

Matthew J. Gerber, Ph.D.

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Advanced Robotic Eye Surgery (ARES) Laboratory and Mechatronics and Controls Laboratory
University of California, Los Angeles (UCLA)

EDUCATION

- Aug. 2014 – Dec. 2019 **Ph.D. in Mechanical Engineering**
University of California, Los Angeles (UCLA), Advisor: Prof. Tsu-Chin Tsao
Dissertation Title: “Optical Coherence Tomography–Guided Robotic System for Automated Retinal Microsurgery”
- Aug. 2012 – Jul. 2014 **M.S. in Mechanical Engineering**
The Ohio State University (OSU), Advisor: Prof. Shaurya Prakash
- Sep. 2009 – May 2013 **B.S. in Mechanical Engineering**, The Ohio State University (OSU)
- Sep. 2003 – Jun. 2007 **B.S.D. in Visual Communication Design**, The Ohio State University (OSU)
- Sep. 2003 – Jun. 2007 **B.A. in Japanese**, The Ohio State University (OSU)

PUBLICATIONS

ORCID: [0000-0001-9187-4827](https://orcid.org/0000-0001-9187-4827) · [Google Scholar](https://scholar.google.com/citations?user=...)

SUBMITTED FOR REVIEW

1. “A Novel Tissue Identification Framework in Cataract Surgery using an Integrated Probe and Machine Learning Algorithms,” S.A. Pedram, P.W. Ferguson, [M.J. Gerber](#), C. Shin, J.P. Hubschman, and J. Rosen, *IEEE Transactions on Biomedical Engineering* (TBME), Under revision: May 2021.

JOURNAL PAPERS (PEER REVIEWED)

1. “An Over-Actuated Multi-Rotor Aerial Vehicle with Unconstrained Attitude Angles and High Thrust Efficiency,” P. Yu, Y. Su, [M.J. Gerber](#), L. Ruan, and T.C. Tsao, *IEEE Robotics and Automation Letters* (RA-L), accepted for publication. DOI: [10.1109/LRA.2021.3095035](https://doi.org/10.1109/LRA.2021.3095035)
2. “Semi-Automated Extraction of Lens Fragments in ex vivo Pig Eyes using Semantic Segmentation of OCT Images with Deep Learning,” C. Shin, [M.J. Gerber](#), Y.H. Lee, M. Rodriguez, S.A. Pedram, J.P. Hubschman, T.C. Tsao, and J. Rosen, *IEEE Robotics and Automation Letters*, vol. 6(3), 2021. DOI: [10.1109/LRA.2021.3072574](https://doi.org/10.1109/LRA.2021.3072574)
3. “Posterior Capsule Polishing by an OCT Image–Guided Intraocular Robotic Surgical System,” [M.J. Gerber](#), J.P. Hubschman, and T.C. Tsao, *The International Journal of Medical Robotics and Computer Assisted Surgery*, eRCS2248, 2021. DOI: [10.1002/rcs.2248](https://doi.org/10.1002/rcs.2248)
4. “Automated Retinal Vein Cannulation on Silicone Phantoms using OCT–Guided Robotic Manipulations,” [M.J. Gerber](#), J.P. Hubschman, and T.C. Tsao, *ASME/IEEE: Transactions on Mechatronics* (TMECH), Dec. 2020. DOI: [10.1109/TMECH.2020.3045875](https://doi.org/10.1109/TMECH.2020.3045875)
5. “A Robotic System for Telementoring and Training in Laparoscopic Surgery,” S.W. Prince, C. Kang, J. Simonelli, Y.H. Lee, [M.J. Gerber](#), C. Lim, K. Chu, E.P. Dutson, and T.C. Tsao, *The International Journal of Medical Robotics and Computer Assisted Surgery*, e2040 (2019). DOI: [10.1002/rcs.2040](https://doi.org/10.1002/rcs.2040)
6. “Semiautomated Optical Coherence Tomography–guided Robotic Surgery for Porcine Lens

Removal,” C.W. Chen, A.A. Francone, [M.J. Gerber](#), Y.H. Lee, A. Govetto, T.C. Tsao, and J.P. Hubschman, *Journal of Cataract & Refractive Surgery*, vol. 45(11), pp. 1665–1669 (2019). DOI: [10.1016/j.jcrs.2019.06.020](#)

7. “Twisting and Tilting Rotors for High-Efficiency, Thrust-Vectored Quadrotors,” [M.J. Gerber](#) and T.C. Tsao, *Journal of Mechanisms and Robotics*, 10(6): 061013 (2018). DOI: [10.1115/1.4041261](#)
8. “Intraocular Robotic Interventional Surgical System (IRISS): Semi-Automated OCT-Guided Cataract Removal,” C.W. Chen, Y.H. Lee, [M.J. Gerber](#), A. Govetto, A.A. Francone, W.S. Grundfest, J.P. Hubschman, and T.C. Tsao, *International Journal of Medical Robotics and Computer Assisted Surgery*, 14.6: e1949 (2018). DOI: [10.1002/rcs.1949](#)
9. “Tractional Abnormalities of the Central Foveal Bouquet in Epiretinal Membranes: Clinical Spectrum and Pathophysiological Perspectives,” A. Govetto, K.V. Bhavsar, G. Virgili, [M.J. Gerber](#), K.B. Freund, C.A. Curcio, C.F. Burgoyne, J.P. Hubschman, D. Sarraf, *American Journal of Ophthalmology*, vol. 184, pp. 167–180 (2017), DOI: [10.1016/j.ajo.2017.10.011](#)
10. “Intraocular Robotic Interventional Surgical System (IRISS): Mechanical Design and M-S Manipulation,” J. Wilson, [M.J. Gerber](#), S. Prince, C-W. Chen, S. Schwartz, J-P. Hubschman, and T.C. Tsao, *The International Journal of Medical Robotics and Computer Assisted Surgery*, 14.1: e1842 (2017). DOI: [10.1002/rcs.1842](#)
11. “Effect of Microstructure Geometric Form on Surface Shear Stress,” K.K. Rangharajan, [M.J. Gerber](#), and S. Prakash, *Journal of Fluids Engineering*, 139(1), 2016. DOI: [10.1115/1.4034363](#)
12. “Software Testing with an Operational Profile: OP Definition,” C.S. Smidts, C. Mutha, M. Rodríguez, and [M.J. Gerber](#), *ACM Computing Surveys*, vol. 46(3), pp. 1–39, 2014, DOI: [10.1145/2518106](#)

ARTICLES AND INVITED JOURNAL PAPERS

1. “Robotic Cataract Surgery,” M.J. Gerber and J.P. Hubschman, *Cataract & Refractive Surgery Today (CRST)*, July 2021, pp. 28–33.
2. “What’s Ahead for Robotic Eye Surgery?,” M.J. Gerber, J.P. Hubschman, and C.W. Mango (Editor), *ASRS Retina Times*, Spring 2021, vol. 39 (1), issue 88, pp. 56–58.
3. “Advanced Robotic Surgical Systems in Ophthalmology,” [M.J. Gerber](#), M. Pattenkofer, and J.P. Hubschman, *Eye*, 2020. DOI: [10.1038/s41433-020-0837-9](#)
4. “Integrating Robotics into Ophthalmic Surgery,” I. Chehaibou, [M.J. Gerber](#), Y.H. Lee, T.C. Tsao, J. Rosen, J.P. Hubschman, *YO Times*, vol. 14, pp. 88–99, Apr 2019.

CONFERENCE PAPERS

1. “Nullspace-Based Control Allocation of Overactuated UAV Platforms,” Y. Su, P. Yu, [M.J. Gerber](#), L. Ruan, T.C. Tsao, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Accepted.
2. “A Numerical Study for Biomimetic Structures to Control Wall Shear Stress in Water,” [M.J. Gerber](#), *ASME International Mechanical Engineering Congress and Exposition*, San Diego, CA, pp. 1–8, Nov. 2013, DOI: [10.1115/IMECE2013-67342](#)

PATENTS

1. “Probe for Identification of Ocular Tissues during Surgery,” (63/210,256), Provisional Filed: Jun. 14, 2021.
2. “Modular Platforms with Multi-rotor Copters Mounted on Hinges or Gimbals to Form Mechanically Constrained Flight Formations” (63/069,487), Provisional Filed: Aug. 24, 2020.

3. "Probe for Identification of Ocular Tissues during Surgery" (63/038,682), Provisional: Jun. 22, 2020.
4. "Device for Mobilizing Cortical Material at Lens Equator during Cataract Surgery" (62/985,143), Provisional Filed: May 7, 2020.
5. "Suction-based Tool for Positioning of Intraocular Implants" (62/934,694), Provisional: Nov. 13, 2019.
6. "Spinopelvic Mobility Sensor Guided Hip Arthroplasty Navigation System" (62/874,246), Provisional Filed: Jul. 15, 2019.
7. "Fully Actuated Propeller Mount System for Unmanned Aerial Vehicles" (62/689,596), Provisional Filed: Jun. 25, 2018.
8. "System and Method for Automated Image-guided Robotic Intraocular Surgery" (PCT/US2019/032236), Filed Nov. 21 2019 (Pending); Provisional Filed: May 15, 2018.
9. "Intraoperative Assessment of Implant Positioning" (PCT/US2019/028937), Filed Oct. 31, 2019; Provisional Filed: Apr. 25, 2018.
10. "Docking System to Stabilize Eyeball During Intraocular Surgery" (PCT/US2019/022986), Filed Sep. 26, 2019; Provisional Filed: Mar. 20, 2018.
11. "Rapid and Precise Tool Exchange Mechanism for Intraocular Robotic Surgical Systems" (PCT/US2019/023193); Filed Sep. 26, 2019; Provisional Filed: Mar. 21, 2018.
12. "Laser-assisted Surgical Alignment" (U.S. Patent 20190380795A1), Filed Dec. 19, 2019.

BOOK CHAPTERS (INVITED)

1. M.J. Gerber and J.P. Hubschman, Robotics in Vitreoretinal Surgeries, in A. Jain et al. (Eds.), *Cutting-edge Vitreoretinal Surgery*, Springer Nature, 2021, DOI: [10.1007/978-981-33-4168-5](https://doi.org/10.1007/978-981-33-4168-5)

PROFESSIONAL PRESENTATIONS

* Invited ** Volunteered *** Conference

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- | | |
|---------------|---|
| May 03, 2021 | Work Experience as an Engineering Postdoctoral Researcher (Postdoc) *
Senior design capstone class, Mechanical Engineering, UCLA |
| Feb. 06, 2020 | Intraocular Robotic Surgery: Lens Extraction and Retinal Vein Cannulation *
Basic Sciences Seminar Series, Stein Eye Institute, UCLA |
| May 01, 2019 | Intraocular Robotic Surgical System: Semi-Automated Lens Extraction ***
Association for Research in Vision and Ophthalmology (ARVO), Special Interest Group (Vancouver, Canada) |
| Mar. 08, 2018 | Airborne Tool Manipulator with Twisting and Tilting Rotors **
Industrial Advisory Board (IAB) Open House, UCLA |
| Aug. 22, 2017 | Smart Magnetic Bearings for Green Energy Applications ***
TECO Green Energy Technology International Conference (Taipei, Taiwan) |

TEACHING EXPERIENCE

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- | | |
|-----------------------|--|
| Fall 2013 – Present | Academic Research Mentor
33 students in Biomedical, Computer Science, and Mechanical Engineering |
| Win. 2016 – Spr. 2019 | Mechanical Engineering: Senior Capstone Design
Graduate Teaching Assistant, University of California, Los Angeles (UCLA) |
| Fall 2013 – Spr. 2014 | Mechanical Engineering: Thermodynamics
Graduate Teaching Assistant, The Ohio State University (OSU) |
| Fall 2012 – Spr. 2013 | Engineering Mechanics: Dynamics |

Undergraduate Teaching Assistant, The Ohio State University (OSU)
Sep. 2007 – Oct. 2007 **English as a Second Language (ESL)**
Online Instructor, Osaka, Japan

GRANT WRITING

R01 EY029689-01 **National Institutes of Health (NIH), \$2,147,445, Feb. 2019 to Jan. 2024**
“Vitreoretinal Surgery via Robotic Microsurgical System with Image Guidance, Force Feedback, Virtual Fixture, and Augmented Reality,”
MPIs: J.P. Hubschman, T.C. Tsao, and J. Rosen; Role: Co-author

R01 EY030595-01 **National Institutes of Health (NIH), \$2,280,000, Sep. 2019 to Aug. 2023**
“Intraocular Robotic Interventional and Surgical System for Automated Cataract Surgery,” MPIs: J.P. Hubschman and T.C. Tsao; Co-PIs: J. Rosen and S. Soatto; Role: Co-author

HONORS & AWARDS

Jun. 2021 JSEI Excellence in Research Award

May 2020 UCLA School of Engineering “Outstanding PhD in Mechanical Engineering”

Jan. 2020 – Dec. 2020 National Institutes of Health (NIH) T32 Training Grant, UCLA (\$50,000)

Mar. 2019 1st Place (48 applicants) Poster Competition at Industrial Advisory Board Open House, UCLA

Aug. 2014 – Mar. 2015 First-year Graduate Student Research Fellowship, UCLA (\$45,000)

SERVICE & OUTREACH

Mar. 2021 – Present **Assistant Green Coordinator**, University Apartments South Residents Association

Spring 2021 **Invited Panelist**, X1 Robotics Design Review (UCLA)

Jun. 2020 – Present **Ad Hoc Reviewer**, IEEE/ASME Transactions on Mechatronics (TMECH)

Jun. 2019 – Present **Ad Hoc Reviewer**, *The International Journal of Medical Robotics and Computer Assisted Surgery*

Aug. 2017 – Mar. 2021 **“Zero Food Waste” Organizer**, University Apartments South Residents Association

Summer 2017 **Panelist & Moderator**, Pathways to Graduate School, UCLA

Summer 2016 **Research Mentor**, Transfer Student Summer Research Program, UCLA

Summer 2016 **Panelist & Moderator**, Summer Undergraduate Scholars Program, UCLA

Summer 2015 **Research Mentor**, High School Summer Research Program, UCLA

REFERENCES

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