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Maggie A. Collier

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

Medical Technologies, Assistive Robotics, Healthcare Robotics, Human Robot Interaction, Shared Autonomy, Data Science, Deep Learning, Reinforcement Learning

Publications

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

Greatest Achievements

Named **2017 Goldwater Scholar**
Selected for **2018 Carnegie Mellon Robotics Institute Summer Scholars Program**
Selected for **2017 Georgia Tech SURE Robotics Summer Program**
Named **2017 Outstanding Student Engineer in Biomedical Engineering** at UAB

Research Projects

Enhancement of a Shared Autonomy Algorithm for Improved Robotic Assistance
Human and Robot Partners Lab, Carnegie Mellon University *June '18 - Present*
Principle Investigator : Henny Admoni, Ph.D.

Aim: To improve the performance of a shared autonomy algorithm during a multi-stage task by using features from eye gaze data

- Investigating the usefulness of eye gaze data in improving robotic assistance during a task
- Drawing from psychology to featurize eye gaze data for use in a shared autonomy algorithm
- Modifying a shared automony algorithm (a POMDP) to include eye gaze features as an observation

Detecting Disease Progression of Emphysema from CT Scans
Department of Electrical and Computer Engineering, UAB *Jan '18 - Present*
Principle Investigators : Arie Nakhmani, Ph.D.; Surya Bhatt, M.D.

Aim: To detect disease progression of emphysema from CT images of lungs

- Studying numerous machine learning algorithms to accomplish accurate disease progression detection
- Specifically experimenting with deep learning techniques such as convolutional neural networks
- Exploring image processing techniques to potentially featurize CT scans of lungs

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: To 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: To 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: To 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

Conferences

Maggie Collier, Matthew Chan, David Chasteen-Boyd, Samuel Holder, Alan Eberhardt, "An Independent Alarm Clock Designed for the Deaf-Blind" presented in the *2017 Design of Medical Devices Conference* at the University of Minnesota

Maggie Collier, Patrick Hwang, Brigitta Brott, Robert Hergenrother, Rahm Kardivel, David Kallmes, and Ho-Wook Jun, "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

Maggie Collier, Patrick Hwang, Grant Alexander, Brigitta Brott, Robert Hergenrother, Rahm Kardivel, David Kallmes, Ho-Wook Jun, "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

Maggie Collier, Patrick Hwang, Grant Alexander, Rahm Kardivel, David Kallmes, Ho-Wook Jun, "Improving Coil Embolization of Intracranial Aneurysms through the Application of a Nitric Oxide-Releasing Nanomatrix Coating" presented at the *UAB Spring 2016 EXPO*

Patrick Hwang, **Maggie Collier**, Grant Alexander, Brigitta Brott, Robert Hergenrother, Rahm Kardivel, David Kallmes, Ho-Wook Jun, "A Self-assembled Bionanomatrix Coating for Intracranial Aneurysm Coils to Enhance Healing" presented at the *2016 Biomedical Engineering Society Annual Meeting*

Grant Alexander, Jeremy Vines, **Maggie Collier**, Patrick Hwang, J. Kim, Brigitta Brott, Ho-Wook Jun, "Evaluation of Inflammation on a Self-Assembled Nanomatrix Stent Coating *In Vitro*" presented at the *2015 Biomedical Engineering Society Annual Meeting*

Oral Presentations

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

Maggie Collier, "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

Patrick Hwang, Grant Alexander, M. Somarathna, **Maggie Collier**, Brigitta Brott, J. Pollock, Timothy Lee, Ho-Wook Jun, "Nitric Oxide Releasing Nanomatrix to Enhance Dialysis Fistula Maturation" presented at the *2016 Biomedical Engineering Society Annual Meeting*

Skills

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

Hardware Skills:
- (*Proficient*) Breadboarding, soldering, wiring and programming microcontrollers (mainly Arduino, but some Raspberry Pi), testing with function generators and oscilloscopes
- (*Competent*) Using documentation to wire and program an IC for use in a circuit

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

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

- Aided in contacting eligible engineering students for recruitment
- Completed and submitted recruitment forms to headquarters
- Booked rooms for meetings and events

Bioinstrumentation Teaching Assistant *Sept '16 - Dec '16*
Employer : Department of Biomedical Engineering, UAB

- Taught Biomedical Engineering students to build bioinstrumentation circuits
- Built an EKG with LabVIEW and op-amps

Tutoring and Supplemental Instruction *Jan '15 - Present*
Employer : Vulcan Materials Academic Success Center, UAB

- Tutored approximately 12 hours a week in challenging courses such as Calculus, Physics, Biology, and Organic Chemistry
- Certified with the Association of Tutoring Professionals
- Assisted professors of 3 physics classes by holding weekly practice problem sessions and creating and hosting mock tests

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

- Oversaw the publication of Volume IX and X
- Secured expensive website rebuild from the Office of the Provost to make *Inquiro* a visually appealing, open-access online publication
- Gained experience on the editorial board of a peer-reviewed undergraduate research journal during Volume VIII's creation

Relevant Coursework

Software:
Engineering Graphics (Cad), Computer Methodology in Engineering (MATLAB), Engineering Programming Method (C), Engineering Programming using Objects (in 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 (Udacity course)

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

Additional Achievements

Awarded **2018 Tau Beta Pi Scholarship**
Inducted into **Tau Beta Pi**, an engineering honors society
Received **Outstanding Performance in Organic Chemistry Award**
Inducted into **Phi Kappa Phi**, an honors society
Second place in School of Public Health's Wicked Problems competition
Awarded **2016 Science and Technology Summer Research Scholarship**
Accepted into UAB's **Biomedical Engineering Honors Program**
Accepted into UAB's **Science and Technology Honors Program**
Awarded UAB's **Golden Excellence Scholarship**