

Columbia University  
Fu Foundation School of Engineering and Applied Science  
Faculty Personnel Record

**MATEI THEODOR CIOCARLIE**

---

Associate Professor  
Department of Mechanical Engineering  
Affiliate Faculty, Department of Computer Science  
Affiliate Member, Data Science Institute  
Columbia University, New York, NY 10027  
**Lab Website:** <http://roam.me.columbia.edu/>  
**Telephone:** 212-851-0407  
**E-mail:** [mtc2103@columbia.edu](mailto:mtc2103@columbia.edu)

**Date:** April 2018

**EDUCATION**

---

**Columbia University**, New York, NY

- Ph.D. in Computer Science, conferred February 2010. Thesis: “Low-Dimensional Robotic Grasping: Eigengrasp Subspaces and Optimized Underactuation”.
- M.S. in Computer Science, conferred May 2005.

**Polytechnic University of Bucharest**, Romania

- B.S. in Engineering, conferred June 2003.

**METRICS**

---

**Google Scholar** (retrieved: April 2019)

- Citations: 2604
- h-index: 26
- i10-index: 34

**PRINCIPAL FIELDS OF INTEREST**

---

- Robot motor learning for manipulation and locomotion in complex environments.
- Robot hand designs and control algorithms: underactuated and passively adaptive hands, optimized hand designs, uses of tactile, proprioceptive or range sensing for hand control.
- Assistive and rehabilitation robotics, active orthotic and prosthetic devices for the upper limb.
- Sensing for physical interaction: design of tactile and proprioceptive sensors for robot hands.
- Computer simulators for physical systems: development (rigid body collision detection and dynamics, models for soft body contacts) and applications (on-line planning and grasp analysis).

## CAREER HISTORY

---

### Columbia University, New York, NY

- Associate Professor (without tenure but on tenure track) of Mechanical Engineering (07/2018 – present)
- Assistant Professor of Mechanical Engineering (07/2014 – 06/2018)
- Affiliated Faculty, Department of Computer Science (12/2014 – present)
- Affiliated Member, Data Science Institute (10/2014 – present)

### Google, Inc., Mountain View, CA

- Senior Research Scientist (10/2013 – 06/2014)

### Willow Garage Inc., Menlo Park, CA

- Manager, Interactive Manipulation and Gripper Design (05/2012 – 9/2013)
- Research Scientist (09/2009 – 9/2013)

## AWARDS RECEIVED

---

### External Awards

- Sloan Research Fellowship, Alfred P. Sloan Foundation (2016)
- National Science Foundation CAREER Award (2016)
- Google Faculty Research Award (2016)
- Office of Naval Research Young Investigator Award (2015)
- IEEE Robotics and Automation Society Early Career Award (2013)
- Winner of the Robotdalen Scientific Award, international competition for recent doctoral dissertations in the field of robotics - Orebro, Sweden (2010)
- Best Student Paper Award, 2<sup>nd</sup> Joint Eurohaptics Conference and IEEE Symposium on Haptic Interfaces, Tsukuba, Japan (03/2007)

### Internal Awards

- Distinguished Faculty Teaching Award, Columbia Engineering Alumni Association (2019)
- Doctoral Thesis awarded with Honorary Mention for Distinction, Columbia University, Department of Computer Science (2010)
- The Paul Michelman Memorial Award for exemplary service to the community life of the Department of Computer Science, Columbia University (05/2009)
- Extraordinary Teaching Assistant Award, The Fu Foundation School of Engineering and Applied Science, Columbia University (12/2005)
- Ph.D. Service Award for superior contributions to the community life of the Department of Computer Science, Columbia University (awarded twice, 05/2007 and 05/2008)

## SERVICE

---

### Department of Mechanical Engineering

- Member, Graduate Committee (Fall 2014 – present)
- Coordinator, Robotics Concentration, Mechanical Engineering Master's Program (Fall 2015 – present)

- Coordinator, Departmental Seminar Series (Fall 2015 – Spring 2016)
- Speaker, External Advisory Board Meeting (April 2015)

### **School of Engineering and Applied Science**

- Speaker, SEAS Faculty Tech Talk: “Our Driverless Future?” (April 2018)
- Speaker, Egleston Student Seminar (October 2017)
- Speaker, Mechanical Engineering Graduate Associate Professor Seminar (April 2017)
- Speaker, SEAS Family Weekend (October 2015)
- Speaker, Career Discussion Advising Forum, Computer Science Department (April 2015)

## **PROFESSIONAL SERVICES**

---

### **Professional Association Activity**

- Co-Chair, Technical Committee on Mechanisms and Design, *IEEE Robotics and Automation Society* (2014 – present)

### **Program Committee Membership, Editorship and Reviewing**

- Panel Member, National Science Foundation, 2018
- Associate Editor, *IEEE Robotics and Automation Letters (RA-L)*, 2017 – present
- Area Chair, *Robotics: Science and Systems Conference*, 2017
- Area Chair, *Robotics: Science and Systems Conference*, 2016
- Reviewer, *National Aeronautics and Space Administration*, 2016
- Guest Editor, *Big Data Journal, Special Issue on Big Data in Robotics*, 2016
- Program Committee Member and Mini-symposium Co-Chair, *Intl. Symposium on Robotics Research*, 2015
- Associate Editor, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2015
- Program Committee Member, *Robotics: Science and Systems Conference*, 2015
- Associate Editor, *IEEE Intl. Conference on Robotics and Automation*, 2015
- Panel Member, National Science Foundation, 2015
- Reviewer, *National Aeronautics and Space Administration*, 2015
- Associate Editor, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2014
- Program Committee Member, *Robotics: Science and Systems Conference*, 2014
- Associate Editor, *IEEE Intl. Conference on Robotics and Automation*, 2014
- Guest Editor, *IEEE Trans. on Automation Science and Engineering, Special Issue on Cloud Robotics and Automation*, 2014
- Panel Member, *National Science Foundation*, 2013
- Associate Editor, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2013
- Program Committee Member, *AAAI Conference on Artificial Intelligence, Robotics Track*, 2013
- Program Committee Member, *AAAI Conference on Artificial Intelligence, Main Track and Robotics Special Track*, 2012
- Program Committee Member, *Workshop on Challenges and Opportunities in Robot Perception, Intl. Conference on Computer Vision*, 2011

- Program Committee Member, *Intl. Conference on Simulation, Modeling and Programming for Autonomous Robots*, 2010
- Program Committee Member, *Workshop on Mobile Manipulation, Robotics: Science and Systems Conference*, 2010
- Panel Member, *National Science Foundation*, 2010
- Program Committee Member, *Robotics: Science and Systems Conference*, 2009
- Program Committee Member, *Workshop on Mobile Manipulation in Human Environments, Robotics: Science and Systems Conference*, 2009
- Program Committee Member, *Workshop on Semantic Perception for Mobile Manipulation, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2009
- Journal and book reviewing (selection): Springer STAR Series, Transactions of the IEEE, Intl. Journal of Robotics Research, IEEE Trans. On Robotics, IEEE Robotics & Automation Mag., Autonomous Robots, Robotics and Autonomous Systems, ASME Journal of Mechanisms and Robotics, IEEE Trans. on Neural Systems & Rehabilitation Engineering, Robotica
- Conference reviewing (selection): IEEE ICRA, IEEE/RSJ IROS, AAI, World Haptics, IEEE Haptics Symposium, SIGGRAPH, ROSCon, SIMPAR, WAFR

### Event Organization

- Chair, *Northeast Manipulation Symposium (NEMS)*, New York City, June 2019
- Co-Organizer, Cloud Robotics Workshop, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2013
- Co-Organizer, Workshop on Common Platforms in Robotic Manipulation, *Robotics: Science and Systems Conference*, 2013
- Co-Organizer, Workshop on Robots in Clutter: Manipulation, Perception and Navigation in Human Environments, *Robotics: Science and Systems Conference*, 2012
- Co-Organizer, Special Symposium on Grasping and Manipulation, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2011
- Co-Organizer, Workshop on Manipulation Under Uncertainty, *IEEE Intl. Conference on Robotics and Automation*, 2011
- Chair, Mobile Manipulation Challenge, *IEEE Intl. Conference on Robotics and Automation*, 2010
- Co-Chair, Mobile Manipulation Challenge, *Intl. Joint Conference on Artificial Intelligence*, 2009

### PATENTS

---

- “High resolution tactile sensor with embedded electrodes”. Inventors: Matei Ciocarlie, Ioannis Kymissis, Pedro Piacenza, Steve Park. U.S. Patent Number 10,107,612 B2, October 2018
  - “Wearable and Functional Hand Orthotic”. Inventors: Matei Ciocarlie and Joel Stein. Provisional Patent Application No. 62/239,802. Filed: October 2015.
  - “Kinetic and Dimensional Optimization for a Tendon-driven Gripper”. Inventors: Matei Ciocarlie and Scott Stanford. Patent Application No. 14/050,075. Filed: October 2013.
-

## TEACHING

---

### Courses

- Spring 2019: MECE E6616 “Robot Learning”, Columbia University Dept. of Mechanical Engineering. Enrollment: 97 students. Role: Instructor.
- Fall 2018: MECE E4602 “Introduction to Robotics”, Columbia University Dept. of Mechanical Engineering. Enrollment: 120 students. Role: Instructor.
- Spring 2018: MECS E6615 “Advanced Robotic Manipulation”, Columbia University Dept. of Mechanical Engineering and Dept. of Computer Science. Enrollment: 36 students. Role: Instructor.
- Fall 2017: MECS E4603 “Applied Robotics: Algorithms and Software”, Columbia University Dept. of Mechanical Engineering and Dept. of Computer Science. Enrollment: 36 students. Role: Instructor.
- Spring 2017: ColumbiaX CSMM103x “Robotics”, EdX online platform, part of ColumbiaX Artificial Intelligence MicroMasters Program. Enrollment: over 20,000 online students as of April 2017. Role: Instructor.
- Spring 2016: MECS E6615 “Advanced Robotic Manipulation”, Columbia University Dept. of Mechanical Engineering and Dept. of Computer Science. Enrollment: 36 students. Role: Instructor.
- Spring 2016: “Enabling Technologies for Data Science and Analytics: The Internet of Things”, Columbia Data Science Institute (offered online on edX). Role: Lecturer, responsible for one segment (Cloud Robotics).
- Fall 2015: MECE E4602 “Introduction to Robotics”, Columbia University Dept. of Mechanical Engineering. Enrollment: 95 students. Role: Instructor.
- Fall 2014: MECE E4602 “Introduction to Robotics”, Columbia University Dept. of Mechanical Engineering. Enrollment: 36 students. Role: Instructor.

### Teaching Innovations

- MECE E4616 “Robot Learning”. Designed new course focusing on the intersection of Machine Learning and Robotics, studying learning abilities needed for physical robots interacting with the world, and applications of recent advances in machine learning for robotics. Created new set of class projects developed in Python and using the open-source Robot Operating System (ROS), covering topics ranging from classification and regression to deep reinforcement learning in robotics.
- MECS E4603 “Applied Robotics: Algorithms and Software”. Designed new interdisciplinary course introducing the field of robotics from an applied perspective, with a focus on the implementation of algorithms with wide use in industry and research. Designed new set of class projects developed in Python and using the open-source Robot Operating System (ROS), covering applied topics from robotic manipulation to mobile robots and self-driving vehicles.
- ColumbiaX CSMM103x “Robotics”. Designed new Massive Online Open Course (MOOC) focusing on Robotics. Designed curriculum and recorded lectures combining slide and whiteboard content with demonstrations of software libraries and tools. Developed cloud-based framework for class programming assignments and projects using open-source Robot Operating System through on-line programming assignment tools.
- MECS E6615 “Advanced Robotic Manipulation”. Designed new interdisciplinary course focusing on the interplay between computational and mechanical intelligence in the context of robotic manipulation. Presented theoretical concepts spanning the mechanics of manipulation, design, simulation, sensing and computer vision. Students from different backgrounds (Mechanical and

Electrical Engineering and Computer Science) combined expertise to design, build and program fully functional hand prototypes.

- MECE E4602 “Introduction to Robotics”. Re-designed class, including creation of new handouts and study material. Integrated open-source Robot Operating System (ROS), currently used in a majority of robotics research labs. Integrated new robotic platform: Baxter Robotic Manipulator. Designed set of class projects culminating with implementation and testing of ROS code on the real Baxter robot; developed simulator allowing multiple teams to develop and test robot code in parallel.

## **PUBLICATIONS**

---

Underlined authors are students in my group or interns I mentored or co-mentored for the project resulting in the respective publication.

### **Peer Reviewed Journal Publications**

- J1. S. Park, C. Meeker, L. Weber, L. Bishop, J. Stein and **M. Ciocarlie**. "Multimodal Sensing and Interaction for a Robotic Hand Orthosis", *IEEE Robotics & Automation Letters*, 4(2), 2019
- J2. P. Piacenza, S. Sherman and **M. Ciocarlie**. “Data-driven super resolution on a tactile dome”, *IEEE Robotics & Automation Letters*, 3(3), 2018
- J3. M. Haas Heger, G. Iyengar and **M. Ciocarlie**. “Passive Reaction Analysis for Grasp Stability”, *IEEE Transactions on Automation Science and Engineering*, 15(3), 2018
- J4. **M. Ciocarlie**, F. Hicks, R. Holmberg, J. Hawke, M. Schlicht, J. Gee, S. Stanford and R. Bahadur. “The Velo Gripper: A Versatile Single-actuator Design for Enveloping, Parallel and Fingertip Grasps”, *International Journal of Robotics Research*, 33(5), 2014
- J5. T. Chen, **M. Ciocarlie**, S. Cousins, P. Grice, K. Hawkins, K. Hsiao, C. Kemp, C. King, D. Lazewatsky, A. Leeper, H. Nguyen, A. Paepcke, C. Pantofaru, W. Smart, and L. Takayama. "Robots for Humanity: A Case Study in Assistive Mobile Manipulation", *IEEE Robotics & Automation Magazine, Special issue on Assistive Robotics*, 20(1), 2013
- J6. S. Chitta, E. G. Jones, **M. Ciocarlie** and K. Hsiao. “Perception, Planning, and Execution for Mobile Manipulation in Unstructured Environments”, *IEEE Robotics & Automation Magazine Special Issue on Mobile Manipulation*, 19(2), 2012
- J7. **M. Ciocarlie**, C. Pantofaru, K. Hsiao, G. Bradski, P. Brook and E. Dreyfuss. “A Side of Data with My Robot: Three Datasets for Mobile Manipulation in Human Environments”, *IEEE Robotics & Automation Magazine Special Issue: Towards a WWW for Robots*, 18(2), 2011
- J8. **M. Ciocarlie** and P. Allen. “A Constrained Optimization Framework for Compliant Underactuated Grasping”, *Mechanical Sciences*, 2, 17-26, 2011
- J9. **M. Ciocarlie** and P. Allen. “Hand Posture Subspaces for Dexterous Robotic Grasping”, *International Journal of Robotics Research*, 28(7), 2009 (**IJRR Top Ten Impact Factor in 2011**)

### **Peer Reviewed Conference Publications**

- C1. C. Meeker and **M. Ciocarlie**. "EMG-Controlled Non-anthropomorphic Hand Teleoperation Using a Continuous Teleoperation Subspace", *IEEE Intl. Conference on Robotics and Automation*, 2019 (acceptance rate: 44%, in press)
- C2. T. Chen and **M. Ciocarlie**. "Grasping Unknown Objects with Proprioception Using a Series-Elastic-Actuated Gripper", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2018 (acceptance rate: 47%)
- C3. M. Haas Heger, C. Papadimitriou, M. Yannakakis, G. Iyengar and **M. Ciocarlie**. "Passive Static Equilibrium with Frictional Contacts and Application to Grasp Stability Analysis", *Robotics: Science and Systems Conference*, 2018 (acceptance rate: N/A)
- C4. S. Park, L. Bishop, L. Weber, J. Stein and **M. Ciocarlie**. "Design and Development of Effective Transmission Mechanisms on a Tendon Driven Orthosis for Stroke Patients", *IEEE Intl. Conference on Robotics and Automation*, 2018 (acceptance rate: 41%)
- C5. C. Meeker and **M. Ciocarlie**. "Intuitive Hand Teleoperation by Novice Operators Using a Continuous Teleoperation Subspace", *IEEE Intl. Conference on Robotics and Automation*, 2018 (acceptance rate: 41%)
- C6. T. Chen, M. Haas Heger and **M. Ciocarlie**. "Underactuated Hand Design Using Mechanically Realizable Manifolds", *IEEE Intl. Conference on Robotics and Automation*, 2018 (acceptance rate: 41%)
- C7. C. Meeker, S. Park, L. Bishop, J. Stein and **M. Ciocarlie**. "EMG Pattern Classification to Control a Hand Orthosis for Functional Grasp Assistance after Stroke", *IEEE International Conference on Rehabilitation Robotics*, 2017 (acceptance rate: 74%)
- C8. I. Park, T. Smith, H. Sanchez, S. W. Wong, P. Piacenza and **M. Ciocarlie**. "Developing a 3-DOF Compliant Perching Arm for a Free-Flying Robot on the International Space Station", *IEEE International Conference on Advanced Intelligent Mechatronics*, 2017 (acceptance rate: N/A)
- C9. P. Piacenza, W. Dang, E. Hannigan, J. Espinal, I. Hussein, I. Kymissis and **M. Ciocarlie**. "Accurate Contact Localization and Indentation Depth Prediction With an Optics-based Tactile Sensor", *IEEE Intl. Conference on Robotics and Automation*, 2017 (acceptance rate: 41%)
- C10. M. Haas Heger, G. Iyengar and **M. Ciocarlie**. "On the Distinction between Active and Passive Reaction in Grasp Stability Analysis", *12<sup>th</sup> Intl. Workshop on the Algorithmic Foundations of Robotics*, 2016 (biennial conference; direct acceptance rate: 25%)
- C11. P. Piacenza, Y. Xiao, S. Park, I. Kymissis and **M. Ciocarlie**. "Contact Localization through Spatially Overlapping Piezoresistive Signals", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, 2016 (acceptance rate: 48%)
- C12. S. Park, L. Bishop, T. Post, Y. Xiao, J. Stein and **M. Ciocarlie**. "On the Feasibility of Wearable Exotendon Networks for Whole-Hand Movement Patterns in Stroke Patients", *IEEE Intl. Conference on Robotics and Automation* (acceptance rate: 35%), Stockholm, May 2016
- C13. J. Mahler, S. Patil, B. Kehoe, J. van den Berg, **M. Ciocarlie**, P. Abbeel and K. Goldberg. "GP-GPIS-OPT: Grasp Planning Under Shape Uncertainty Using Gaussian Process Implicit Surfaces and Sequential Convex Programming", *IEEE Intl. Conference on Robotics and Automation* (acceptance rate: 41%), Seattle, May 2015
- C14. A. Leeper, K. Hsiao, **M. Ciocarlie**, I. Sucas and K. Salisbury. "Methods for Collision-Free Arm Teleoperation in Clutter Using Constraints from 3D Sensor Data", *IEEE Intl. Conf. on Humanoid Robots*, Atlanta, October 2013

- C15. **M. Ciocarlie**, **F. Hicks** and S. Stanford. "Kinetic and Dimensional Optimization for a Tendon-driven Gripper", *IEEE Intl. Conference on Robotics and Automation*, Karlsruhe, May 2013
- C16. **H. Nguyen**, **M. Ciocarlie**, K. Hsiao and C. Kemp. "ROS Commander: Flexible Behavior Creation for Home Robots", *IEEE Intl. Conference on Robotics and Automation*, Karlsruhe, May 2013
- C17. **M. Ciocarlie**, K. Hsiao, **A. Leeper** and **D. Gossow**. "Mobile Manipulation Through An Assistive Home Robot", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Vilamoura, October 2012
- C18. T. Chen, **M. Ciocarlie**, S. Cousins, P. Grice, K. Hawkins, K. Hsiao, C. Kemp, C. King, D. Lazewatsky, **A. Leeper**, **H. Nguyen**, A. Paepcke, C. Pantofaru, W. Smart and Leila Takayama. "Robots for Humanity: User-Centered Design for Assistive Mobile Manipulation", Video Session Contribution, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Vilamoura, October 2012
- C19. **M. Dogar**, K. Hsiao, **M. Ciocarlie** and S. Srinivasa. "Physics-based Grasp Planning Through Clutter", *Robotics: Science and Systems*, Sydney, July 2012
- C20. **A. Leeper**, K. Hsiao, **M. Ciocarlie**, **D. Gossow** and L. Takayama. "Strategies for Human-in-the-Loop Robotic Grasping", *IEEE/ACM Intl. Conf. on Human-Robot Interaction*, Boston, March 2012
- C21. **A. Leeper**, S. Chan, K. Hsiao, **M. Ciocarlie** and K. Salisbury. "Constraint-based Haptic Rendering of Point Data for Teleoperated Robot Grasping", *IEEE Haptics Symposium*, Vancouver, March 2012
- C22. **P. Brook**, **M. Ciocarlie** and K. Hsiao. "Collaborative Grasp Planning with Multiple Object Representations", *IEEE Intl. Conference on Robotics and Automation*, Shanghai, May 2011
- C23. **M. Ciocarlie**, K. Hsiao, E. G. Jones, S. Chitta, R. B. Rusu and I. A. Sucas. "Towards Reliable Grasping and Manipulation in Household Environments", *Intl. Symp. on Experimental Robotics*, Delhi, December 2010
- C24. K. Hsiao, S. Chitta, **M. Ciocarlie** and E. Gil Jones. "Contact-Reactive Grasping of Objects with Partial Shape Information", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Taipei, October 2010
- C25. **M. Ciocarlie** and P. Allen. "Data-driven Optimization for Underactuated Robotic Hands", *IEEE Intl. Conference on Robotics and Automation*, Anchorage, May 2010
- C26. **M. Ciocarlie** and P. Allen. "A Design and Analysis Tool for Underactuated Compliant Hands", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, St. Louis, October 2009
- C27. C. Goldfeder, **M. Ciocarlie**, J. Peretzman, H. Dang and P. Allen. "Data-Driven Grasping with Partial Sensor Data", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, St. Louis, October 2009
- C28. C. Goldfeder, **M. Ciocarlie**, **H. Dang** and P. Allen. "The Columbia Grasp Database", *IEEE Intl. Conference on Robotics and Automation*, Kobe, May 2009
- C29. **M. Ciocarlie**, **H. Dang**, J. Lukos, M. Santello and P. Allen. "Functional Analysis of Finger Contact Locations during Grasping", *3<sup>rd</sup> Joint EuroHaptics Conference and IEEE Symposium on Haptic Interfaces*, Salt Lake City, March 2009
- C30. **M. Ciocarlie**, S. Clanton, M. Spalding and P. Allen. "Biomimetic Grasp Planning for Cortical Control of a Robotic Hand", *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Nice, September 2008
- C31. **M. Ciocarlie** and P. Allen. "On-Line Interactive Dexterous Grasping", *EuroHaptics Conference*, Madrid, June 2008

- C32. **M. Ciocarlie**, C. Goldfeder and P. Allen. “Dimensionality Reduction for Hand-Independent Dexterous Robotic Grasping”, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, San Diego, October 2007
- C33. **M. Ciocarlie**, C. Lackner and P. Allen. “Soft Finger Model with Adaptive Contact Geometry for Grasping and Manipulation Tasks”, *2<sup>nd</sup> Joint EuroHaptics Conference and IEEE Symposium on Haptic Interfaces*, Tsukuba, March 2007 (**Best Student Paper Award**)
- C34. **M. Ciocarlie**, A. Miller and P. Allen. “Grasp Analysis Using Deformable Fingers”, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Edmonton, August 2005

### Book Chapters

- B1. P. Allen, **M. Ciocarlie** and C. Goldfeder, "Grasp Planning Using Low Dimensional Subspaces", in “The Human Hand as an Inspiration for Robot Hand Development”, Springer Tracts in Advanced Robotics (STAR) Series, Balasubramanian, R. and Santos, V.J., Eds., Springer, Heidelberg, 2014

### Workshop Papers, Abstracts and Presentations

- W1. T. Chen, P. Piacenza, M. Haas-Heger and **M. Ciocarlie**. “The ROAM Hand: Design for Sensing and Dexterity”, *Workshop on Hands in the Real World, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Madrid, October 2018
- W2. P. Piacenza, E. Hannigan, S. Sherman, C. Baumgart, K. Behrman, I. Kyriassis and **M. Ciocarlie**. “Tactile Sensing with Overlapping Signals”, *Workshop on Active Touch, IEEE Intl. Conf. on Robotics and Automation*, Brisbane, May 2018
- W3. L. Webber, L. Bishop, J. Stein, S. Park, C. Meeker and **M. Ciocarlie**. “MyHand: A wearable robotic device for upper extremity rehabilitation and performance following stroke”, *American Occupational Therapy Association Conference*, Salt Lake City, April 2018
- W4. S. Sherman, P. Piacenza and **M. Ciocarlie**. “Super-resolution on a tactile dome: simulation, analysis and initial results”, *Workshop on Tactile Sensing for Manipulation: Hardware, Modeling, and Learning, Robotics: Science and Systems Conference*, Boston, July 2017
- W5. P. Piacenza, W. Dang, E. Hannigan, J. Espinal, I. Hussein, I. Kyriassis and **M. Ciocarlie**. “An Optics-based Tactile Sensor: Design and Operation”, *Workshop on Tactile Sensing for Manipulation: New Progress and Challenges, IEEE Intl. Conf. on Humanoid Robots*, Cancun, November 2016
- W6. M. Haas-Heger, G. Iyengar and **M. Ciocarlie**. “Active and Passive Reaction in Grasp Stability Analysis of Underactuated Hands”, *Workshop on Evaluation and Benchmarking of Underactuated and Soft Robotic Hands, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Daejeon, October 2016
- W7. P. Piacenza, W. Dang, E. Hannigan, J. Espinal, I. Hussein, I. Kyriassis and **M. Ciocarlie**. “Tactile Sensing with Overlapping Optical Signals”, *Workshop on Closed-loop Grasping and Manipulation: Challenges and Progress, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Daejeon, October 2016
- W8. P. Piacenza, Y. Xiao, S. Park, I. Kyriassis and **M. Ciocarlie**. “An Investigation of Contact Localization through Overlapping Signals”, *Workshop on Exploiting Contact and Dynamics in Manipulation, IEEE Intl. Conference on Robotics and Automation*, Stockholm, May 2016

- W9. A. Leeper, K. Hsiao, **M. Ciocarlie**, I. Sucan and K. Salisbury. “Assisted Arm Teleoperation in Clutter Using Constraints from 3D Sensor Data”, *Workshop on Robots in Clutter, Robotics: Science and Systems Conference*, Berlin, June 2013
- W10. L. Zhang, **M. Ciocarlie** and K. Hsiao. “Grasp Evaluation With Graspable Feature Matching”, *Workshop on Mobile Manipulation, Robotics: Science and Systems Conference*, Los Angeles, June 2011
- W11. K. Hsiao, **M. Ciocarlie** and P. Brook. “Bayesian Grasp Planning”, *Workshop on Mobile Manipulation, IEEE Intl. Conference on Robotics and Automation*, Shanghai, May 2011
- W12. **M. Ciocarlie**, G. Bradski, K. Hsiao and P. Brook. “A Dataset for Grasping and Manipulation using ROS”, *RoboEarth Workshop, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Taipei, October 2010
- W13. **M. Ciocarlie** and P. Allen. “A Constrained Optimization Framework for Compliant Underactuated Grasping”, *Workshop on Underactuated Grasping*, Montreal, August 2010
- W14. **M. Ciocarlie**, K. Hsiao, E. Gil Jones, S. Chitta, R. B. Rusu and I. A. Sucan. “Towards Reliable Grasping and Manipulation in Household Environments”, *Robotics: Science and Systems Manipulation Workshop*, Zaragoza, June 2010
- W15. K. Hsiao, S. Chitta, **M. Ciocarlie** and Gil E. Jones. “Contact-reactive Grasping of Objects with Partial Shape Information”, *Workshop on Mobile Manipulation, IEEE Intl. Conference on Robotics and Automation*, Anchorage, May 2010
- W16. **M. Ciocarlie** and P. Allen. “Low-Dimensional Dexterous Grasping for Robotic and Prosthetic Hands”, *IEEE Intl. Conf. on Robotics and Automation Full-Day Tutorial on Dexterous Manipulation*, Pasadena, May 2008
- W17. **M. Ciocarlie**, C. Goldfeder, and P. Allen. “Dexterous Grasping via Eigengrasps: a Low-Dimensional Approach to a High-Complexity Problem,” *Robotics: Science and Systems Manipulation Workshop - Sensing and Adapting to the Real World*, Atlanta, June 2007.

## Thesis

- T1. **M. Ciocarlie**. “Low-Dimensional Robotic Grasping: Eigengrasp Subspaces and Optimized Underactuation”, Doctoral Thesis, Dept. of Computer Science, Columbia University, February 2010

## Other Publications

- O1. P. Beckerle, G. Salvietti, R. Inal, D. Prattichizzo, S. Rossi, C. Castellini, S. Hirche, S. Endo, H. Ben Amor, **M. Ciocarlie**, F. Mastrogiovanni, B. Argall and M. Bianchi. “A Human-Robot Interaction Perspective on Assistive and Rehabilitation Robotics”, *Frontiers in Robotics and AI* (Perspective Paper), 2017
- O2. I. Park, T. Smith, H. Sanchez, S. Wong, P. Piacenza and **M. Ciocarlie**. “Developing a 3-DOF Compliant Perching Arm for a Free-Flying Robot on the International Space Station”, Late-breaking Result Abstract, *IEEE Intl. Conference on Robotics and Automation*, Seattle, May 2015
- O3. **M. Ciocarlie**. “Obstacle Avoidance and Path Planning Using a Sparse Array of Sonars”, Technical Report 04904, Department of Computer Science, Columbia University, December 2004

O4. **M. Ciocarlie**. “Parallel Numerical Algorithms Using MPI”, B.S. Eng. Graduation Thesis, School of Automatic Control and Computers, Polytechnic University of Bucharest, June 2003

## INVITED LECTURES

---

### Conferences and Workshops

- “Smart Robotic Manipulation”, *MARS Conference* (invitation-only), Palm Springs, March 2019
- “Proprioception: the (Half) Forgotten Sensing Modality”, *Workshop on Examining Sensing Modalities for Robust and Dexterous Object Manipulation, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Madrid, October 2018
- “A Tactile Sensor Designed for Learning-based Use: Successes, Limitations and Pitfalls”, *Workshop on New Progress in Tactile Perception and Learning in Robotics, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Madrid, October 2018
- “MyHand: a Wearable Hand Orthosis for Stroke Patients”, *Workshop on Wearable Robotics for Motion Assistance and Rehabilitation (RoboAssist 2018), IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Madrid, October 2018
- “Optics-based Tactile Sensing: from Planar Arrays to 3D Fingertips”, *Workshop on The Intelligence of Touch: Haptics, Tactile, Interaction, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Madrid, October 2018
- “Accurate Contact Localization with Few Wires”, *Workshop on Tactile Sensing for Manipulation, Robotics: Science and Systems Conference*, July 2017
- “Senses and Sensing Ability for Dexterous Hands”, *RSS 2017 Area Chair Symposium*, Carnegie Mellon University, April 2017
- “Towards an Active Hand Orthosis for Stroke Patients: Can We Achieve Dexterity in Wearable Form?”, *Workshop on Human-Oriented Approaches for Assistive and Rehabilitation Robotics, IEEE Intl. Symposium on Robot and Human Interactive Communication*, New York, August 2016
- “Contact Sensing for Manipulation: Thoughts on Why and How”, *Workshop on Exploiting Contact and Dynamics in Manipulation, IEEE Intl. Conference on Robotics and Automation*, Stockholm, May 2016
- “Recent Progress: Wearable Hand Orthoses and High-Resolution Contact Sensing”, *Robotics Workshop, Texas A&M University*, April 2016
- “Robotic Grasping: Complexity vs. Versatility”, Keynote Presentation, *Mini-Symposium on Hands and Haptics, Intl. Symposium on Robotics Research*, September 2015
- “Constraint-aware Teleoperation for Manipulation in Clutter”, *Towards a Unifying Framework for Whole-body and Manipulation Control Workshop, Robotics: Science and Systems Conference*, July 2015
- “More Hand for the Buck: Free Features through Design Optimization”, *Workshop on Robotic Hands, Grasping, and Manipulation, IEEE Intl. Conference on Robotics and Automation*, May 2015
- “Mobile Manipulation in and through the Cloud”, *Cloud Robotics Workshop, IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, November 2013
- “3D Printing: Research Prototypes and Beyond”, *Principal Investigator Meeting, National Robotics Initiative*, October 2013

- “The Humans in the Cloud: Shared Autonomy Over the Internet”, *IEEE/NSF Workshop on Cloud Manufacturing and Automation, IEEE Intl. Conf. on Automation Science and Engineering*, August 2013
- “From Co-robot to Extension of Self: Mobile Manipulation through an Assistive Home Robot”, *Workshop on Human Robot Collaboration, Robotics: Science and Systems Conference*, June 2013
- "The Humans in the Cloud: Shared Autonomy Over the Web", *Cloud Robotics Workshop, European Robotics Forum*, March 2013
- "Assistive Robotics for Motor Impaired Users: Manipulation in the Home Through A Mobile Robot", *Piper Health Solutions Workshop on Rehabilitation Robotics*, Tempe, Arizona, February 2013
- "Mobile Manipulation Through an Assistive Home Robot", *UTARI Symposium in Assistive Robotics*, Arlington, Texas, February 2013
- "Mobile Manipulation Through an Assistive Home Robot" - Keynote Presentation, Workshop on Assistance and Service Robotics in a Human Environment, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Vilamoura, October 2012
- "Manipulation in ROS: the Good, the Bad and the Research", Handling ROS Tutorial, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Vilamoura, October 2012
- "Interactive Manipulation with the PR2 Robot" (joint with Kaijen Hsiao), Robotics Workshop, *AAAI Conference on Artificial Intelligence*, San Francisco, August 2011
- “Towards Reliable Grasping and Manipulation in Household Environment: Applications on the PR2 Robot using ROS”, Towards a Robotics Software Platform Workshop, *IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*, Taipei, October 2010
- “Grasp Planning and Hand Design Optimization”, Workshop on Grasp Acquisition: How to Realize Good Grasps, *Robotics: Science and Systems Conference*, June 2010
- “Combining Perception and Manipulation in ROS”, Workshop on Representations for Object Grasping and Manipulation, *IEEE Intl. Conference on Robotics and Automation*, May 2010

### **Universities and Industry**

- “How to Make, Sense, and Make Sense of Contact in Robotic Manipulation”, Robotics Institute Seminar, *University of California, San Diego*, March 2019
- “How to Make, Sense, and Make Sense of Contact in Robotic Manipulation”, Mechanical Engineering seminar, *University of California, Los Angeles*, March 2019
- “How to Make, Sense, and Make Sense of Contact in Robotic Manipulation”, Robotics Seminar, *University of Southern California*, March 2019
- “Smart Robotic Manipulation”, *Samsung AI Research Center New York*, February 2019
- “How to Make, Sense, and Make Sense of Contact in Robotic Manipulation”, Robotics Seminar, *Massachusetts Institute of Technology*, September 2018
- “Embodied Intelligence for Robotic Hands”, *New York City Artificial Intelligence Meetup*, June 2018
- “Senses and Sensing Ability for Robot Hands”, Brain Robotics Team, *Google Inc.*, January 2018
- “Inner Sense: The Wealth of Data Inside a Robot (or Human) Body”, Sense, Collect and Move Data Center, *Data Science Institute, Columbia University*, November 2017
- “Smart Robotic Manipulation: From Healthcare to Material Handling”, New Frontiers in Robotics Showcase, *Columbia Technology Ventures*, October 2017
- “Robot Hands: Elements of Design, Grasp Analysis and Tactile Sensing”, *NASA Johnson Space Center*, August 2017

- “Senses and Sensing Ability for Robot Hands”, Department of Computer Science, *Rice University*, August 2017
- “Robotic Manipulation: Design, Sensing and Planning”, Dept. of Mechanical Engineering Colloquium Series, *City College of New York*, April 2016
- “Versatility in Robotic Manipulation: the Long Road to Everywhere”, Robotics Institute Seminar, *Carnegie Mellon University*, September 2015
- “Brain-Machine Interfaces for Robotic Manipulation: Tales from the Machine Side”, Center for Neural Engineering and Computation Seminar, *Columbia University*, January 2015
- “Brain-Machine Interfaces for Robotic Manipulation: Tales from the Machine Side”, Biomedical Engineering Seminar, *SUNY Downstate Medical Center and NYU Polytechnic School of Engineering*, January 2015
- "Versatile Mobile Manipulation: the Long Road to Everywhere", GRASP Laboratory, *University of Pennsylvania*, December 2014
- "Versatile Mobile Manipulation: the Long Road to Everywhere", Robotics and State Estimation Lab, *University of Washington*, June 2013
- "Versatile Mobile Manipulation", *Microsoft Corporation*, June 2013
- "Versatile Mobile Manipulation: the Long Road to Everywhere", Automation Sciences Lab, *University of California Berkeley*, March 2013
- “Robotic Manipulation in the Home: Challenges, Solutions and Perspectives”, EECS Seminar, *University of California Merced*, October 2011
- “From Human Hands to Robot Hands: Ideas and Applications for Robotic and Prosthetic Manipulation”, Neural Prosthetic Systems Laboratory, *Stanford University*, February 2011
- “Mobile Manipulation for Human Environments”, *Samsung Robotics Group* (via telepresence robot), Suwon, Korea, November 2010
- “Towards Reliable Grasping in Unstructured Environments”, Centre for Autonomous Systems, *KTH Royal Institute of Technology*, September 2010
- “Low-dimensional Robotic Grasping”, Dept. of Mechanical Engineering, *Yale University*, November 2009
- “Robotic Grasping: the Brains and the Brawn”, Dept. of Computer Science, *Brown University*, May 2009

## **OUTREACH EFFORTS**

---

### **Outreach and Engagement with Under-Represented Groups**

- Host for World Science Academy Festival, providing New York City high schoolers with access to scientists and research labs, February 2019.
- Lab participation in the 10th Annual Harlem STEM EXPO, an event held in partnership between Manhattan’s Community School District 5 and Harlem Children’s Zone, with a hands-on demo of a prototype robotic hand orthosis for stroke patients, May 2018.
- Host for the IDEAL School's Robotics Club “Inside Engineering” Columbia SEAS visit, Spring 2018.
- Invited speaker at the Family Astronomy Night Series hosted by the Intrepid Sea, Air and Space Museum, led project team presenting our work on rehabilitation robotics to audience of children and their families, July 2017.

- Host for the Columbia Inside Engineering program, hosting women high school students for hands-on demos of engineering projects, Spring 2017.
- Workshop host for the Engineering Exploration Experience program organized by the Columbia Society of Women Engineers, Spring 2017.
- Columbia University Young Scholars Program: host for high-achieving minority high school students, Summer 2016. Paper co-authored with student members submitted for peer review.

### Media Highlights

- “Humans beat robots, hands down”, Knowable Magazine, August 2018
- “Robotic muscle and sensitive polymer fingers in Columbia University’s robotics labs”, Ars Technica, March 2018
- “Inside Columbia University's secretive robot labs”, Business Insider, October 2017
- “Columbia Pioneers Launch Online Micromasters in Artificial Intelligence”, Columbia Engineering Magazine, Spring 2017
- “How NASA's Astrobees Robot Is Bringing Useful Autonomy to the ISS”, *IEEE Spectrum Robotics (online)*, February 2017
- “Columbia professors develop robotic glove to help stroke survivors recover”, *Columbia Spectator*, February 2016
- "Is It Really A Robot?", *Forbes Magazine*, December 2012
- "Willow Garage scientists who make robots to help disabled people", *San Jose Mercury News*, November 2012
- "Robot developer attempts to speed up A.I. tech", *CBS This Morning*, November 2012
- "Willow Garage Introduces Velo 2G Adaptive Gripper", *IEEE Spectrum Robotics (online)*, October 2012
- "How You Could Help Your Future Robot Coworker", *MIT Technology Review (online)*, September 2012
- " 'Co-robots' Join Workforce" (cover story), *EETimes*, August 2012
- "New robots give disabled some freedom", *CBS Evening National News*, June 2012
- “America Revealed: Robots”, *PBS Network*, May 2012
- “Prophets of Science Fiction: Isaac Asimov”, *Science Channel*, March 2012
- “Innovation Nation: Artificial Intelligence”, *SCN Network (Canada)*, June 2011
- “Robot Manipulation Challenge: Clean Up Dining Table, Load Dishwasher”, *IEEE Spectrum Robotics (online)*, November 2009
- “Helping Robots Get a Grip”, *MIT Technology Review (print)*, July 2009

### RESEARCH FUNDING HISTORY

---

- Amazon Research Award: “Sample-efficient Motor Learning for Tactile Grasping in Clutter”. Role: Principal Investigator (sole PI). Award period: 9/2019 – 8/2020.
- Office of Naval Research: “Learning by Doing: Realized Low-level Manipulation Skills as the Foundation for High-level Human-robot Collaboration”. Role: Principal Investigator (sole PI). Award period: 1/2019 – 12/2021.

- Columbia University School of Engineering and Applied Science: “Embedded Computing for Embodied Learning”. Role: Principal Investigator (co-PI: Luca Carloni). Award period: 09/2018 – 08/2019.
- National Science Foundation: “NRI: FND: Scalable Multimodal Tactile Sensing for Robotic Manipulators in Manufacturing”. Role: Principal Investigator (co-PIs: Ioannis Kymissis, Peter Allen). Award period: 09/2017-08/2020.
- Office of Naval Research: “DURIP: A Mobile Manipulation Platform for Collaborative Human-Robot Dexterous Manipulation”. Role: Principal Investigator (sole PI). Award period: 09/2016 – 09/2017.
- Sloan Research Fellowship: “Robotic Manipulation: Intelligence through Interaction”. Role: Principal Investigator (sole PI). Total funding: \$55,000. Award period: 07/2016 – 06/2018.
- Google Faculty Research Award: “Cloud Simulation as a Service for Robotic Manipulation”. Role: Principal Investigator (co-PI: Eitan Grinspun). Award period: 09/2016 – 08/2017.
- National Science Foundation: “CAREER: From Grasp Quality to Hand Quality: Analysis and Optimization for Effective Robot Hands”. Role: Principal Investigator (sole PI). Award period: 07/2016-06/2021.
- National Aeronautics and Space Administration: “Versatile Manipulation for Assistive Fee-Flyers”. Role: Principal Investigator (sole PI). Award period: 01/2016 – 12/2018.
- Columbia University School of Engineering and Applied Science: “A Multi-Modal Robotic Skin Sensor”. Role: Principal Investigator (co-PIs: Ioannis Kymissis, Peter Allen). Award period: 01/2016-12/2017.
- Office of Naval Research: “Collaborative Dexterous Manipulation: Mechanisms and Interfaces”, Young Investigator Program. Role: Principal Investigator (sole PI). Award period: 10/2015 – 09/2018.
- National Science Foundation: “NRI: Active Tendon-Driven Orthosis for Prehensile Manipulation After Stroke” (part of the National Robotics Initiative). Role: Principal Investigator (co-PI: Joel Stein). Award period: 08/2015 – 07/2018.
- Wallace H. Coulter Foundation: “MyHand: An Active Hand Orthosis for Stroke Patients”. Role: Principal Investigator (co-PI: Joel Stein). Award period: 07/2015 – 06/2016.
- National Science Foundation SBIR Phase II: “Personal Service Robotics with Tiered Human-in-the-Loop Assistance”, awarded to Willow Garage, Inc. Role: Principal Investigator (sole PI). Award period: 03/2013 – 03/2015.
- National Science Foundation SBIR Phase I: “Personal Service Robotics with Tiered Human-in-the-Loop Assistance” awarded to Willow Garage, Inc. Role: Principal Investigator (sole PI). Award period: 01/2012 – 06/2012.