Winona Richey

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RESEARCH INTERESTS

Image Guided Surgery • Computer Vision • Finite Element Modeling • Machine Learning

EDUCATION

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

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

EXPERIENCE

2017 - Present *Biomedical Modeling Lab,* with Dr. Michael Miga;
Vanderbilt University, Nashville, TN

- Dissertation Title: "*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

- Thesis Title: "*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 REU: Center for Research in Computer Vision*, with Dr. Ulas Bagci;
University of Central Florida, Orlando, FL

- Implemented hand crafted features, combined with deep learning features for lung nodule detection in CT scans

PUBLICATIONS

1. **W. L. Richey,** J. S. Heiselman, M. J. Ringel, I. M. Meszoely, and M. I. Miga, "Computational imaging to compensate for soft-tissue deformations in image-guided breast conserving surgery". (Under Review).
2. **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,1-12. (2021).
3. 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.

4. **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.
5. **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.
6. 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.
7. 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

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

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

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 — *Glencliff High School STEM Outreach*; Nashville, TN

- Biomedical Engineering Graduate Student Alliance Outreach Chair, 2018-2019, 2020-2021; 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; restructured of team meetings to focus on teaching pedagogy; tutor chemistry, physics, calculus, and engineering courses (all levels offered)