Loris Fichera, Ph.D.

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BACKGROUND

1. Education

Ph.D. Robotics, Cognition, and Interaction Technologies, University of Genova, Italy 2015
Dissertation: Cognitive Supervision for Robot-Assisted Minimally Invasive Laser Surgery
Advised by Darwin G. Caldwell, Leonardo S. Mattos, Diego Pardo

M.S. Computer Engineering, University of Catania, Italy 2011
Thesis: Design and Implementation of a Monitoring System for Photovoltaic Power Stations
Advised by Corrado Santoro
Evaluation: 110/110, cum laude*

B.S. Computer Engineering, University of Catania, Italy 2008
Thesis: Design and Implementation of a Localization System for Autonomous Mobile Robots
Advised by Corrado Santoro
Evaluation: 110/110, cum laude*

2. Work Experience other than Teaching

Postdoctoral Researcher, Dept. of Mechanical Engineering, Vanderbilt University, USA 2015-2017
Graduate Research Assistant, Dept. of Advanced Robotics, Italian Institute of Technology, Italy 2012-2015
Junior Storage Administrator, Autostrade per l'Italia SpA, Italy 2011
Software Engineer, Jurma Srl, Italy 2011
Visiting Research Fellow, School of Engineering, University of Hertfordshire, UK Spring 2010

TEACHING

3. Teaching Experience

Assistant Professor, Worcester Polytechnic Institute, USA 2018-present
Visiting Assistant Professor, Worcester Polytechnic Institute, USA Fall 2017

4. Teaching Innovations at WPI

- I designed a new graduate course entitled "RBE 522: Continuum Robotics." Continuum robotics focuses on the study of *continuously flexible* robotic arms. This branch of robotics takes inspiration from flexible animal appendages (e.g., elephant trunks and octopus tentacles) to create manipulators capable of complex bending motions. Real-world applications of continuum robots include minimally invasive surgery, industrial inspection, and more generally any scenario that requires manipulation within highly unstructured, confined environments, where traditional rigid-link robotic arms are not suitable for use. RBE 522 introduces students

* In the Italian system, this is the highest possible academic distinction

to fundamental topics in continuum robot design, modeling, and control. The course culminates in the development of a continuum robot simulator, where students apply the concepts learned in the classroom.

- I created a new module for "RBE 3001: Unified Robotics – Manipulation" that focuses on vision-based tracking. This new module fills a gap in the undergraduate "Unified Robotics" sequence by covering for the first time the fundamentals of vision-based robot tracking. The module includes 2 entirely new lectures and 1 new laboratory assignment.

- I developed new class materials for "RBE 501: Robot Dynamics" to cover the following topics that were previously not part of the syllabus: Exponential Coordinates, Product of Exponentials, Numerical Inverse Kinematics, the Recursive Newton-Euler algorithm. I developed new MATLAB-based assessments for this course. All the homework assignments are now administered through MATLAB Grader, an online platform through which students can submit their code and get immediate feedback without having to wait for the instructor/TAs to grade their assignment.

5. Courses Taught at WPI

The following table lists all the courses I have taught at WPI to date. For each course, the table reports the class size and the average student ratings for Question #1 (overall course rating), Question #2 (instructor rating) of the course evaluations. Ratings use a 5-point scale, with 1 being "Very Poor" and 5 being "Excellent."

Year	Term	Course	Course Title	Class Size	Q1	Q2
2018	C	RBE3001	Unified Robotics - Manipulation	45	4.7	4.9
2018	Fall	RBE595	Advanced Topics in Surgical Robotics	3	5	5
2019	C	RBE3001	Unified Robotics - Manipulation	57	4.9	4.9
2019	B	RBE595	Advanced Topics in Surgical Robotics	10	4.7	4.8
2020	C	RBE3001	Unified Robotics - Manipulation	43	4.8	4.9
2020	Fall	RBE594	Capstone Project Experience in Robotics Engineering	6	5	4.8
2020	B	RBE595	Advanced Topics in Surgical Robotics	14	4.8	4.9
2021	Spring	RBE501	Robot Dynamics	32	4.8	4.6
2021	Fall	RBE501	Robot Dynamics	42	4.6	4.8
2021	B	RBE595	Advanced Topics in Surgical Robotics	7	5	5
2022	Spring	RBE501	Robot Dynamics	86	4.6	4.7
2022	Fall	RBE594	Capstone Project Experience in Robotics Engineering			
2022	Fall	RBE522	Continuum Robotics			

6. Undergraduate Projects Advised and Co-advised at WPI

Major Qualifying Projects

As main adviser:

MQP1. Emily Minch, Rositsa Mihaleva, Hoang Do, Ryan Tougas, *Super-elastic Continuum Robot for Endoscopic Articulation and Manipulation* 4.0. 2022.

MQP2. Brandon Sanders, Kyle Lang, *Optically-driven Robots*. 2021. Awarded an Honorable Mention for the Provost's MQP Award.

MQP3. Sabrina Liu, Phillip Abell, Samuel Johnson, Zhongchuan Xu, *Super-elastic Continuum Robot for Endoscopic Articulation and Manipulation* 3.0. 2021. Awarded the RBE Director's MQP Award.

MQP4. Irene Wong, Yixue Wang, Kayla Swiston, Floris Van Rossum, *Tissue-type Recognition for Laser-Based Surgery*. 2020.

MQP5. Nicholas Pacheco, Jesse d'Almeida, Joseph Bartone, Andrew Gulotta, *Super-elastic Continuum Robot for Endoscopic Articulation and Manipulation* 2.0. 2020. Awarded an Honorable Mention for the Provost's MQP Award.
MQP6. Chenggu Wang, Ryan St. Hilaire, Matt Collins, James Kradjian, Wentao Yuan, *Thermal Endoscope for Robotic Surgery*. 2019.
MQP7. Zach Boyer, Ben Mart, Cory Brolliar, Kevin O'Brien, *Super-elastic Continuum Robot for Endoscopic Articulation and Manipulation*. 2019. Awarded the RBE Director's MQP Award.
MQP8. Andre Imperiali, *Design, and Implementation of a Manufacturing Process to create Nitinol Flexure Wrists for use in Medical Applications*. 2018.

As co-adviser:
MQP9. Rui Hou, Yongxian Jin, Te Lu, *A Robotic Medical Device for Spinal Surgery*. 2022. (primary adviser: Yihao Zheng).
MQP10. Hannah Brooks, Zhuofan Lu, Karina Mirochkin, Olivia Petropulos, *Optical Coupling System Optimization for Medical Laser Surgical Applications*. 2022. (primary adviser: Shawn Liu).
MQP11. Nicholas Weddington, Tej Sheth, Ryan Eastwood, Timothy Fromme, *N-Link Modular Smart Robotic Arm*. 2020. (primary adviser: Cagdas Onal)
MQP12. Keion Bisland, Xavier Little, Alex Tacescu, *Smallkat MQP*. 2019. (primary adviser: Nick Bertozzi)
MQP13. Daniel Wivagg, Ariel Goldner, Steven Franca, Matthew Schueler, Stephanie Marcucci, *Preventative Care Knee Exoskeleton*. 2019. (primary adviser: Greg Fischer)
MQP14. Bohn Bunnag, Colin Buckley, Rebecca Miles, Apiwat Ditthapron, *Object Manipulation and Control with Robotic Hand*. 2019. (primary adviser: Jane Li)
MQP15. Kirsten Herchenroder, Spenser Martin, Connor Mastropoli, Maria Perez Luna, Silvio Torres, *Dynamic Correction of Postural Kyphosis*. 2018. (primary adviser: Greg Fischer)

Interactive Qualifying Projects
IQP1. Julia Milks, *A Review of Technological Predictions for Office-Based Laryngeal Surgery*, 2020.

Undergraduate Research Projects
RE1. Jialin Song, *Making Surgical Lasers to Cut Better*, Summer Training in Arts & Sciences (STAR), 2020.
RE2. Razan Andigani, *In-vitro models of the Larynx*, Early Research Experience in E-Term (EREE), 2019.
RE3. Floris Van Rossum, *N3RDS: Notched Endoscope Research Design Software*, Summer Research Project (funded with start-up funds), 2019.
RE4. Samantha Moriarty, *Fabrication of Agarose Gels for Laser-Tissue Interactions Studies*, Summer Research Project (funded with start-up funds), 2018.

7. Graduate Theses and Dissertations Advised at WPI

Doctoral Dissertations:
PhD1. Alex Chiluisa, *A hand-held Robotic System for In-Office Laser Surgery of the Vocal Folds*. 2023 (expected).
PhD2. Nicholas Pacheco. 2025 (expected) **Awarded the NSF GRFP in April 2022.**

Master's Theses:
MS1. Jesse d'Almeida, *Making Concentric Tube Robots More Accessible: A New Open-Source Design Made of 3D-Printed and Other Easy-to-Source Materials*. 2021. Awarded the Glenn Yee Robotics Graduate Student Project Award.
MS2. Nicholas Pacheco, *A New Mechanics Model for Continuum Notched-Tube Wrists that Accounts for Tendon Friction and Material Nonlinearities*. 2021.

MS3. Karim Tarabein, *Towards the Automatic Control of Laser Cutting for Laser Surgery*. 2019.
MS4. Shravan Murlidaran, *A mixed reality framework for surgical navigation: approach and preliminary results*. 2019.

Membership on WPI Student Committees:

Robotics Practicum:

SC1. Abhishek Shivdeo, RBE MS 2022 (expected)
SC2. Sushimita Belede, RBE MS 2022 (expected)
SC3. Soumya Balijepally, RBE MS 2021

Master's Degrees:

SC4. Shreyas Chandra Sekhar, RBE MS 2022 (expected)
SC5. Enxhi Jaupi, BME MS 2022
SC6. Shang Gao, RBE MS 2020
SC7. Vignesh Varier, RBE MS 2020
SC8. Keion Bisland, RBE MS 2020
SC9. Anna Novoseltseva, BME MS 2018
SC10. Ankur Agrawal, RBE MS 2018
SC11. Katie Gandomi, RBE MS 2018
SC12. Radian Gondokaryono, RBE MS 2018
SC13. Meagan Hiatt, RBE MS 2017

Ph.D. Degrees:

SC14. Zhanyue (Jimmy) Zhao, RBE PhD 2022 (expected)
SC15. Katie Gandomi, RBE PhD 2021
SC16. Junius Santoso, RBE PhD 2019
SC17. Paulo Carvalho, RBE PhD 2019
SC18. Adnan Munawar, RBE PhD 2019
SC19. Marek Wartenberg, RBE PhD 2018
SC20. Christopher J. Nycz, RBE PhD 2018
SC21. Payam Razavi, ME PhD 2018

8. Independent Studies Conducted at WPI

IS1. Kalani Picho & Brandon Persons. *Multi-Jet Fusion of Nylon-12: A Viable Method to 3D print Concentric Tube Robots?* Directed Research (6 credits), Fall 2021-Spring 2022. Awarded the Glenn Yee Robotics Graduate Student Project Award.
IS2. Neet Mehta, *Learning the Kinematics of Notched-Tube Continuum Wrists*. Directed Research (3 credits), Fall 2021.
IS3. Ajay Balasubramanian, *Elastic Stability of Concentric Tube Robots*, Directed Research (1 credit), Spring 2021.
IS4. Maria Rao, Optical Spectroscopy for Tissue Identification in the Urinary System, Biomedical Engineering Professional Project, (6 credits), Summer-Fall Semesters 2020.
IS5. Mostafa Atalla, *Kinetostatic Modeling of Continuum Notched-tube Wrists*. Directed Research (9 credits), Fall 2019-Summer 2020[†].

[†] This project was initially supposed to be a MS thesis, but the student had to revert to Directed Research due to the inability to complete his experimental campaign because of the outbreak of the COVID-19 pandemic.

IS6. Samantha Grillo, *Laser-based Tonsillectomy: Review of the State of the Art and Future Outlook*, Independent Study Project, D Term 2020.
IS7. Taylor Bergeron, *Behavior Trees for Robot Control*, Independent Study Project, B Term 2019.
IS8. Brendon Sanders & Natasha Levey, *Micro Electronic Medical Records*, Independent Study Project, A-B Terms 2018.
IS9. Nicholas Fajardo, *Robotic Control of a Surgical Laser Waveguide*. Directed Research (6 credits), Spring-Summer 2019.
IS10. Wentao Yuan, *Tracking a cannula robot*. Independent Study Project, E1 Term 2018.
IS11. Mike Sokolosvky, *Modeling of Temperature Increase in Laser-Irradiated Biological Tissue*. Directed Research (3 credits), Spring 2018.
IS12. Zhitao Li, *Design Optimization of a Miniature Steerable Robotic Endoscope*. Directed Research (3 credits), Spring 2018. Awarded third place in the Data Science Category at GRIE 2018.

9. Academic Advising at WPI

2021-2022: 29 advisees (CS and RBE students)
2020-2021: 39 advisees (CS and RBE students)
2019-2020: 47 advisees (CS and RBE students)
2018-2019: 20 advisees (CS and RBE students)

10. Honors, Awards, and other Recognitions Related to Teaching

HT1. Nominated for the Moruzzi Award, 2020.
HT2. Rho Beta Epsilon Award for Excellence in Robotics Education, 2019.

SCHOLARSHIP

11. Publications

My research interests are primarily in computer/robot assisted surgery and, more generally, in the use of robotics and computer science to enhance medical diagnosis and treatment. Besides fundamental scientific research, I am also fully invested in the clinical translation of the technology developed in my laboratory. This is reflected in the fact that I disseminate my research in both engineering and medical conferences/journals.

In Robotics, the top conferences in the field only accept rigorously peer-reviewed papers. A list of the most impactful publications in robotics is available on Google Scholar[‡]. Manuscript authored or co-authored by me have appeared on four out of the top five venues listed on the Google Scholar ranking.

Within medicine, I am active in the field of Otolaryngology, where the publishing model involves first submitting an abstract to one of the main professional society meetings; Abstracts are reviewed by a program committee, and authors of accepted abstracts are then invited to submit a full manuscript for consideration in one of the peer-reviewed journals. To date, I have co-authored manuscripts that have appeared in several high-impact journals, including *Otolaryngology-Head and Neck Surgery*, the *Laryngoscope*, and *Otology & Neurotology*, all of whom rank among the 25% most impactful (1st quartile) journals in Otolaryngology[§].

In the following list, WPI graduate student authors are underlined in blue, while undergraduate students* names are in red followed by an asterisk.

[‡] https://scholar.google.com/citations?view_op=top_venues&hl=en&vq=eng_robotics
[§] https://www.scimagojr.com/journalrank.php?category=2733

Peer-Reviewed Journal Articles:

J1. DeVore EK, Chiluisa AJ, Minch EV*, Mihaleva R*, Do HS*, Tougas RM*, **Fichera L**, Carroll TL. Benefits of Side-Firing Optical Fibers in Endoscopic Laser Treatment of the Larynx. The Laryngoscope. [in press]

J2. Lee B, Pacheco NE, **Fichera L**, Russo S. When the End Effector is a Laser: A Review of Robotics in Laser Surgery. Advanced Intelligent Systems. [in press]

J3. Arnold A, **Fichera L**. Identification of tissue optical properties during thermal laser-tissue interactions: An ensemble Kalman filter-based approach. International Journal for Numerical Methods in Biomedical Engineering. 2022 Apr;38(4):e3574.

J4. Freeman MH, Gafford JB, **Fichera L**, Noble J, Webster III RJ, Labadie RF. Transeustachian Middle Ear Endoscopy Using a Steerable Distal-Camera Tipped Endoscope. Otology & Neurotology. 2022 Feb 1;43(2):206-11.

J5. Pacheco NE, Gafford JB, Atalla MA, Webster III RJ, **Fichera L**. Beyond Constant Curvature: A New Mechanics Model for Unidirectional Notched-Tube Continuum Wrists. Journal of Medical Robotics Research. 2021 Mar 2;6(01n02):2140004.

J6. Mattos LS, Acemoglu A, Geraldes A, Laborai A, Schoob A, Tamadazte B, Davies B, Wacogne B, Pieralli C, Barbalata C, Caldwell DG, **Fichera L** et al. µRALP and beyond: Micro-technologies and systems for robot-assisted endoscopic laser microsurgery. Frontiers in Robotics and AI. 2021:240.

J7. **Fichera L**. Bringing the light inside the body to perform better surgery. Science Robotics. 2021 Jan 13;6(50):eabf1523.

J8. Gafford J, Freeman M, **Fichera L**, Noble J, Labadie R, Webster RJ. Eyes in ears: a miniature steerable digital endoscope for trans-nasal diagnosis of middle ear disease. Annals of biomedical engineering. 2021 Jan;49(1):219-32.

J9. Kesler K, Dillon NP, **Fichera L**, Labadie RF. Human kinematics of cochlear implant surgery: an investigation of insertion micro-motions and speed limitations. Otolaryngology–Head and Neck Surgery. 2017 Sep;157(3):493-8.

J10. Siebold MA, Dillon NP, **Fichera L**, Labadie RF, Webster III RJ, Fitzpatrick JM. Safety margins in robotic bone milling: from registration uncertainty to statistically safe surgeries. The International Journal of Medical Robotics and Computer Assisted Surgery. 2017 Sep;13(3):e1773.

J11. Dillon NP, **Fichera L**, Kesler K, Zuniga MG, Mitchell JE, Webster RJ, Labadie RF. Pre-operative screening and manual drilling strategies to reduce the risk of thermal injury during minimally invasive cochlear implantation surgery. Annals of biomedical engineering. 2017 Sep;45(9):2184-95.

J12. Illiano P, Bass CE, **Fichera L**, Mus L, Budygin EA, Sotnikova TD, Leo D, Espinoza S, Gainetdinov RR. Recombinant adeno-associated virus-mediated rescue of function in a mouse model of dopamine transporter deficiency syndrome. Scientific reports. 2017 Apr 18;7(1):1-5.

J13. **Fichera L**, Messina F, Pappalardo G, Santoro C. A Python framework for programming autonomous robots using a declarative approach. Science of Computer Programming. 2017 Jun 1;139:36-55.

J14. Acemoglu A, **Fichera L**, Kepiro IE, Caldwell DG, Mattos LS. Laser incision depth control in robot-assisted soft tissue microsurgery. Journal of Medical Robotics Research. 2017 Sep 28;2(03):1740006.

J15. **Fichera L**, Dillon NP, Zhang D, Godage IS, Siebold MA, Hartley BI, Noble JH, Russell PT, Labadie RF, Webster RJ. Through the eustachian tube and beyond: A new miniature robotic endoscope to see into the middle ear. IEEE robotics and automation letters. 2017 Feb 14;2(3):1488-94.

J16. **Fichera L**, Pardo D, Illiano P, Ortiz J, Caldwell DG, Mattos LS. Online estimation of laser incision depth for transoral microsurgery: approach and preliminary evaluation. The International Journal of Medical Robotics and Computer Assisted Surgery. 2016 Mar;12(1):53-61.

J17. Pardo D, **Fichera L**, Caldwell D, Mattos LS. Learning Temperature Dynamics on Agar-Based Phantom Tissue Surface During Single Point CO_2 Laser Exposure. Neural Processing Letters. 2015 Aug;42(1):55-70.

Peer-Reviewed Conference Proceedings:

C1. Chiluisa AJ, Pacheco NE, Do HS*, Tougas RM*, Minch EV*, Mihaleva R*, Shen Y, Liu Y, Carroll TL, **Fichera L**. Light in the Larynx: A Miniaturized Robotic Optical Fiber for In-Office Laser Surgery of the Vocal Folds. IEEE IROS 2022. [in press]

C2. Picho K, Persons B*, d'Almeida JF, Pacheco NE, Reynolds C*, **Fichera L**. Multi Jet Fusion of Nylon-12: A Viable Method to 3D-print Concentric Tube Robots? Hamlyn Symposium 2022. [in press]

C3. Zhu M*, Shen Y, Chiluisa AJ, Song J*, **Fichera L**, Liu Y. Optical Fiber Coupling System for Steerable Endoscopic Instruments. In2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) 2021 Nov 1 (pp. 4871-4874). IEEE.

C4. Chan IA*, d'Almeida JF*, Chiluisa AJ, Carroll TL, Liu Y, **Fichera L**. On the merits of using angled fiber tips in office-based laser surgery of the vocal folds. In Medical Imaging 2021: Image-Guided Procedures, Robotic Interventions, and Modeling 2021 Feb 15 (Vol. 11598, p. 115981Z). International Society for Optics and Photonics. **Winner of the best student paper award.**

C5. Gao S, Ma Z, Tsumura R, Kaminski J, **Fichera L**, Zhang HK. Augmented immersive telemedicine through camera view manipulation controlled by head motions. In Medical Imaging 2021: Image-Guided Procedures, Robotic Interventions, and Modeling 2021 Feb 15 (Vol. 11598, p. 1159815). International Society for Optics and Photonics.

C6. Munawar A, Srishankar N, **Fichera L**, Fischer GS. A Parametric Grasping Methodology for Multi-Manual Interactions in Real-Time Dynamic Simulations. In 2020 IEEE International Conference on Robotics and Automation (ICRA) 2020 May 31 (pp. 8712-8718). IEEE.

C7. Chiluisa AJ, Van Rossum FJ*, Gafford JB, Labadie RF, Webster RJ, **Fichera L**. Computational optimization of notch spacing for a transnasal ear endoscopy continuum robot. In 2020 International Symposium on Medical Robotics (ISMR) 2020 Nov 18 (pp. 188-194). IEEE.

C8. O'Brien K*, Boyer ZR*, Mart BG*, Brolliar CT*, Carroll TL, **Fichera L**. Towards flexible steerable instruments for office-based laryngeal surgery. In Frontiers in Biomedical Devices 2019 Apr 15 (Vol. 41037, p. V001T06A017). American Society of Mechanical Engineers. **Nominated as one of the 10 top papers that describe new medical devices (out of 150+ paper submissions). Finalist for the three-in-five pitch competition.**

C9. Vu M, Banalagay RA, Zhang D, Rivas A, **Fichera L**, Webster R, Labadie RF, Noble JH. Analysis of middle ear morphology for design of a transnasal endoscope. In Medical Imaging 2019: Image-Guided Procedures, Robotic Interventions, and Modeling 2019 Mar 8 (Vol. 10951, pp. 723-728). SPIE.

C10. Lin S, **Fichera L**, Fulton MJ, Webster III RJ. Don't get burned: thermal monitoring of vessel sealing using a miniature infrared camera. InMedical Imaging 2017: Image-Guided Procedures, Robotic Interventions, and Modeling 2017 Mar 3 (Vol. 10135, pp. 263-269). SPIE.

C11. Dillon NP, **Fichera L**, Wellborn PS, Labadie RF, Webster RJ. Making robots mill bone more like human surgeons: Using bone density and anatomic information to mill safely and efficiently. In2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2016 Oct 9 (pp. 1837-1843). IEEE.

C12. **Fichera L**, Dillon NP, Kesler K, Zuniga Manrique M., Mitchell JE, Labadie RF, Thermal monitoring of the facial recess during drilling for minimally invasive cochlear implantation: comparison of manual and automated approaches, in Proceedings of the 30th International Congress and Exhibition on Computer Assisted Radiology and Surgery (CARS), Heidelberg, Germany, 2016. **Recipient of the ISCAS Young Investigator Scolarship.**

C13. **Fichera L**, Pacchierotti C, Olivieri E, Prattichizzo D, Mattos LS. Kinesthetic and vibrotactile haptic feedback improves the performance of laser microsurgery. In 2016 IEEE haptics symposium (HAPTICS) 2016 Apr 8 (pp. 59-64). IEEE.

C14. **Fichera L**, Kepiro IE, Caldwell DG, Mattos LS, Towards Automatic Laser Incision of Soft Tissue for Transoral Microsurgery, in 5th Joint Workshop on New Technologies for Computer/Robot Assisted Surgery (CRAS), Brussels, Belgium, 2015.

C15. **Fichera L**, Pardo D, Illiano P, Caldwell DG, Mattos LS. Feed forward incision control for laser microsurgery of soft tissue. In2015 IEEE International Conference on Robotics and Automation (ICRA) 2015 May 26 (pp. 1235-1240). IEEE. **Best Paper Finalist. Best Student Paper Finalist. Best Medical Robotics Paper Finalist.**

C16. **Fichera L**, Pardo D, Illiano P, Caldwell DG, Mattos LS, New Assistive Technologies for Laser Microsurgery, in 4th Joint Workshop on New Technologies for Computer/Robot Assisted Surgery (CRAS), Genova, Italy, 2014.

C17. Pardo D, **Fichera L**, Caldwell DG, Mattos LS. Thermal supervision during robotic laser microsurgery. In5th IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics 2014 Aug 12 (pp. 363-368). IEEE.

C18. **Fichera L**, Pardo D, Mattos LS. Artificial Cognitive Supervision during Robot-Assisted Laser Surgery, in 3rd Joint Workshop on New Technologies for Computer/Robot Assisted Surgery (CRAS), Verona, Italy, 2013.

C19. **Fichera L**, Pardo D, Mattos LS, Supervisory System for Laser-Assisted Phonomicrosurgery, in Engineering in Medicine and Biology Society (EMBC), 2013 Annual International Conference of the IEEE, Osaka, Japan, 2013.

C20. **Fichera L**, Pardo D, Mattos LS. Modeling tissue temperature dynamics during laser exposure. In International Work-Conference on Artificial Neural Networks 2013 Jun 12 (pp. 96-106). Springer, Berlin, Heidelberg.

C21. **Fichera L**, Marletta D, Nicosia V, Santoro C. Flexible robot strategy design using belief-desire-intention model. In International Conference on Research and Education in Robotics 2010 May 27 (pp. 57-71). Springer, Berlin, Heidelberg.

Non-refereed Abstract/Workshop Papers and Presentations:

W1. Chiluisa AJ, Pacheco NE, Do HS*, Tougas RM*, Minch EV*, Mihaleva R*, Shen Y, Liu Y, Carroll TL, **Fichera L**. Light in the Larynx: A Miniaturized Robotic Optical Fiber for In-Office Laser Surgery of the Vocal Folds, in Workshop on Frontiers of Endoluminal Interventions, 39th IEEE International Conference on Robotics and Automation, Philadelphia, PA, USA, 2022.

W2. DeVore EK, Chiluisa AJ, Minch EV*, Mihaleva R*, Do HS*, Tougas RM*, **Fichera L**, Carroll TL, Benefits of Side-firing Optical Fibers in Endoscopic Laser Treatment of the Larynx, Combined Otolaryngology Spring Meetings 2022, Dallas, TX, April 2022

W3. Arnold A, **Fichera L**, Identification of Tissue Optical Properties During Thermal Laser-Tissue Interactions, Joint Mathematical Meetings 2022, Seattle, WA, January 2022

W4. Chiluisa AJ, Shen Y, Liu ST*, Abell P*, Johnson SQ*, Zhu M*, Liu Y, **Fichera L**, Carroll TL, Amplifying a Physician's Reach into the Larynx: Initial Prototype and Testing of a Novel Steerable Laser Fiber for In-Office Laryngology Procedures, in Fall Voice Conference, 2021.

W5. Chan IA*, d'Almeida JF*, Zhu M*, Chiluisa AJ, Shen Y, Liu Y, Carroll TL, **Fichera L**, Introducing Steerable Laser Fibers in Office-Based Laryngology Procedures, in Fall Voice Conference, 2020.

W6. Freeman MH, Gafford JB, **Fichera L**, Labadie RF, Webster RJ, A Steerable Trans-Eustachian Endoscope for Middle Ear Examination, in Combined Otolaryngology Spring Meetings, Atlanta, GA, 2020.

W7. Zuniga MG, Kesler K, Dillon NP, **Fichera L**, Mitchell JE, Labadie RF, Heat generated during temporal bone drilling: is the facial nerve at risk? in Combined Otolaryngology Spring Meetings, San Diego, CA, 2017.

W8. Kesler K. Dillon NP, **Fichera L**, Labadie RF, Human Kinematics of Cochlear Implant Insertion at Various Speeds, in American Academy of Otolaryngology–Head and Neck Surgery, Annual Meeting & OTO EXPOSM, San Diego, CA, 2016.

W9. **Fichera L**, Pardo D, Mattos LS, Thermal Supervision during Robotic Laser Microsurgery, in Workshop on Robotic Microsurgery and Image-Guided Surgical Interventions, 5th IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics, Sao Paulo, Brazil, 2014.

W10. **Fichera L**, Pardo D, Deshpande N, Mattos LS, On-line Estimation of Ablation Depth During CO2 Laser Exposure, in Workshop on Cognitive Surgical Robotics, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013). Tokyo, Japan, 2013.

W11. **Fichera L**, Pardo D, Mattos LS, Virtual Supervision for a Virtual Scalpel, in uRALP Workshop, 1st Russian-German Conference on Biomedical Engineering (RCG), Hanover, Germany, 2013.

W12. **Fichera L**, Mattos LS, Towards Cognitive Supervision in Robot-Assisted Surgery, in Workshop on Robot-Assisted Laryngeal Microsurgery, 4th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob), Rome, Italy, 2012.

W13. **Fichera L**, Marletta D, Santoro C, Nicosia V, A Methodology to Extend Imperative Languages with AgentSpeak Declarative Constructs, in 11th National Workshop "From Objects to Agents" (WOA), Rimini, Italy, 2010.

Books

B1. **L. Fichera**, Cognitive Supervision for Robot-Assisted Minimally Invasive Laser Surgery. Springer, Apr. 2016, PhD Thesis, ISBN: 978-3-319-30329-1.

Book Chapters

BC1. Nguyen Y, Gerber N, Caversaccio M, Weber S, Kahrs LA, Majdani O, Dillon NP, **Fichera L**, Labadie RF, Robot-based otological surgery, in *Robotics and Digital Guidance in ENT-H&N Surgery*, B. Lombard and P. Ceruse, Eds. Elsevier, 2017.

BC2. Mattos LS, Pardo D, Olivieri E. Barresi G, Ortiz J, Fichera L, Deshpande N, Penza V, Microsurgery Systems, in *The E-Medicine, E-Health, M-Health, Telemedicine, and Telehealth Handbook*, H. Eren and J. Webster, Eds. CRC Press, 2015.

12. Fellowships and Grants

G1. **Principal Investigator:** NIH R15 "Flexible Steerable Laser Probe for Office-based Laryngeal Interventions," L. Fichera (PI), Y. Liu, T.L. Carroll. For $438,939 over three years (5/1/2020 – 4/30/2023)

G2. **Co-Investigator:** WPI TRIAD Seed Grant "Spectroscopic Photoacoustic Imaging for Robot-Assisted Laparoscopic Nerve-Sparing Pelvic Surgery," H. Zhang (PI), L. Fichera, G.S. Fischer, B. Nephew (co-Is). For $60,000 over two years (1/1/2020 – 12/31/2021).

G3. **Co-Investigator:** "Transnasal Diagnosis of Middle Ear Disease," R.J. Webster III (PI), Jack H. Noble, Paul T. Russell III, R.F. Labadie, L. Fichera. For $446,413 over two years (9/1/2017 – 8/31/2019). Note: I led the development of this proposal during my postdoc at Vanderbilt and wrote many sections of it personally. WPI subaward: $43,266.

G4. **Principal Investigator:** WPI Engineering Seed Grant "Make the laser feel more like a scalpel: combining haptics and digital holography to enhance the perception of laser cutting depth during surgery," L. Fichera (PI), Cosme Furlong. $10,000

G5. **Principal Investigator:** WPI Engineering Seed Grant "Intraoperative detection of cancerous tissue for laser-based microsurgery using tissue-specific dynamic thermal response signature," L. Fichera (PI), Andrea Arnold. $10,000

G6. **PhD Fellowship:** For €49,500 over three years (01/2012 – 12/2014). I was the recipient of an Italian Institute of Technology (IIT) fellowship providing financial support during my doctoral studies. My application ranked 1st out of 30+ (the call was advertised through the "Robotics Worldwide" mailing list and was open to international students).

G7. **Erasmus Placement Mobility Grant:** For €2,600 over four months (04/2010 – 07/2010) This European Commission Grant supported my research internship at the University of Hertfordshire (UK).

13. Professional Presentations

PP1. International Symposium on Medical Robotics, *Lasers + Surgical Robots: Is the Whole Greater than the Sum of Its Parts?* Invited talk. April 2022.

PP2. IROS Workshop, *On the role of autonomy in robot-assisted laser surgery*. October 2020.

PP3. University of Tulsa, *Combining robotics and AI to enable advanced treatment modalities in the head and neck*. October 2020.

PP4. WPI Department of Mechanical Engineering, *Combining robotics and AI to enable advanced treatment modalities in the head and neck*. October 2020.

PP5. Boston Medical Center, *Combining robotics and AI to enable advanced treatment modalities in the head and neck*. February 2020.

PP6. IEEE Robotics and Automation Society Boston Chapter, *Combining robotics and machine intelligence to enable advanced treatment modalities in the head and neck*. December 2019.

PP7. World Congress on Endoscopic Ear Surgery 3.0*, Towards a new ultra-thin steerable scope to look into the ear by way of the nose*. June 2019. (https://www.youtube.com/watch?v=ABc1U5z-MBQ)

PP8. World Congress on Endoscopic Ear Surgery 3.0*, New instrumentation for ear surgery:Smaller and smarter*. June 2019. (https://www.youtube.com/watch?v=VV4Lf3nXrcc)

PP9. Massachusetts Ear and Eye Infirmary, *Combining robotics and AI to enable advanced treatment modalities in the head and neck*. May 2019.

PP10. Mathematics Institute for Secondary Teaching, WPI, *Robotic manipulators in interventional medicine and surgery.* July 2018.

PP11. University of Catania, Italy, *Rise of the machines in the Operating Room: Using AI to build smarter, more dexterous surgical robots*. April 2018.

PP12. University of New Hampshire, *Rise of the machines in the Operating Room: Using AI to build smarter, more dexterous surgical robots*. March 2018.

14. Patents

PA1. L. Fichera et al. *Flexible Articulating Surgical Probe,* USPTO patent application no. 38849990. *Note: this patent application is the result of the work of an MQP project advised by me in 2019.*

PA2. Arnold & L. Fichera *Estimating Optical Properties of Surgical Tissue*, USPTO patent application no. 17711100.

15. Consultantships

Nothing to report

16. Professional Society Memberships and Offices

PS1. International Society for Optical Engineering (SPIE)
PS2. International Institute of Electrical and Electronics Engineering (IEEE)

17. Editorial and Referee Activities

2020-present: Associate Editor, IEEE Robotics and Automation Letters
2022: Associate Editor, IEEE BIOROB
2021: Early Career Reviewer for the BTSS Study Section of the NIH
2020: Proposal Review Panelist for the National Science Foundation (NSF)
2019: Associate Editor, IEEE ICRA
2018: Proposal Review Panelist for the Department of Defense (DoD) – CDMRP and the NSF
Associate Editor for Workshops, IEEE BIOROB
2017: Proposal Review Panelist for the National Science Foundation (NSF)

Technical Reviews

I have reviewed many papers for the following Journals and Conferences:

IEEE Transactions on Robotics (T-RO)
International Journal of Robotics Research (IJRR)
IEEE Robotics and Automation Letters (RA-L)
Journal of Medical Robotics Research (JMRR)
ASME Journal of Mechanisms and Robotics (ASME JMR)
Applied Physics Part B: Lasers and Optics
IEEE International Conference on Robotics and Automation (ICRA)
IEEE International Conference on Multisensor Fusion and Information Integration (MFI)
IEEE Engineering in Medicine and Biology (EMBC)
IEEE International Conference on Biomedical Robotics and Biomechatronics (BIOROB)

18. Honors, Awards, and Other Scholarship Recognition

HT1. Best Student Paper Award in the Robotics Track at SPIE Medical Imaging 2021
(awarded to WPI undergraduate students IA Chan and J d'Almeida, advised by me)
HT2. Top ten papers that describe new medical devices, Design of Medical Devices Conference 2019
HT3. Best Engineering Poster Award, Vanderbilt Postdoctoral Symposium 2017
HT4. Koh Young Investigator Scholarship, International Society for Computer Assisted Surgery
HT5. Best Paper Finalist, Best Student Paper Finalist, Best Medical Robotics Paper Finalist, ICRA 2015
HT6. Outstanding PhD Thesis, University of Genoa, Italy
(My dissertation *Cognitive Supervision for Robot-Assisted Minimally Invasive Laser Surgery* was nominated as an outstanding PhD thesis by the faculty of Italian Institute of Technology / University of Genoa, and published in the Springer PhD Theses series)

SERVICE

19. Service to the Profession

Note: For editorial service, see section 17 above.

SC1. Session Chair, International Symposium on Medical Robotics (ISMR) 2022

SC2. Session Chair, SPIE Medical Imaging 2017
SC3. Workshop Organizer: Guo J, Wu D, **Fichera L**, Zeng C, Li Z, Alambeigi F. *A Panacea or an Alchemy? Benefits and Risks of Robot Learning in Medical Applications*. Workshop at IEEE IROS 2022.

20. Service to the University and Department

Membership on Faculty Governance Committees at WPI:
2020-2023: Committee on Graduate Studies and Research (CGSR)
2019-2020: On-Campus Research Continuation Appeal (ORCA) Committee
2019-2020: Office of Undergraduate Research Advisory Board

Membership on RBE Department Committees:
2019-present: RBE Colloquium Committee (Chair)
2022-2023: Recruiting Committee
2021-2022: Graduate Program Committee
2020-2021: Graduate Admissions Committee
2019-2020: Recruiting Committee
2019-2020: Curriculum Committee
2018-2019: Undergraduate Program Committee

21. Service to Students at WPI

I mentored the following students in their job/graduate applications:
1. K. Picho (now a research engineer at Intuitive Surgical)
2. N. Pacheco (now a PhD student in my laboratory)
3. J. d'Almeida (now a PhD student at Vanderbilt University)
4. M. Atalla (now a PhD student at TU Delft)
5. N. Fajardo (formerly a PhD student at the University of Arkansas)
6. S. Murlidaran (now a PhD student at USC)
7. N. Dennler (now a PhD student at USC)

I wrote letters of recommendation for the following two students to support their applications to Tau Beta Pi:
1. S.T. Liu
2. I.A. Chan

22. Community Service

Music Ministry, St. Ignatius Catholic Church, Chestnut Hill, MA