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Jeremy D. Brown

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Education

University of Michigan, Ann Arbor, Michigan

Ph.D., Mechanical Engineering, May 2014

- Dissertation Topic: Haptic Sensory Feedback for Improved Interface to Smart Prosthetics
- Advisor: R. Brent Gillespie

M.S.E., Mechanical Engineering: April 2012

B.S.E., Mechanical Engineering: Dual-Degree Engineering Program, December 2008 (Cum Laude)

Morehouse College, Atlanta, Georgia

B.S., Applied Physics: Dual-Degree Engineering Program, December 2008 (Magna Cum Laude)

Positions Held

John C. Malone Assistant Professor, Johns Hopkins University 2017-Present
Department of Mechanical Engineering

Assistant Research Professor, Johns Hopkins University 2016
Department of Mechanical Engineering

Postdoctoral Research Fellow, University of Pennsylvania 2014-2016
Department of Mechanical Engineering and Applied Mechanics, GRASP Laboratory (Haptics Group)
Advisor: Katherine J. Kuchenbecker, Ph.D

Graduate Research Assistant, University of Michigan 2009-2014
Department of Mechanical Engineering, Haptix Laboratory
Advisor: R. Brent Gillespie, Ph.D

Research Interests

My research seeks to improve the interface between humans and engineered systems with a specific focus on medical applications. I combine methods from human perception, motor control, neurophysiology, biomechatronics, and haptics. As a result, my work crosses the boundary between engineering, biomechanics, medicine, and psychophysics. My postdoctoral work currently focuses on haptic feedback and advanced training platforms for minimally invasive robotic surgery.

Selected Honors and Awards

University of Pennsylvania Postdoctoral Fellowship for Academic Diversity, 2014-Present
Ford Foundation Dissertation Fellowship Honorable Mention, 2013
Edward Alexander Bouchet National Honor Society, 2013
Best Student Paper Award, IEEE Haptics Symposium, 2012
University of Michigan Martin Luther King North Campus Spirit Award (Nomination), 2012
AGEP Imade M. Asemoto First Year Student Award, 2010

National Science Foundation Graduate Research Fellowship, 2010-2013
University of Michigan Rackham Merit Fellowship, 2009-2014 Department of Mechanical Engineering Transfer Student Award, 2008
Dual-Degree Engineering Program Most Outstanding Fifth Year Student Award, 2008
Pi Tau Sigma National Mechanical Engineering Honor Society, 2007
Beta Kappa Chi National Scientific Honor Society, 2006
University of Michigan College of Engineering Scholarship 2006-2008 *(partial-tuition)*
NASA Ronald E. McNair Scholarship 2003-2008 *(partial-tuition)*
Morehouse College Academic Scholarship 2003-2006 *(tuition, room, board)*

Professional Affiliations

Institute of Electrical and Electronics Engineers, Robotics and Automation Society (IEEE)
American Society of Mechanical Engineers (ASME)
National Society of Black Engineers (NSBE)

Journal Publications

J1 **Brown J.D.**, O'Brien C.E., Leung S.C., Dumon K.R., Lee D.I., Kuchenbecker K.J. Using Contact Forces and Robot Arm Accelerations to Automatically Rate Surgeon Skill at Peg Transfer. [Available online] *IEEE Transactions on Biomedical Engineering (Impact Factor = 2.347)*, Accepted 2016.

J2 **Brown J.D.**, Shelley M., Gardner D., Gansallo E.A., Gillespie R.B., Non-colocated Kinesthetic Display Limits Compliance Discrimination in the Absence of Terminal Force Cues. [Available online] *IEEE Transactions on Haptics (Impact Factor = 1.41)*, 9(3), 387-96, 2016.

J3 **Brown J.D.**, Kunz T., Gardner D., Shelley M.K., Gillespie R.B., Davis A.J., An Empirical Evaluation of Force Feedback in Body-Powered Prostheses. [Available online] *IEEE Transactions on Neural Systems and Rehabilitation Engineering (Impact Factor = 3.188)*, Accepted 2015.

J4 **Brown J.D.**, Paek A., Syed M., O'Malley M.K., Shewokis P.A., Contreras-Vidal J.L., Davis A.J., Gillespie R.B., An Exploration of Grip Force Regulation with a Low-Impedance Myoelectric Prosthesis Featuring Referred Haptic Feedback. *Journal of NeuroEngineering and Rehabilitation (Impact Factor = 2.74)*, 12(104), 2015.

Peer-Reviewed Conference Publications

C1 **Brown J.D.**, Ibrahim M., Chase E.D.Z., Pacchierotti C., Kuchenbecker K.J. (2016) Data-Driven Comparison of Four Cutaneous Displays for Pinching Palpation in Robotic Surgery. Accepted for publication *IEEE Haptics Symposium, 2016.*

C2 Gillespie R.B., Suchoski J.M., Yu B., **Brown J.D.**, Kim D. Series Elasticity for Free Free-Space Motion for Free. In *Proc. IEEE Haptics Symposium*, 609-615, 2014.

C3 Paek A., **Brown J.D.**, Gillespie R.B., O'Malley M., Shewokis P., Contreras-Vidal J. Reconstructing Surface EMG from Scalp EEG During Myoelectric Control of a Closed Looped Prosthetic Device. In *Proc. IEEE Engineering in Medicine and Biology Society (EMBS) Conference*, 5602-5605, 2013.

C4 **Brown J.D.**, Paek A., Syed M., O'Malley M.K., Shewokis P.A., Contreras-Vidal J.L., Gillespie R.B. Understanding the Role of Haptic Feedback in a Teleoperated / Prosthetic Grasp and Lift Task. In *Proc. IEEE World Haptics Conference*, 271-276, 2013.

C5 **Brown J.D.**, Gillespie R.B., Gardner D., Gansallo E.A. Co-Location of Force and Action Improves Identification of Force-Displacement Features. In *Proc. IEEE Haptics Symposium*, 187-193, 2012. (*Awarded Best Student Paper*).

C6 **Brown J.D.**, Gillespie R.B. The Effect of Force/Motion Coupling on Motor and Cognitive Performance. In *Proc. IEEE World Haptics Conference*, 197-202, 2011.

C7 Gillespie R.B., Contreras-Vidal J.L., Shewokis P.A., O'Malley M.K., **Brown J.D.**, Agashe H., Gentili R., Davis A. Toward improved sensorimotor integration and learning using upper-limb prosthetic devices. In *Proc. IEEE Engineering in Medicine and Biology Society (EMBS) Conference*, 5077-5080, 2010.

Short Peer-Reviewed Conference Papers and Abstracts

S1 **Brown J.D.**, O'Brien C., Miyasaka K.W., Dumon K.R., Kuchenbecker K.J. Analysis of Instrument Vibrations and Contact Forces Caused by an Expert Robotic Surgeon Doing FRS Tasks. In *Proc. 8th Annual Hamlyn Symposium on Medical Robotics*, 75-77, 2015.

S2 Paek A., **Brown J.**, Gillespie B., O'Malley M., Shewokis P., Contreras-Vidal J. Reconstructing Electromyography from Electroencephalography during Myoelectric Control of a Closed Looped Prosthetic Device. *16th International Graphonomics Society Conference*, 2013.

Presentations

1. The Role of Haptic Feedback in a Teleoperated Grasp and Lift Task. NSF Michigan Alliance for Graduate Education and Professoriate (AGEP) Symposium, Ann Arbor, MI, April 6, 2013. (*oral presentation*)
2. Development of Haptic Sensory Feedback System for an Upper-Limb Prosthetic Gripper. Rehabilitation Institute of Chicago, Prothesis Design & Control Lab, April 13, 2012. (*invited talk*)
3. Co-location of Force and Action Improves Identification of Force-Displacement Features. IEEE Haptics Symposium, Vancouver, British Columbia, March 7, 2012. (*oral presentation*)
4. The Effect of Force/Motion Coupling on Motor and Cognitive Performance. IEEE World Haptics Conference, Istanbul, Turkey, June 22, 2011. (*poster presentation*)
5. Sensory Feedback for Neuroprosthetic Devices. University of Michigan Engineering Graduate Symposium, Ann Arbor, MI, November 12, 2010. (*poster presentation*)
6. Sensory Substitution and Neuroprosthetics. NSF Michigan Alliance for Graduate Education and Professoriate (AGEP) Symposium, Ann Arbor, MI, April 10, 2010. (*oral presentation*)
7. Sensory Feedback for Neuroprosthetic Devices. NSF Michigan Alliance for Graduate Education and Professoriate (AGEP) Symposium, Ann Arbor, MI, August 11, 2009. (*oral presentation*)

Funding

Postdoctoral

1. Intuitive Surgical Technology Research Award
   Comparison of Cutaneous Feedback Methods for Pinching Palpation in Robotic Surgery
   Role: Postdoctoral Investigator
   Agency: Intuitive Surgical, Inc.
   Funding: $50,000
   Dates: January 1, 2015 through December 31, 2015

2. Postdoctoral Fellowship for Academic Diversity
   Role: Postdoctoral Fellow
   Agency: University of Pennsylvania
   Funding: $50,000 *(salary, research, travel)*
   Dates: July 1, 2014 through July1, 2015 (renewable up to three years)

Doctoral

1. Rackham Research Grant
   Role: Graduate Student Researcher
   Agency: University of Michigan Rackham Graduate School
   Funding: $3,000
   Dates: February 5, 2013 through May 27, 2014

2. Graduate Research Fellowship
   Role: Graduate Student Researcher
   Agency: National Science Foundation
   Funding: $30,000*(yearly stipend)*, $12,000*(education allowance)*
   Dates: April 6, 2010 through May 7, 2013

3. Rackham Merit Fellowship
   Role: Graduate Student Researcher
   Agency: University of Michigan Rackham Graduate School
   Funding: $17,500 *(yearly stipend)* + tuition waiver
   Dates: April 6, 2010 through May 7, 2013

Travel Grants

Rackham International Travel Grant, 2012 *($950)*
Rackham International Travel Grant, 2011 *($1100)*
Department of Mechanical Engineering Conference Travel Grant, 2011 *($1000)*

Previous Research Experience

Haptix Laboratory, University of Michigan (Ann Arbor, MI)

Graduate Research Assistant, Supervisor: R. Brent Gillespie **May 2009-May 2014**
Researched the application of sensory feedback in upper-limb prosthetic devices. Current work focuses on comparing haptic force-feedback and vibrotactile feedback modalities. The effectiveness of each modality is measured in information-carrying capability and associated cognitive loading.

Human Biomechanics and Controls Laboratory, University of Michigan (Ann Arbor, MI)

Post-Baccalaureate Research Assistant, Supervisor: Art Kuo **January-May 2009**
Studied the effects of foot length asymmetries on the metabolic cost and dynamics of walking. Designed an experiment to test hypothesis using simulator boots and arc-shaped feet made of wood. Conducted two pilot studies measuring metabolic data and one full-scale study measuring metabolic data and dynamic data using a split-belt force-plate treadmill. Performed statistical analysis on the metabolic data measured during the full-scale study.

Institute of Biomedical Manufacturing and Life Quality Engineering, Shanghai Jiao Tong University (Shanghai, China)

Undergraduate Research Assistant, Supervisor: Shien-Ming Wu **June-August 2008**
Analyzed human motion data used in the calibration of a musculoskeletal modeling software program being developed in the lab. Created organizational structure for motion trial data. Streamlined process to analyze data for multiple trials and multiple subjects.

Human Biomechanics and Controls Laboratory, University of Michigan (Ann Arbor, MI)

Undergraduate Research Assistant, Supervisor: Art Kuo **January-April 2008**
Set up data acquisition system for energy-harvesting backpack, a device that uses spring-mass oscillations generated by walking to drive an electric generator. Performed a sensitivity analysis to determine which system components were the most sensitive to electrical noise. Developed a strategy to shield certain components from electrical noise.

Graphics Research and Analysis Facility, NASA Johnson Space Center (Houston, TX)

Undergraduate Research Assistant, Supervisor: Jame Maida **June-August 2007**

Developed a process for articulating a human in NASA's various soft-bodied suits using Jack human modeling and analysis software. Modeled static work envelopes and reach zones, as well as simulated range of motion and suit mobility to assist NASA in designing soft-bodied suits compatible with current and future space vehicles.

Reconfigurable Manufacturing Laboratory, University of Michigan (Ann Arbor, MI)

Undergraduate Research Assistant, Supervisor: Stephan Segall **June-August 2006**

Performed design analysis of third generation non-contact optical cylinder bore probe using CAD software to ensure proper fit of all probe components and proper geometry for machining. Analyzed engine cylinder surface by taking silicone impressions of cylinder surfaces. Manufactured prototype non-contact optical cylinder bore probe using CNC and manual mills and lathes.

Micro-Optical Element Research Laboratory, Morehouse College (Atlanta, GA)

Undergraduate Research Assistant, Supervisor: Willie Rockward **September 2004-May 2006**

Maintained scatterometer experiment, gap measurement experiment, and photo-reduction laboratory for research and production of micro-optical elements. Assisted in the assembly of a cross-phase-grating experiment used in the study of the phase gratings as passive optical switches.

Interferometry and Advanced Optical Systems Division NASA Jet Propulsion Laboratory (Pasadena, CA)

Undergraduate Research Assistant, Terrestrial Planet Finder Team **June-August 2005**

Worked on main optical test-bed for the Terrestrial Planet Finder Mission. Used Zemax to conduct beam deviation analysis to detect stray light and noise in system. Characterized the CO_2 lasers in the test-bed to create a functional understanding of their power output vs. temperature. Constructed a rack-mounted case and installed a diode laser with optical fiber connections.

Atmospheric Physics Division, NASA Marshall Space Flight Center (Huntsville, AL)

Undergraduate Research Assistant, Lunar Lander Team **June-August 2004**

Researched U.S. Lunar and micro-satellite missions to assist with lunar mission proposal. Compiled and presented research to proposal team and division.

Teaching Experience

ME-461: Introduction to Automatic Controls, University of Michigan

Graduate Student Instructor **Fall 2013**

Assisted course instructor in the development and implementation of course material. Held regular office hours to assist students with homework, exam preparation, and course projects. Developed assignments for a hands-on experiential learning module being designed for the course.

Summer College Engineering Exposure Program (SCEEP), University of Michigan

Engineering Concepts Instructor **Summer 2012**

Co-facilitated the engineering concepts course for the 10-day SCEEP program, an engineering exposure program for rising high school seniors. The course involved a team-based engineering design project and covered topics such as engineering fundamentals, engineering ethics, teamwork, and the engineering design process.

Mechanical Engineering Workshop Instructor **Summer 2010, 2011, 2012**

Led a workshop on mechanical engineering as part of the SCEEP program. The workshop consisted of an hour-long lecture on the different aspects of mechanical engineering, followed by an hour-long hands-on haptics workshop.

Teaching Engineering Course, University of Michigan
Student **Fall 2011**
Took a course focused on engineering education. Course topics included teaching philosophies, teaching statements, Bloom's taxonomy, syllabus development, lecture development, exam development, and teaching to diverse groups with varying preferred learning styles.

Mentoring

Research Mentor, University of Pennsylvania

Elyse Chase · MEAM Undergraduate Student, May 2015 - Present
Mary Ibrahim · MEAM Masters Student, January 2015 - Present
Sean Cohen · MEAM Undergraduate Student, May 2015 - August 2015
Shoshana Yaffee · MEAM Undergraduate Student, January 2015 - May 2015
Conor O'Brien · Robotics Masters Student, September2014 - May 2015
Naomi Hachen · MEAM Masters Student, September 2014 - December 2014

Research Mentor, University of Michigan

Mackenzie Shelley · EECS Undergraduate Student, January 2013 - April 2014
Bruce Cousin · Dual-Degree Engineering Student at Morehouse College, June 2014 - August 2014
Jordan Barkus · ME Undergraduate Student, June 2014 - August 2014
Kendall King · Biology Undergraduate Student, January 2012 - April 2012
Justin Flietstra · ME Undergraduate Student, January 2012 - April 2012
Duane Gardner · ME Undergraduate Student, June 2011 - August 2011
Emmanuel Gansallo · EECS Undergraduate Student, June 2011 - August 2011
Matthew Ewald · EECS Undergraduate Student, January 2011 - April 2011
Matthew Blanchard · ME Undergraduate Student, January 2011 - April 2011

Mentor, University of Michigan

Multicultural Engineering Programs Office (MEPO) Mentoring Program, January-April 2011
National Society of Black Engineers (NSBE) TORCH Mentoring Program, January 2008-April 2009

Mentor, Morehouse College

NSBE Pre-College Initiative Mentoring Program, September 2004-April 2007
Project Identity Mentoring Program, January-May 2006

Service

Professional Service

2016 Co-Chair, IEEE Haptics Symposium (to take place in Philadelphia, PA),

University Service, University of Michigan College of Engineering

Honors Program Interview Committee (2012)
Transfer Student Curriculum Committee (January 2012 - April 2012)
Graduate Advisor, Transfer Student Leader Network (August 2009 - April 2011)
Executive Board, Students of Color of Rackham (August 2008-April 2009) Dual-Degree Engineering Program Recruitment Committee (August 2006-December 2008)

University Service, University of Michigan Department of Mechanical Engineering

Graduate Engineering Council (August 2013-April 2014)
Community Building Committee (April 2013-July 2013)

Diversity Recruitment Committee (August 2010-April 2011)

Professional Development

Academic and Research Leadership Network Symposium *(Participant)*
Academic and Research Leadership Network — April 2015

Building Future Faculty Program *(Participant)*
North Carolina State University — April 2015

FOCUS Fellows Program *(Participant)*
Georgia Institute of Technology — January 2014

NextProf Future Faculty Workshop *(Participant and Invited Guest Speaker)*
University of Michigan — September 2012

Academy for Future Science Faculty *(Member)*
Northwestern University — June 2012-Present

Project Management Workshop *(Participant)*
Michigan Alliance for Graduate Education and the Professoriate — March 2012

Minority Faculty/Student Mixer *(Organizer and Participant)*
Society of Minority Engineers and Scientists Graduate Component — October 2011

Compact for Faculty Diversity Workshop *(Participant)*
Southern Regional Education Board — September 2011

Professional Skills for Research Scientists Course *(Student)*
University of Michigan Department of Kinesiology — January-April 2010

Computer Skills

Modeling/Simulation: Matlab, Simulink, SolidWorks, ADAMS, LabView

Languages: C++, NIDAQMX, Arduino

Applications: Microsoft Office, LaTeX

Operating Systems: Windows, MacOS