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Maggie A. Collier

Ph.D. Student, Robotics Institute, CMU

Education

Carnegie Mellon University (CMU), Pittsburgh, Pennsylvania *2019 - present*
Ph.D., The Robotics Institute

University of Alabama at Birmingham (UAB), Birmingham, Alabama *2013 - 2019*
Bachelor of Science, Department of Electrical Engineering (EE)
Bachelor of Science, Department of Biomedical Engineering (BME)
GPA: 3.98/4.0, *Science and Technology Honors Distinction*

Honors & Awards

National Defense Science and Engineering Graduate Fellowship *2019*

National Science Foundation Graduate Research Fellowship *(declined)* *2019*

CMU Robotics Institute Summer Scholars Program *2018*

Goldwater Scholarship *2017*

Georgia Tech SURE Robotics Summer Program *2017*

Outstanding Student Engineer in Biomedical Engineering at UAB *2017*

Research Experience

Automating Robot Assistance during Complex Tasks Using Anticipatory Eye Gaze
Human and Robot Partners Lab, Carnegie Mellon University *June '18 - Present*
Principal Investigator: Prof. Henny Admoni

Aim: Enable a teleoperated assistive system to anticipate the next subtask during a multi-stage task

- 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

Human Pose Tracking with Capacitive Proximity Sensor in Robot Assisted Dressing
Healthcare Robotics Lab, Georgia Institute of Technology *May '17 - Aug '17*
Principal 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 - 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

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)*

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*

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*

Theses

M. Collier (2019). *(Undergraduate Honors Thesis)* "Eye Gaze Behavior during Teleoperation of a Robot in a Multi-stageTask"
Committee: Prof. Henny Admoni, Prof. Joel Berry, Prof. Diane Tucker

M. Collier (2017). *(Undergraduate Honors Proposal)* "Novel Endothelium-Mimicking Nanomatrix Coating to Enhance Healing of Ruptured Intracranial Aneurysms Treated with Coil Embolization"
Committee: Prof. Ho-Wook Jun, Prof. Brigitta Brott, M.D., Prof. Joel Berry

Additional Presentations

M. Collier, R. Aronson, H. Admoni (Aug '18). "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 (Apr '17). "An Independent Alarm Clock Designed for Individuals with Deaf-Blindness" presented in the *UAB Spring 2017 EXPO*

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 *UAB Spring 2016 EXPO*

Teaching Experience

Supplemental Instruction *Jan '17 - Apr '19*
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 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 *Aug '16 - Dec '18*
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

Built Autonomous Robot for Hardware Competition *Aug '18 - Apr '19*
Organizations: IEEE Southeast Conference & EE Senior Design

- Built an autonomous robot for IEEE Southeast Conference student competition
- Implemented the localization component of the project with a Lidar and a variant of ICP
- Gained more experience with real-time processing and embedded systems

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

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