

# Winona Richey

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[wrichey.github.io](https://wrichey.github.io)

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## RESEARCH INTERESTS

Image Guided Surgery • Computer Vision • Finite Element Modeling

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## EDUCATION

2017-Present      Doctor of Philosophy, *Biomedical Engineering*, In Progress; Vanderbilt University, Nashville, TN

2013- 2017      Bachelor of Science, *Biomedical Engineering with Secondary Major in Computer Science*; Tulane University, New Orleans, LA

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## RESEARCH EXPERIENCE

- 2017 - Present      *Biomedical Modeling Lab*, with Dr. Michael Miga; Vanderbilt University, Nashville, TN
- “Computer vision-driven image guided breast conserving surgery”
  - Establishing an integrated system for data collection and visualization for breast conserving surgery (BCS) using stereo cameras and computer vision
  - Developing a novel model-based correction of breast deformation using preoperative MR data and sparse intraoperative data
  - Integrating computer vision-based digitization and model-based correction approaches within a BCS image guidance approach
- 2016 - 2017      *Biomedical Engineering Lab*, with Dr. Doug Chrisey; Tulane University, New Orleans, LA
- “Matrix assisted pulsed laser evaporation direct write (MAPLE-DW) automated transfer validation: a machine learning approach”
  - Designed experiments and software for detection of 3D bioprinting cell transfers using image processing and machine learning
- 2016      *NSF sponsored REU: Center for Research in Computer Vision*, with Dr. Ulas Bagci; University of Central Florida, Orlando, FL
- Implemented hand crafted features, combined with deep learned features for lung nodule detection in CT scans

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## PUBLICATIONS

1. **W. L. Richey**, J. S. Heiselman, M. Luo, I. M. Meszoely, and M. I. Miga, "Impact of deformation on a supine-positioned image guided breast surgery approach," *International Journal of Computed Assisted Radiology and Surgery*. In Review.
2. J. S. Heiselman, **W. L. Richey**, S. L. Taylor, and M. I. Miga, "Improving accuracy of image-to-physical laparoscopic liver registration via reconstruction of intrahepatic pressure changes from abdominal insufflation," in *Medical Imaging 2021: Image-Guided Procedures, Robotic Interventions, and Modeling*, 2021, vol. 11598, p. 115980W: International Society for Optics and Photonics.
3. **W.L. Richey**, J.S. Heiselman, M. Luo, I. M. Meszoely, and M. I. Miga, "Textual fiducial detection in breast conserving surgery for a near-real time image guidance system," in

Medical Imaging 2020: Image-Guided Procedures, Robotic Interventions, and Modeling, 2020, vol. 11315, p. 113151L: International Society for Optics and Photonics.

4. **W. L. Richey**, M. Luo, S. E. Goodale, L. W. Clements, I. M. Meszoely, and M. I. Miga, "A system for automatic monitoring of surgical instruments and dynamic, non-rigid surface deformations in breast cancer surgery," in Medical Imaging 2018: Image-Guided Procedures, Robotic Interventions, and Modeling, 2018, vol. 10576, p. 105761H: International Society for Optics and Photonics.
5. N. Khosravan, **W. L. Richey**, U. Bagci. "How Deep Can Hand Crafted Features Be?" In IEEE International Engineering in Medicine and Biology Conference (EMBC). 2018.
6. S. C. Sklare, **W. L. Richey**, B. T. Vinson, and D. B. Chrisey, "Directed self-assembly software for single cell deposition," International Journal of Bioprinting, vol. 3, no. 2, 2017.

## AWARDS

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- 2019-Present *T32 Graduate Fellowship Award: Vanderbilt Institute for Surgery and Engineering Training Program for Surgical and Interventional Engineering, National Institutes of Health National Institute of Biomedical Imaging and Bioengineering T32EB021937*
- 2020 *Finalist: Vanderbilt Institute of Surgery and Engineering Symposium, top 5 poster presentations*
- 2018 *Honorable Mention: National Science Foundation Graduate Research Fellowship, top 30%*
- 2018 *Honorable Mention: Ford Foundation Graduate Research Fellowship, top 30%*
- 2017 *Vanderbilt Engineering Graduate Fellowship, \$5000, Vanderbilt University*
- 2017 *Tulane 34 Award, Tulane University*
- For leadership, service and academic excellence; presented to 34 graduates across undergraduate, graduate, law, and medical schools
- 2017 *Leaders in Service Award; Tulane University*
- For improving the community through service-learning courses and student leadership
- 2013-2017 *Presidential Scholarship, 50% of tuition, room and board; Tulane University*

## CONTRIBUTED TALKS

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1. Textual fiducial detection in breast conserving surgery for a near-real time image guidance system. *SPIE Medical Imaging*. 2020
2. A Novel Guidance System for Breast Conserving Surgery. *Vanderbilt Ingram Cancer Center Breast Cancer Research Program Retreat*. 2020
3. Computer Vision Driven Image Guided Breast Conserving Surgery. *Research in Progress Seminar, Vanderbilt Institute of Surgery and Engineering*. 2020
4. Computer Vision Tracking in an Image Guidance System for Breast Cancer Lumpectomy. *Research in Progress Seminar, Vanderbilt Institute of Surgery and Engineering*. 2019
5. A system for automatic monitoring of surgical instruments and dynamic, non-rigid surface deformations in breast cancer surgery. *SPIE Medical Imaging*. 2018

## LEADERSHIP and SERVICE

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- 2017 - Present *Women of Vanderbilt Institute of Surgery and Engineering; Nashville, TN*
- Planning Committee, 2017-2019; Founding President 2019-2020, Steering Committee 2020-Present

- Started and formalized the group to foster community, discuss translational research, and promote the success of women in STEM
  - Coordinate monthly events including invited speakers, mentorship groups, K-12 outreach, gender inequality discussions
- 2017 – Present      Glenclyff High School STEM Outreach; Nashville, TN*
- Biomedical Engineering Graduate Student Alliance Outreach Chair, 2018-2019, 2020-Present; monthly lectures and hands-on activities
  - Developed and led events; introductions to Vanderbilt research areas and a discussion panel on college, research, and STEM
- 2017-2020      Vanderbilt Center for Science Outreach, Tutor*
- Tutored computer science, chemistry and pre-calculus
- 2019      Vanderbilt Biomedical Engineering Graduate Recruitment Coordinator*
- Organized the invitation weekend for prospective students
- 2017-2018      Vanderbilt Students Volunteering for Science, Team Leader*
- Led weekly science lectures and hands-on activities
- 2015-2017      Tulane Center for Public Service, Leader of Service Learning Assistants*
- Provide logistical support to Senior Program Coordinator for service learning; manage mentoring and co-training of 27 service learning assistants; organize speakers/special events; aid in hiring
  - Coordinated communication between community partners, Tulane professors and service learning students; managed logistics and facilitated class discussions, reflections and workshops
- 2016-2017      Tulane Academic Success Center*
- Supervised team of 20 tutors; revamped structure of team meetings and administrative tasks; tutor chemistry, physics, calculus, and engineering courses (all levels offered)