

Maggie A. Collier

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UNDERGRADUATE RESEARCHER, ELECTRICAL AND BIOMEDICAL ENGINEERING, UAB

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| EDUCATION | University of Alabama at Birmingham (UAB) , Birmingham, Alabama <i>Bachelor of Science</i> , Electrical Engineering (EE), <i>Aug '16 - Apr '19 (Expected)</i> <i>Bachelor of Science</i> , Biomedical Engineering (BME), <i>Aug '13 - Apr '19 (Expected)</i> GPA: 3.97/4.0 (Cumulative) |
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| RESEARCH INTERESTS | Human Robot Interaction, Assistive Robotics, Healthcare Robotics, Machine Learning, Reinforcement Learning, Deep Reinforcement Learning |
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| SELECTED HONORS & AWARDS | <p>Awarded 2018 Scholarship from Tau Beta Pi, an engineering honors society</p> <p>Selected for 2018 Carnegie Mellon Robotics Institute Summer Scholars Program * 1 of 35 selected out of 800 applicants</p> <p>Named 2017 Goldwater Scholar</p> <p>Selected for 2017 Georgia Tech SURE Robotics Summer Program</p> <p>Named 2017 Outstanding Student Engineer in Biomedical Engineering at UAB</p> <p>Inducted into Tau Beta Pi, an engineering honors society</p> <p>Inducted into Phi Kappa Phi, an honors society</p> <p>Awarded 2016 Science and Technology Summer Research Scholarship</p> <p>Accepted into UAB's Science and Technology Honors Program * 1 of approximately 50 Honors students interviewed and selected from freshman class</p> <p>Awarded UAB's Golden Excellence Scholarship</p> |
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| RESEARCH EXPERIENCE | <p>Automating Robot Assistance during Complex Tasks Using Anticipatory Eye Gaze <i>Human and Robot Partners Lab, Carnegie Mellon University</i> <i>June '18 - Present</i> Principal Investigator: Henny Admoni, Ph.D.</p> <p>Aim: Enable a teleoperated assistive system to anticipate the next subtask during a multi-stage task</p> <ul style="list-style-type: none">- Designed and conducted a user study to collect eye gaze during complex robot manipulation- Characterizing eye gaze behavior while users teleoperate a robot to perform a multi-stage task- Creating an algorithm for subtask anticipation during a multi-stage task using eye gaze <p>Human Pose Tracking with Capacitive Proximity Sensor in Robot Assisted Dressing <i>Healthcare Robotics Lab, Georgia Institute of Technology</i> <i>May '17 - Aug '17</i> Principal Investigator: Prof. Charlie Kemp</p> <p>Aim: Equip a robot to manage errors in human pose estimation and adapt to human motion in real time during robot assisted dressing</p> <ul style="list-style-type: none">- 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 |
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Alarm Clock for People with Deaf-Blindness

Department of Biomedical Engineering, UAB

Sept '16 - Apr '17

Principal Investigator: Prof. Alan Eberhardt

Aim: Develop an alarm clock for individuals with deaf-blindness that 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

Principal 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

PUBLICATIONS

M. Collier, R. Aronson, H. Admoni (2018). "Eye Gaze Behavior during Teleoperation of a Robot in 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)*

CONFERENCE PRESENTATIONS

T. J. Hwang, M. Collier, G. Alexander, B. Brott, R. Hergenrother, R. Kardivel, D. Kallmes, H.-W. Jun (Oct '17). "Nitric Oxide Releasing Bionanomatrix Coating for Brain Aneurysm Coils to Improve Healing" presented at the *2017 Biomedical Engineering Society Annual Meeting*

M. Collier, M. Chan, D. Chasteen-Boyd, S. Holder, A. Eberhardt (Apr '17). "An Independent Alarm Clock Designed for Individuals with Deaf-Blindness" presented in the *2017 Design of Medical Devices Conference* at the University of Minnesota

M. Collier (Apr '17). "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, M. Collier, G. Alexander, B. Brott, R. Hergenrother, R. Kardivel, D. Kallmes, H.-W. Jun (Oct '16). "A Self-assembled Bionanomatrix Coating for Intracranial Aneurysm Coils to Enhance Healing" presented at the *2016 Biomedical Engineering Society Annual Meeting*

T. J. Hwang, G. Alexander, M. Somarathna, M. Collier, B. Brott, J. Pollock, T. Lee, H.-W. Jun (Oct '16). "Nitric Oxide Releasing Nanomatrix to Enhance Dialysis Fistula Maturation" 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 (May '16). "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 (Apr '16). "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

G. Alexander, J. Vines, M. Collier, T. J. Hwang, J. Kim, B. Brott, H.-W. Jun (Oct '15). "Evaluation of Inflammation on a Self-Assembled Nanomatrix Stent Coating *In Vitro*" presented at the *2015 Biomedical Engineering Society Annual Meeting*

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| ADDITIONAL PRESENTATIONS | M. Collier, R. Aronson, H. Admoni (Aug '18). "Eye Gaze Behavior during Telemanipulation of a Multi-stage Task" presented in the <i>2018 Robotics Institute Summer Scholars Research Showcase</i> at Carnegie Mellon University |
| | M. Collier, M. Chan, D. Chasteen-Boyd, S. Holder, A. Eberhardt (Apr '17). "An Independent Alarm Clock Designed for Individuals with Deaf-Blindness" presented in the <i>UAB Spring 2017 EXPO</i> |
| | M. Collier (Aug '17). "Capacitive Proximity Sensing for Dynamic Robot-Assisted Dressing" presented in completion of the 2017 SURE Robotics REU at Georgia Institute of Technology |
| | M. Collier, T. J. Hwang, G. Alexander, R. Kardivel, D. Kallmes, H.-W. Jun (Apr '16). "Improving Coil Embolization of Intracranial Aneurysms through the Application of a Nitric Oxide-Releasing Nanomatrix Coating" presented at the <i>UAB Spring 2016 EXPO</i> |

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| TEACHING EXPERIENCE | Supplemental Instruction <i>Jan '17 - Present</i> |
| | <i>Employer: Vulcan Materials Academic Success Center, UAB</i> |
| | Served as Supplemental Instruction leader to Introductory Physics course for four semesters |
| | <ul style="list-style-type: none"> - Teaching large groups of pre-medicine students about physics - Creating and working practice problems for students at two one-hour, weekly sessions - Creating and hosting mock tests for students prior to class tests - Collaborating with professors to develop useful content for sessions |
| | Teaching Assistantship <i>Aug '16 - Present</i> |
| | <i>Employer: School of Engineering, UAB</i> |
| | Signals and Systems (EE 318) – Dr. Arie Nakhmani, Fall 2018 |
| | <ul style="list-style-type: none"> - Providing one-on-one tutoring for math concepts in the course |
| | Bioimaging (BME 340) – Dr. Massimo Fazio, Spring 2017 |
| | <ul style="list-style-type: none"> - Graded tests |
| | Bioinstrumentation (BME 313) – Dr. Joel Berry, Fall 2016 |
| | <ul style="list-style-type: none"> - Taught BME students to build and debug bioinstrumentation circuits, including an EKG |
| | Tutoring <i>Jan '15 - Dec '16</i> |
| | <i>Employer: Vulcan Materials Academic Success Center, UAB</i> |
| | Tutored approximately 10 hours a week in challenging courses such as Calculus, Physics, Biology, and Organic Chemistry |
| | <ul style="list-style-type: none"> - Certified with the Association of Tutoring Professionals |

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| ADDITIONAL ACTIVITIES | Building Autonomous Robot for Hardware Competition <i>Aug '18 - Present</i> |
| | <i>Organizations: IEEE Southeast Conference & EE Senior Design</i> <ul style="list-style-type: none"> - Building an autonomous robot to compete in IEEE Southeast Conference - Implementing SLAM that uses 2D Lidar data - Gaining more experience with real-time processing and embedded systems |
| | Vice Chair of IEEE Chapter <i>Apr '18 - Present</i> |
| | <i>Organization: Institute of Electrical and Electronics Engineers (IEEE)</i> <ul style="list-style-type: none"> - 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 to headquarters

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, MATLAB, Windows OS, Scikit-learn, Microsoft Suite, LTspice
- (*Competent*) C/C++, Java, ROS, Linux (Ubuntu), Jupyter Notebooks, OSX, SolidWorks
- (*Intermediate*) Cadence, LabVIEW
- (*Familiar*) Keras, Tensorflow, L^AT_EX, HTML, Assembly

Hardware Skills:

- (*Proficient*) Breadboarding, soldering, wiring and programming microcontrollers (Arduino, Raspberry Pi, BeagleBone), 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 (Signals and Systems)

Probability & Statistics - Living Systems Analysis (for biology), Engineering Problem Solving II

Misc. - Linear Algebra, Cardiac Electrophysiology (mathematical modeling), Machine Learning in EGR

Courses relevant to Human Robot Interaction:

Control Systems, Introductory Biology 1 and 2, Psychology, Sociology, Biomechanics of Solids, Principles of Human Physiology, Modern Control Theory (spring 2019 registration)