

**Margherita Mencattelli-Mkparu, Ph.D.**  
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## SUMMARY OF QUALIFICATIONS

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- Experienced bioengineer focused on translational research, from R&D to clinical setting.
- Product developer from problem definition to design, manufacturing and validation.
- Excellent verbal and written skills, strong interpersonal and teamwork skills. Ability to communicate and lead across multiple disciplines.
- Affiliation with Sun Group Energy Consultants LLC; equity investor.

## EXPERIENCE

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**Boston Children's Hospital, Harvard Medical School, Boston, MA** Dec 2019-present  
*Pediatric Cardiac Bioengineering Lab is specialized in medical robotics and instrument design, development of imaging techniques for surgical guidance, modeling tool-tissue interaction and teleoperation/automation of instrument control*

Postdoctoral Fellow

- Design, build, and testing of a transcatheter platform (manually and robotically actuated) for heart valve repair.
- Design, build, and testing of devices for mitral valve repair (e.g. edge-to-edge, chordal repair).
- Design, build, and testing of endoscopic devices for imaging inside the beating heart.
- Benchtop, ex-vivo, and in-vivo validation on large animal models (porcine) of manually actuated transatrial endoscopes and transfemoral catheters for heart valve repair.
- In-vivo demonstrated the capability to manually navigate inside the beating heart, imaging valve structures (tricuspid and mitral), and deliver devices for mitral chordal repair.
- Design validation of a robotic platform for neurosurgery.
- Design of benchtop neurosurgical skill tasks patterned after the steps of brain tumor resection; data collection and statistical data analysis.
- Design, build, and testing of custom polymeric and Nitinol stents for airways treatment.
- Design, build, and testing of endoscopic devices for stent delivery and removal.
- Benchtop characterization, ex-vivo, and in-vivo validation on large animal models (ovine and porcine) of UV curable and Nitinol stents to treat tracheobronchomalacia.
- In-vivo demonstrated successful deployment of both UV curable and Nitinol stents, implanted stent observation over an extended period, and stent removal with minimal trauma.
- Design and testing of magnetic ball chain robots for endoluminal procedures.
- Worked in a team of 4 engineers, 2 cardiologist, 1 cardiac surgeon, 1 neurosurgeon, 2 pulmonologists, and 2 vet techs.
- Postdoc research activities published in 3 Journal papers and 4 conference papers.

**Columbia University, Department of Mechanical Engineering, New York City, NY** Dec 2018-Nov2019  
*Vukelic Group is focused on studying fundamental properties of biomaterials exploring ways to both characterize and modify them. The research has diverse applications ranging from precision diagnostics to targeted treatments.*

Postdoctoral Fellow

- Design optimization of a platform for laser-assisted vision correction.
- Build of a platform for corneal tissue inflation tests.
- Benchtop, ex-vivo validation on rabbit models using a robotic laser platform.
- Worked in a team of 3 engineers, 1 molecular biologist, 2 ophthalmologists.
- Postdoc research activities published in 1 Journal paper.

**Boston Children's Hospital, Harvard Medical School, Boston, MA** Oct 2016-Nov 2018  
*Pediatric Cardiac Bioengineering Lab is specialized in medical robotics and instrument design, development of imaging techniques for surgical guidance, modeling tool-tissue interaction and teleoperation/automation of instrument control*

Postdoctoral Fellow

- Design, build, and testing of endoscopic devices for autonomous robotic cardiac surgery.
- Design, build, and testing of artificial aortic valves to build cardiac disease models.
- Design, build, and testing of endoscopic devices for mitral valve repair.
- Design, characterization, and testing of single-axis force sensor to detect forces applied inside the beating heart.
- Benchtop, ex-vivo, and in-vivo validation on large animal models (porcine) using a robotic catheter platform (concentric tube robot).
- In -vivo demonstrated the capability to image inside the beating heart thanks to the combination of cardioscopy and catheter techniques. Validation on paravalvular leaks models.

- In-vivo demonstrated the capability to autonomously navigate inside the beating heart to reach a paravalvular leak, and manually repair it.
- In-vivo demonstrated the capability to manually navigate inside the beating heart for mitral valve repair (transapical access).
- Worked in a team of 5 engineers, 1 computer scientist, 2 cardiac surgeons, and 3 vet techs. Managed and led in-vivo animal studies.
- Postdoc research activities published in 3 Journal papers and 2 patents.

**The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy**

May 2016-Oct 2016

*Creative Engineering Design Lab is focused on merging creativity with robust engineering approaches and methodologies to develop new machines and usable systems*

Research Assistant

- Final in-vitro characterization of a 6-axis force sensor custom designed.
- Worked in a team of 4 engineers, and 2 doctors.
- Research activities published in 1 Journal paper.

**The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy**

May 2011-Nov 2012

*Creative Engineering Design Lab is focused on merging creativity with robust engineering approaches and methodologies to develop new machines and usable systems*

Research Assistant

- Research within the European project ARAKNES, "Array of Robot Augmenting the KiNematics of Endoluminal Surgery".
- Mechanical design and 3D printed prototyping of a 5 DOFs robotic arm for minimally invasive surgery, hydraulically actuated.

## EDUCATION

**The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy**

Nov 2012-May 2016

PhD. in Biorobotics

- Study the interaction between tissues and medical instruments. Development of innovative devices to be optimally interfaced with the anatomical structures.
- Mechanical/electrical design, build, and testing of a customized measuring platform to detect 3-dimensional force/moment applied in orthodontics.
- In-vitro demonstrated the capability to detect orthodontic actions and optimize the patient-specific treatment.
- Porcine ex-vivo characterization of the mechanical behavior of gastrointestinal tract tissues to evaluate functionality in healthy and disease cases, and optimize screening and surgical procedures.
- Mechanical characterization of polymeric fibers as an alternative to steel cables for minimally invasive tools actuation.
- Design, build, and testing of a hand-held cardioscope for paravalvular leak repair. Porcine ex-vivo models demonstrated the capability to image inside the heart and repair the leak.
- Design, build, and testing of an MRI-compatible, multi-port neuroendoscope for ventriculoscopy. Human cadaver ex-vivo models demonstrated the capability to safely conduct minimally invasive ventricular procedures.
- Worked in a team of 7 engineers, 2 biologists, 2 doctors, and 2 surgeons.
- Participated in preparing and writing of operating grant applications (EU Research Projects – FP7/Horizon2020 and National Research Projects - PRIN).
- Trained and supervised undergraduate students.
- PhD research activities published in 4 Journal papers and 7 National/International Conferences.

**University of Pisa, Pisa, Italy**

Sept 2008-Feb 2011

*Master of Science in Biomedical Engineering*

Thesis title: "Design and characterization of a hydraulically actuated instrument for minimally invasive surgery".

**University of Pisa, Pisa, Italy**

Sept 2005-Dec 2008

*Bachelor of Science in Biomedical Engineering*

Thesis title: "Change of direction: biomechanical analysis and comparison with other training exercises in soccer".

## SKILLS AND TECHNIQUES

- **Development:** Adobe Premiere, LabVIEW, Matlab, Simulink, SolidWorks, XCode program developer (Swift)
- **Office:** MS Office, LATEX

- **Testing:** Mechanical prototyping/characterization, Electronical prototyping/characterization, Instron machine, data analysis
- **Lab Management:** Maintaining laboratory and related equipment, order supply, working with external vendors
- **Project Management:** research presentation, project reports meetings
- **Leadership and Management:** strong ability to lead teams of people with different skills set and backgrounds
- **Language:** Italian (mother language), English (proficient), French (intermediate)

## OTHER SKILLS

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Strong communicative and planning skills. Ability to focus on multiple performed tasks and projects.

Cultural awareness and appreciation for diversity, equity and inclusion. Ability and experience working in a global environment. Ability to collaborate across teams and across disciplines, as a contributor or leader.

Conferences reviewer for: IEEE International Conference on Intelligent Robots and Systems (IROS), IEEE International Conference on Robotics and Automation (ICRA), International Conference on Biomedical Robotics and Biomechanics (BioRob).

Journal reviewer for: IEEE Transaction on Medical Robotics and Bionics, IEEE Access.

Review Editor on the Editorial Board of Bionics and Biomimetics (specialty section of Frontiers in Bioengineering and Biotechnology and Frontiers in Robotics and AI), 2021 – present.

## JOURNAL PUBLICATIONS

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K. Price, J. Peine, **M. Mencattelli**, Y. Chitalia, D. Pu, T. Looi, S. Stone, J. Drake, P.E. Dupont. “Neurosurgeons have two hands – shouldn’t their robots? Science Robotics, accepted for publication, May 2023.

S. Manjila, B. Rosa, K. Price, R. Majila, **M. Mencattelli**, P.E. Dupont. “Robotic instruments inside the MRI bore: key concepts and evolving paradigms in imaging-enhanced cranial neurosurgery”, World Neurosurgery, doi.org/10.1016/j.wneu.2023.01.025

V. Del Bono, J. Peine, M. Finocchiaro, K. Price, **M. Mencattelli**, Y. Chitalia, V.H. Ko, L. Yu, J. Secor, A. Pan, Z. Machaidze, M. Puder, A. Artoni, P.E. Dupont. “Non-surgical Removal of Partially Absorbable Bionic Implants,” IEEE Transactions on Medical Robotics and Bionics, 4(2), 530-537, 2022.

**M. Mencattelli**, A. Mondal, R. Miale, D. Van Story, J. Peine, Y. Li, A. Artoni, A.K. Kaza, P.E. Dupont. “In Vivo Molding of Airway Stents”, Advanced Functional Materials, 31(11), 2021.

Y. Li, J. Peine, **M. Mencattelli**, J. Wang, J. Ha, P.E. Dupont. “A Soft Robotic Balloon Endoscope for Airway Procedures” Soft Robotics, 9(5), 1014-1029, 2022.

J. Fan, J. L. Wendt, K. Yang, **M. Mencattelli**, S. Vukelic. “Effects of Combining External Mechanical Load with UV-A Light/Riboflavin CXL onto Corneal Curvature”, Investigative Ophthalmology & Visual Science, 61(9), 2020.

G. Fagogenis, **M. Mencattelli**, Z. Machaidze, B. Rosa, K. Price, F. Wu, V. Weixler, M. Saeed, J. E. Mayer, P. E. Dupont. “Autonomous robotic intracardiac catheter navigation using haptic vision”, Science Robotics, 4(29) eaaw1977, 2019.

Z. Machaidze, **M. Mencattelli**, G. Arnal, K. Price, F. Wu, V. Weixler, D. W. Brown, J. E. Mayer Jr, P. E. Dupont. “Optically-guided instrument for transapical beating-heart delivery of artificial mitral chordae tendineae”, The Journal of thoracic and cardiovascular surgery, 2019.

S. Manjila, B. Rosa, **M. Mencattelli**, P.E. Dupont. “Minimally Invasive Bilateral Anterior Cingulotomy via Open Minicraniotomy Using a Novel Multiport Cisternoscope: A Cadaveric Demonstration”, Operative Neurosurgery, opy083 2018.

B. Rosa, Z. Machaidze, **M. Mencattelli**, S. Manjila, B. Shin, K. Price, M.A. Borger, V. Thourani, P. del Nido, D.W. Brown, C.W. Baird, J.E. Mayer, P.E. Dupont. “Cardioscopically guided beating heart surgery: paravalvular leak repair”, The Annals of Thoracic Surgery, 104(3) 1074-1079, 2017.

**M. Mencattelli**, E. Donati, P. Spinelli, M. Cultrone, C. Luzi, D. Cantarella, C. Stefanini. “Measuring 3D- orthodontic actions to guide clinical treatments involving coil springs and miniscrews”, Biomedical Microdevices, 19(1) 14, 2017.

S. Manjila, **M. Mencattelli**, B. Rosa, K. Price, G. Fagogenis, P.E. Dupont, “A multiport MR-compatible neuroendoscope: spanning the gap between rigid and flexible scopes”, Neurosurgical Focus, 41 (3):E13, 2016.

Z. Machaidze, B. Rosa, **M. Mencattelli**, S. Manjila, K. Price, M. Borger, V. Thourani, D. Brown, C. Baird, J. Mayer, P. E. Dupont. “TCT-246 cardioscopy-guided repair of aortic paravalvular leak in porcine beating heart model”, Journal of the American College of Cardiology, 68(18S), 2016.

E.L. Carniel, **M. Mencattelli**, G. Bonsignori, C.G. Fontanella, A. Frigo, A. Rubini, C. Stefanini, A.N. Natali, "Analysis of the structural behaviour of colonic segments by inflation tests: Experimental activity and physio- mechanical model", Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine, 229(11) 794-803, 2015.

**M. Mencattelli**, E. Donati, M. Cultrone, C. Stefanini. "A novel universal system for 3D orthodontic force- moment measurements and its clinical use", American Journal of Orthodontics and Dentofacial Orthopedics 148(1) 174-183, 2015.

G. Benelli, N.G. Kavallieratos, E. Donati, **M. Mencattelli**, G. Bonsignori, C. Stefanini, A. Canale, R.H. Messing. "May the wild male loose? Male wing fanning performances and mating success in wild and mass- reared strains of the aphid parasitoid *Aphidius colemani* Viereck (Hymenoptera: Braconidae: Aphidiinae)", BioControl, 59(5) 487-500, 2014.

## **NATIONAL/INTERNATIONAL CONFERENCES AND WORKSHOPS**

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G. Pittiglio, **M. Mencattelli**, A. Donder, Y. Chitalia, P.E. Dupont. "Workspace Characterization for Hybrid Tendon and Ball Chain Continuum Robots", The Hamlyn Symposium on Medical Robotics, 2023, In press.

G. Pittiglio, **M. Mencattelli**, P.E. Dupont. "Closed-form Kinematic Model and Workspace Characterization for Magnetic Ball Chain Robots", International Symposium on Medical Robotics (ISMR) 2023, In press.

G. Pittiglio, **M. Mencattelli**, P.E. Dupont. "Magnetic Ball Chain Robots for Endoluminal Interventions" 2023 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2023, In press.

K. Price, J. Peine, Y. Chitalia, **M. Mencattelli**, A. Pourkand, T. Looi, J. Drake, P. E. Dupont. "Bimanual Endoscopic Robot for Neurosurgery", The Hamlyn Symposium on Medical Robotics, pp99-100, 2022.

**M. Mencattelli**, S. Manjila, B. Rosa, K. Price, G. Fagogenis, P. E. Dupont. "Multi-port neuroendoscope for robotic intraventricular procedures", The Hamlyn Symposium on Medical Robotics, 1, pp32-33, 2016.

**M. Mencattelli**, A. Tonazzini, I. Martinelli, M. Menchicchi, C. Stefanini. "A novel fluid driven, foldable joint for Minimally Invasive Surgery", Biomedical Robotics and Biomechanics (BioRob), 2016 6th IEEE International Conference on, 335-340, 2016.

**M. Mencattelli**, C. Kim, Z. Machaidze, I. Berra, B. Rosa, C. Stefanini, P.E. Dupont. "A new cardioscopic device for paravalvular leak repair", 5th National Congress of the Italian Group of Bioengineering, 2016.

**M. Mencattelli**, S. Manjila, B. Rosa, K. Price, G. Fagogenis, P.E. Dupont, "Multi-port Neuroendoscope for Robotic Intraventricular Procedures", Hamlyn Symposium on Medical Robotics, pp. 32-33, 2016.

**M. Mencattelli**, E. Donati, M. Cultrone, C. Stefanini. "Customized Load Cell for Three-Dimensional Force- Moment Measurements in Orthodontics", Biomedical Robotics and Biomechanics (BioRob), 2014 5th IEEE International Conference on, 238-243, 2014.

M. Cultrone, **M. Mencattelli**, L. Lombardo, C. Stefanini. "An innovative orthodontic solution for three- dimensional force-moment measurements" 114th Annual Session of the American Association of Orthodontists, 2014.

A.N. Natali A. Frigo, E.L. Carniel, V. Gramigna, **M. Mencattelli**, G. Bonsignori, G. Favaro, C. Stefanini. "Investigation of gastrointestinal tissues and structures biomechanical response", 4th National Congress of the Italian Group of Bioengineering, 2014.

**M. Mencattelli**, M. Cultrone, C. Stefanini. "New Technologies and methods for quantitative evaluation of 3D orthodontic actions", 20th Congress of the European Society of Biomechanics, 2013.

## **PATENTS**

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P. E. Dupont, G. Fagogenis, R. Benoit, **M. Mencattelli**, Z. Machaidze. Autonomous Robotic Catheter for Minimally Invasive Interventions, 2021. US application number 17154486. Publication number US 2021/0236773 A1

P. Dupont, A. Ataollahi, P.J Del Nido, I. Berra, **M. Mencattelli**, S. Manjila, B. Rosa, Z. Machaidze. Optically guided surgical devices, 2016. International application number PCT/US2016/038147. International Publication Number WO 2016/205694 A1

## **EXTRACURRICULAR**

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### **Equity Investor for Sun Group Energy Consultants LLC**

Support services to a renewable energy startup including web design, app design and development, administration, business branding, recruiting, on-boarding, training, business communication and technical support.

### **Creative Engagements**

Dynamic and positive character with a passion for music, theatre and travelling. Experienced violinist. Avid hiker. My indoor activities comprise of reading and cooking.