface in python using haptic controllers (Haply Inverse 3), enabling low-latency control of a chopstick style manipulator.
- Led a three-person team to execute large-scale human-in-the-loop data collection for behavior cloning methods (50 hours).

PhD: Studying Human Manipulation Strategies to Measure Robot Hand Design [4] *Oregon State University*

under Cindy Grimm and Ravi Balasubramanian *2017-2022*

- Pinpointed control and design improvements to underactuated hands for manipulative tasks using human study experiments [7, 1].
- Developed metrics to quantitatively assess in-hand manipulation performance of robot hand designs: Asterisk Test (in-hand manipulation) [5], tool-use [7], and human-intuitive robot hand measurements to communicate graspable region of hand and actuation space [6].
- Assessed a robot hand's upper potential of versatile in-hand manipulation performance using the above metrics and human study design for robot hands [4]
- Contributed human-expert data on a team to train an actor-critic reinforcement learning model for basic in-hand manipulation skills.

Soft Robotics Experience (Masters, Undergrad) *OSU, Worcester Polytechnic Institute*

under Yigit Menguc (Masters), Dmitry Berenson (Undergrad). *2015-2017, 2012-2015*

- Developed custom soft robots with integrated liquid metal sensors [8]. Work under Dmitry Berenson.
- Developed a prototype FDM printer capable of printing hollow structures out of silicone with no support [3, 2, 9]. Work under Yigit Menguc.

Publications

[1] Ammar Kothari, **John Morrow**, Victoria Thrasher, Kadon Engle, Ravi Balasubramanian, and Cindy Grimm. Grasping objects big and small: Human heuristics relating grasp-type and object size. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2018.

[2] **J. Morrow**, S. Hemleben, and Y. Menguc. Directly fabricating soft robotic actuators with an open-source 3-d printer. *IEEE Robotics and Automation Letters*, 2(1):277–281, Jan 2017.

[3] **John F. Morrow IV**. Direct 3d printing of silicone elastomer soft robots without support. Master's thesis, Oregon State University, Corvallis, OR, 2018.

[4] **John Morrow**. *A Novel Method for the Quantitative Assessment of Fingered Robot Hand Designs for In-Hand Manipulation using Human Studies and Object-Centric Benchmarks*. Phd thesis, Oregon State University, Corvallis, OR, November 2022. Available at `https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/4b29bf159`.

[5] **John Morrow**, Joshua Campbell, Ravi Balasubramanian, and Cindy Grimm. Benchmarking a robot hand's ability to translate objects using two fingers. *IEEE Robotics and Automation Letters*, 7(1):588–593, 2021.

[6] **John Morrow**, Joshua Campbell, Nuha Nishat, Ravi Balasubramanian, and Cindy Grimm. Measuring a robot hand's graspable region using power and precision grasps, 2022.

[7] **John Morrow**, Ammar Kothari, Yi Herng Ong, Nathan Harlan, Ravi Balasubramanian, and Cindy Grimm. Using human studies to analyze capabilities in underactuated and compliant hands in manipulation tasks. In *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2018.

[8] **John Morrow**, Hee-Sup Shin, Calder Phillips-Grafflin, Sung-Hwan Jang, Jacob Torrey, Riley Larkins, Steven Dang, Yong-Lae Park, and Dmitry Berenson. Improving soft pneumatic actuator fingers through integration of soft sensors, position and force control, and rigid fingernails. In *Robotics and Automation (ICRA), 2016 IEEE International Conference on*, pages 5024–5031. IEEE, 2016.

[9] Osman Dogan Yirmibesoglu, **John Morrow**, Stephanie Walker, Walker Gosrich, Reece Aidan Canizares, Hansung Kim, Uranbileg Daalkhaijav, Chloe Fleming, Callie Branyan, and Yigit Menguc. Direct 3d printing of silicone elastomer soft robots and their performance comparison with molded counterparts. In *Proceedings of the 2018 IEEE/RAS International Conference on Soft Robotics*. IEEE, April 2018.

Research Topics Currently Excited About

Robot Hand Design & Actuation • Suction + Finger Control Strategies • Robot Hands Using Tools • Benchmarking Grasping and Manipulation Tasks • Understanding the Limits of Simple Manipulator Systems • Complex + Simple End Effector Dual Arm Systems • Teleoperating Robot Hands Effectively • Human Grasping Shared and Manipulation Strategies • Robotics Pedagogy

Technical Skills

Hardware: Arduino | Raspberry Pi | 3D printers | UR Robot Arms | Basic Pneumatic Systems | Suction Cups | Force-Torque Sensors | Haply Inverse 3/3x Haptic Devices | Casting Silicone (Smooth-On) | EGaIn Sensor Fabrication | Lerobot SO101 Arm

Software: ROS | RTOS | SOLIDWORKS | Git | Unity | LINUX | Googling | Pybullet | OBS | LCM | Unity | ArUco

Programming (Experience): Python (+++) | C# (++) | Julia (++) | C++ (+) | Matlab (+)

Languages (Proficient): English (+++) | Russian (+) | Latin (+)

Hobbies: 3D printing | Hobbyist Flashlights | Music: Harmonica, Voice | Table Tennis | Video game development (Unity) | Birding | Backpacks | Teaching robotics | My two boys

Other Relevant Experience

From Non-Professional Life

- *Oregon State University Table Tennis club president* - under tenure, brought club back from near extinction. Increased club attendance from 3 member avg attendance to 15. Acquired a club sponsorship and external club coaches. Grew annual club funding by 100%.
- *Youth mentorship* - mentored several high school age students on what a career in robotics research looks like and how to begin. Also gave a well-received talk to a high school robotics class about robotics research.