Winona Richey

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Research Interests: Image Guided Surgery • Computer Vision • Finite Element Modeling

EDUCATION

BSE, Biomedical Engineering, Secondary Major in Computer Science
Tulane University, New Orleans, LA, May 2017

PhD, Biomedical Engineering Vanderbilt University, Nashville, TN, May 2022

SKILLS

Python • MATLAB • Bash • Java • C/C++ • Ruby on Rails • 3D Slicer • Qt • ParaView • ITK/VTK CMake • TensorFlow • OpenCV • GitHub • Plus Toolkit • CAD (SolidWorks/Creo) • Grant Writing Ultrasound N-Wire Calibration • Human Anatomy Cadaver Lab • Clinical Experience in Surgery

RESEARCH EXPERIENCE

- *Biomedical Modeling Lab*, Dr. Michael Miga; Vanderbilt University, Nashville, TN; 2017-present
  Image guided software system
  - Software development of a custom Python scripted image guidance system in 3D Slicer (user interface in Qt) deployed on human subjects, with iterative surgeon feedback
  - Leveraged biomechanical modeling to enhance intraoperative tumor localization; improved image-to-physical registration errors 50-65% compared to rigid alignments
  - Implemented tracked ultrasound N-wire calibration framework in a custom module complementing optically tracked NDI tools for surgical data acquisition via Plus Toolkit
  - Medical image analysis/processing with ultrasound/MR/CT imaging; 3D data rendering
  - Design of experimental/clinical research protocol in IRB approved studies with minimal disruption to existing clinical workflow

  Computer vision framework
  - Created innovative surface acquisition method with FLIR (Point Grey) stereo cameras in OpenCV and MATLAB, using colored ink and hand-drawn letters on the breast surface
  - Established repeatable 3D stereo camera calibration for computer vision algorithms
- *Biomedical Engineering Lab*, Dr. Doug Chrisey; Tulane University, New Orleans, LA; 2016-2017
  - Binary classification of 3D bioprinting cell transfers with support vector machines (SVM) and a neural network implemented in Python with TensorFlow
- *NSF sponsored REU: Center for Research in Computer Vision*, Dr. Ulas Bagci; University of Central Florida, Orlando, Florida; 2016
  - Automated lung nodule radius estimation as preprocessing for automatic classification
  - Implemented a binary classifier via TensorFlow deep learning and hand-crafted features

AWARDS

- *Finalist: Vanderbilt Institute of Surgery and Engineering Symposium,* 2020.
- *Honorable Mention: National Science Foundation Graduate Research Fellowship*, 2017
- *Honorable Mention: Ford Foundation Graduate Research Fellowship,* 2017
- *Vanderbilt Engineering Graduate Fellowship,* Vanderbilt University, Nashville TN, 2017
- *Tulane 34 Award*, Tulane University, New Orleans, LA; 2017
  - For leadership, service and academic excellence; presented to 34 graduates across schools
- *Leaders in Service Award*, Tulane University, New Orleans, LA; 2017
  - For improving the community through service-learning courses and student leadership
- *Presidential Scholarship*, Tulane University, New Orleans, LA; 2013-2017

LEADERSHIP AND SERVICE

- *Women of Vanderbilt Institute of Surgery and Engineering;*
  - Steering Committee, 2017-present; Outreach chair 2017-2018, President 2019-2020
- *High School Outreach Coordinator, Vanderbilt Biomedical Engineering Dept.;* 2017-2021