Maggie A. Collier

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UNDERGRADUATE RESEARCHER, ELECTRICAL AND BIOMEDICAL ENGINEERING, UAB

EDUCATION

University of Alabama at Birmingham (UAB), Birmingham, Alabama
Bachelor of Science, Electrical Engineering,   *Aug' 16 - Apr' 19 (Expected)*
Bachelor of Science, Biomedical Engineering,   *Aug' 13 - Apr' 19 (Expected)*
GPA: 3.97/4.0 (Cumulative)

RESEARCH INTERESTS

Human Robot Interaction, Assistive Robotics, Healthcare Robotics, Machine Learning, Reinforcement Learning, Deep Reinforcement Learning

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HONORS & AWARDS

Awarded 2018 Tau Beta Pi Scholarship
Selected for **2018 Carnegie Mellon Robotics Institute Summer Scholars Program**
Named **2017 Goldwater Scholar**
Selected for **2017 Georgia Tech SURE Robotics Summer Program**
Named **2017 Outstanding Student Engineer in Biomedical Engineering** at UAB
Inducted into Tau Beta Pi, an engineering honors society
Inducted into Phi Kappa Phi, an honors society
Awarded 2016 Science and Technology Summer Research Scholarship
Accepted into UAB's Science and Technology Honors Program

RESEARCH EXPERIENCE

Eye Gaze Behavior in Telemanipulation of a Multi-stage Task
Human and Robot Partners Lab, Carnegie Mellon University   *June '18 - Present*
Principle Investigator: Henny Admoni, Ph.D.

   Aim: Characterize eye gaze behavior while users teleoperate a robot to perform a multi-stage task

   - Investigating the usefulness of eye gaze data in improving robotic assistance during a task
   - Designed and conducted a user study to collect eye gaze during complex robot manipulation
   - Creating a classifier to use eye gaze to inform future robotic assistance in a multi-stage task

Human Pose Tracking with Capacitive Proximity Sensor in Robot Assisted Dressing
Healthcare Robotics Lab, Georgia Institute of Technology   *May '17 - Aug '17*
Principle Investigator: Prof. Charlie Kemp

   Aim: Equip a robot to manage errors in human pose estimation and adapt to human motion in real time during robot assisted dressing

   - Built a sensor that can estimate the distance between a robot's end effector and a person
   - Aided in implementing a PD controller on a PR2 robot
   - Helped design a human study to evaluate a novel approach to error management during robot assisted dressing

Alarm Clock for People with Deaf-Blindness
Department of Biomedical Engineering, UAB   *Sept '16 - April '17*
Principle Investigator: Prof. Alan Eberhardt

   Aim: Develop an alarm clock for individuals with deaf-blindness than can be set without assistance from a caretaker

   - Implemented a novel time and alarm setting input mechanism to meet users' needs
   - Designed the entire electrical circuit and programmed the Arduino
   - Helped secure a provisional patent for novel input mechanism

Improving Coil Embolization of Brain Aneurysms

Department of Biomedical Engineering, UAB   *Oct '14 - May '17*

Principle Investigators: Prof. Ho-Wook Jun; Patrick Hwang, Ph.D.

Aim: Increase occlusion rates of brain aneurysms treated with coil embolization in an effort to phase out a more invasive treatment

- Assisted in the project's creation by providing ideas for the strategy used to increase occlusion rates
- Independently designed and conducted the *in vitro* experiments
- Built a robust statistical analysis program in MATLAB to process data from the *in vitro* studies
- Prepared and sent samples to collaborators at the Mayo Clinic for the *in vivo* studies

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PUBLICATIONS

M. Collier, R. Aronson, H. Admoni (2018). "Eye Gaze Behavior during Telemanipulation of a Multi-stage Task" in *Robotics Institute Summer Scholars (RISS) Working Papers Journal*

Z. Erickson, **M. Collier**, A. Kapusta, C. C. Kemp (2018). "Tracking Human Pose During Robot-Assisted Dressing using Single-Axis Capacitive Proximity Sensing" in *IEEE Robotics and Automation Letters (RA-L)*

ORAL PRESENTATIONS

M. Collier (2017). "Capacitive Proximity Sensing for Dynamic Robot-Assisted Dressing" presented in completion of the 2017 SURE Robotics REU at Georgia Institute of Technology

M. Collier (2017). "Novel Endothelium-Mimicking Nanomatrix Coating to Enhance Healing of Ruptured Intracranial Aneurysms Treated with Coil Embolization" presented at the *2017 National Conference on Undergraduate Research (NCUR)* at the University of Memphis

T. J. Hwang, G. Alexander, M. Somarathna, **M. Collier**, B. Brott, J. Pollock, T. Lee, H.-W. Jun (2016). "Nitric Oxide Releasing Nanomatrix to Enhance Dialysis Fistula Maturation" presented at the *2016 Biomedical Engineering Society Annual Meeting*

POSTERS

M. Collier, R. Aronson, H. Admoni (2018). "Eye Gaze Behavior during Telemanipulation of a Multi-stage Task" presented in the *2018 Robotics Institute Summer Scholars Research Showcase* at Carnegie Mellon University

M. Collier, M. Chan, D. Chasteen-Boyd, S. Holder, A. Eberhardt (2017). "An Independent Alarm Clock Designed for Individuals with Deaf-Blindness" presented in the *UAB Spring 2017 EXPO*

M. Collier, M. Chan, D. Chasteen-Boyd, S. Holder, A. Eberhardt (2017). "An Independent Alarm Clock Designed for the Deaf-Blind" presented in the *2017 Design of Medical Devices Conference* at the University of Minnesota

T. J. Hwang, **M. Collier**, G. Alexander, B. Brott, R. Hergenrother, R. Kardivel, D. Kallmes, H.-W. Jun (2016). "A Self-assembled Bionanomatrix Coating for Intracranial Aneurysm Coils to Enhance Healing" presented at the *2016 Biomedical Engineering Society Annual Meeting*

M. Collier, T. J. Hwang, B. Brott, R. Hergenrother, R. Kardivel, D. Kallmes, and H.-W. Jun (2016). "Novel Endothelium-Mimicking Nanomatrix Coating to Enhance Healing of Ruptured Intracranial Aneurysms Treated with Coil Embolization" presented at the *9th Frontiers in Chemistry and Biology Interface Symposium* at Johns Hopkins University

M. Collier, T. J. Hwang, G. Alexander, B. Brott, R. Hergenrother, R. Kardivel, D. Kallmes, H.-W. Jun (2016). "Improving Coil Embolization of Intracranial Aneurysms through the Application of a Nitric Oxide-Releasing Nanomatrix Coating" presented at the *2016 University of Alabama System Honors Research Conference* at the University of Alabama at Huntsville

M. Collier, T. J. Hwang, G. Alexander, R. Kardivel, D. Kallmes, H.-W. Jun (2016). "Improving Coil Embolization of Intracranial Aneurysms through the Application of a Nitric Oxide-Releasing Nanomatrix Coating" presented at the *UAB Spring 2016 EXPO*

G. Alexander, J. Vines, **M. Collier**, T. J. Hwang, J. Kim, B. Brott, H.-W. Jun (2015). "Evaluation of Inflammation on a Self-Assembled Nanomatrix Stent Coating *In Vitro*" presented at the *2015 Biomedical Engineering Society Annual Meeting*

Teaching Experience

Supplemental Instruction *Jan '17 - Present*
Employer: Vulcan Materials Academic Success Center, UAB

Served as Supplemental Instruction leader to Introductory Physics course for four semesters

- Teaching large groups of pre-medicine students about physics
- Creating and working practice problems for students at two-hour, weekly sessions
- Creating and hosting mock tests for students prior to class test
- Collaborating with professors to develop useful content for sessions

Teaching Assistantship *Aug '16 - Present*
Employer: School of Engineering, UAB

Signals and Systems (EE 318) – Dr. Arie Nakhmani, Fall 2018
- Providing one-on-one tutoring for math concepts in the course

Bioimaging (BME 340) – Dr. Massimo Fazio, Spring 2017
- Graded tests

Bioinstrumentation (BME 313) – Dr. Joel Berry, Fall 2016
- Taught BME students to build and debug bioinstrumentation circuits, including an EKG

Tutoring *Jan '15 - Dec '16*
Employer: Vulcan Materials Academic Success Center, UAB

- Tutored approximately 10 hours a week in challenging courses such as Calculus, Physics, Biology, and Organic Chemistry
- Certified with the Association of Tutoring Professionals

Additional Activities

Vice Chair of IEEE Chapter *Apr '18 - Present*
Organization: Institute of Electrical and Electronics Engineers (IEEE)

- Rebuilding UAB's chapter of IEEE by increasing membership
- Engaging new members with IEEE hosted events such as hack-a-thons, software, and hardware competitions
- Networking with local professional IEEE group to secure opportunities for members

Chapter Secretary of Engineering Honors Society *Aug '17 - Apr '18*
Organization: Tau Beta Pi

- Led recruitment of engineering students eligible for honors society
- Maintained and submitted important forms for organizational

Journal Editorship *Sept '14 - May '17*
Organization: Inquiro, UAB's official peer-reviewed undergraduate research journal

- Oversaw the publication of Volume IX and X
- Served on editorial board for Volume VIII
- Secured funding for a website rebuild from the Office of the Provost to make *Inquiro* a visually appealing, open-access online publication

Skills

Computer Skills:
- (*Proficient*) Python (2.7 & 3.6), MATLAB, Windows OS, Microsoft Suite, LTspice
- (*Competent*) C/C++, Java, ROS, Linux (Ubuntu), OSX, Scikit Learn, SolidWorks
- (*Intermediate*) Cadence, LabVIEW
- (*Familiar*) Keras, Tensorflow, LaTeX, HTML, Assembly

Hardware Skills:
- (*Proficient*) Breadboarding, soldering, wiring and programming microcontrollers (Arduino, Raspberry Pi), testing with function generators and oscilloscopes

Circuits Implemented:
- (*Amplifiers*) Op-amp (inverting, non-inverting, instrumentation), BJT (common emitter, common base, common collector), MOSFET (common drain, common source, class A, class AB)
- (*Filters*) Passive and active filters (low-pass, high-pass, band-pass)
- (*Precision Rectifiers*) Half wave and full wave
- (*Misc.*) Schmitt trigger, multivibrator, current mirrors
- (*Multistage Circuits*) EKG, microphone and speaker amplifier circuit, alarm clock

RELEVANT COURSEWORK

Software:
Engineering Graphics (CAD), Computer Methodology in Engineering (MATLAB), Engineering Programming Method (C), Engineering Programming using Objects (Java), Intro to Python (Udacity course)

Hardware:
Bioinstrumentation, Digital Logic, Circuits I and II, Intro to Microprocessors, Electromagnetics, Electronics, Machinery, Analog Integrated Electronics, Medical Instrumentation

Data Analysis:
Signal Processing - Biocomputing, Bioimaging, Methods of System Analysis
Probability & Statistics - Living Systems Analysis (for biology), Engineering Problem Solving II
Misc. - Linear Algebra, Cardiac Electrophysiology (mathematical modeling), Intro to Machine Learning

Biology relevant to Human Robot Interaction:
Psychology, Sociology, Biomechanics of Solids, Principles of Human Physiology