

Emily M. Mugler

Curriculum Vitae

EDUCATION

- 2007–2013* **University of Illinois at Chicago**, Chicago, IL, USA
Ph.D. in Neural Engineering, Bioengineering; 3.65 GPA
Dissertation title: “Investigation of Speech for Communicative Brain-Computer Interface”
- 2006–2007* **Eberhard-Karls Universität Tübingen**, Tübingen, Germany
Visiting Fulbright Scholar in Brain-Computer Interface at the Institute of Medical Psychology and Behavioral Neurobiology
- 2002–2006* **Duke University**, Durham, NC, USA
Bachelor of Science in Biomedical Engineering and Certificate in Neuroscience; 3.180 GPA
- 1998–2002* **Hudson High School**, Hudson, OH, USA
Honors Diploma; 4.223 GPA

RESEARCH EXPERIENCE

- 2013–present* **Post-Doctoral Research Fellow** Neurology Department, Northwestern University
Designed experimental protocols for awake brain surgeries; determined functional cortical correlates of overt speech; applied big data classification algorithms to neural signal with Matlab (Advisor: Marc Slutzky, MD, PhD)
- 2007–2013* **Doctoral Student** Bioengineering Department, University of Illinois at Chicago
Designed experimental protocols to investigate human motor movement and neural signal during overt speech; designed Matlab analytical framework and user interfaces for biosignal classification (Advisors: Patrick J. Rousche, PhD (2007-2009), James L. Patton, PhD (2009-2013))
- 2006–2007* **Fulbright Scholar** Eberhard-Karls University of Tübingen, Institute for Medical Psychology
Created an open-source internet browser for use with control without voluntary movement; adapted software for patients with amyotrophic lateral sclerosis; acted as a cultural diplomatic representative and created international research network. (Advisor: Andrea Kübler, PhD)
- 2005–2006* **Pratt Undergraduate Research Fellow** Pratt School of Engineering, Duke University
Designed behavioral experiments for animal subjects; constructed electrical circuitry for positive reward feedback systems; prepared written reports for publication and oral presentations for the Pratt Board of Trustees; trained animal subjects following U.S. Government regulations. (Advisor: Patrick Wolf, PhD)
- 2004* **Research Intern** McGovern Institute for Brain Research, Massachusetts Institute of Technology
Designed somatosensory experiments and apparatus for animal subjects; trained animal subjects using a manual positive reward feedback system; analyzed and documented somatosensory data for publication. (Advisor: Christopher I. Moore, PhD)
- 2002* **Research Intern** Walter A. Hoyt, Jr. Musculoskeletal Research Laboratory, Summa Medical Center
Collected load-cell data on bones of rats; presented data and documented results in written reports; self-taught statistical analysis. (Advisor: Michael J. Askew, MD)

PUBLICATIONS**Peer-Reviewed Journal Articles**

- 2014 **E. M. Mugler**, J. L. Patton, R. D. Flint, Z. A. Wright, S. U. Schuele, J. Rosenow, J. J. Shih, D. J. Krusienski, M. W. Slutzky, "Direct classification of all American English phonemes using signals from functional speech motor cortex," *J. Neural Eng.*, Vol. 11, No. 3, 2014.
- 2010 **E. M. Mugler**, C.A. Ruf, S. Halder, M. Bensch, A. Kübler, "Design and Implementation of a P300-Based Brain-Computer Interface for Controlling an Internet Browser," *IEEE Trans. on Neural Sys. & Rehab. Eng.*, Vol.18, No.6, pp.599-609, Dec. 2010
- 2008 **E. M. Mugler**, M. Bensch, S. Halder, W. Rosenstiel, M. Bogdan, N. Birbaumer, A. Kübler, "Control of an Internet Browser Using the P300 Event-Related Potential," *International Journal of Bioelectromagnetism*. Vol. 10, No. 1, pp. 56 - 63, 2008.

Peer-Reviewed Abstracts

- 2016 **E. M. Mugler**, M. Goldrick, M. C. Tate, K. Livescu, M. W. Slutzky, "Articulatory gestures are insensitive to within-word context," , " Proceedings of the Sixth International Brain-Computer Interface Meeting 2013, Pacific Grove, CA, May 30-June 3, 2016.
- 2015 **E. M. Mugler**, Eric W Lindberg, M. W. Slutzky, "Using a Myoelectric Computer Interface As a Treatment for Motor Impairment after Stroke," 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'15), Milan, Italy, August 25-29, 2015.
- 2015 **E. M. Mugler**, M. Goldrick, J. Rosenow, Matthew Tate, M. W. Slutzky, "Decoding of Articulatory Gestures During Word Production Using Speech Motor and Premotor Cortical Activity," 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'15), Milan, Italy, August 25-29, 2015.
- 2014 **E. M. Mugler**, M. Goldrick, M. W. Slutzky, " Cortical encoding of phonemic context during word production," 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'14), Chicago, IL, August 26-30, 2014.
- 2013 **E. M. Mugler**, R. D. Flint, Z. A. Wright, S. U. Schuele, J. Rosenow, J. L. Patton, M. W. Slutzky, "Decoding Articulatory Properties of Overt Speech from Electrographic," Proceedings of the Fifth International Brain-Computer Interface Meeting 2013, Pacific Grove, CA, June 3-7, 2013.
- 2013 **E. M. Mugler**, J. L. Patton, M. Goldrick, M. W. Slutzky. Functional categorization and contextual independence of cortical representation of speech. Society for Neuroscience 43rd Annual Meeting San Diego, CA.
- 2012 **E. M. Mugler**, M. W. Slutzky, J. L. Patton. Phonemic differences in cortical representation of overt speech. Society for Neuroscience 42nd Annual Meeting, New Orleans, LA.
- 2011 **E. M. Mugler**, M. W. Slutzky, J. L. Patton. Electromyographic-speech decoding with electrocorticographic correlations: Toward utilization of phoneme production for brain-computer interface. Society for Neuroscience 41st Annual Meeting, Washington, DC.
- 2010 **E. M. Mugler**, P. J. Rousche. Development of a laryngeal surface electromyographic biofeedback system for an efficient neurally-controlled communication interface. Fourth International Brain-Computer Interface Meeting 2010, Pacific Grove, CA.
- 2009 **E. M. Mugler**, C. Ruf, S. Halder, M. Bensch, A. Kübler. The P300-Brain-Computer Interface Browser: Development and Criteria for Evaluation. Berlin Brain-Computer-Interface 2009, Berlin, Germany.
- 2009 **E. M. Mugler**, P. J. Rousche. Speech rehabilitation using laryngeal electromyography feedback. Biomedical Engineering Society Annual Meeting, Pittsburgh, PA, October 7-10.

PUBLICATIONS Continued

- 2003 M. J. Askew, GB. Schneider, K. J. Grecco, J. Hsu, **E. M. Mugler**, D. A. Noe, "Effect of Pharmaceutical Bone Growth Stimulation with Novel Anabolic Peptides: Biomechanical and Bone Density Measurements in a Rat Model," Proceedings of IMECE '03, 2003 ASME International Mechanical Engineering Congress & Exposition, Washington, D.C., November 16-21, 2003, IMECE2003-43044.
- 2003 J. A. Edwards, K. A. Greene, R. S. Davis, M. W. Kovacik, **E. M. Mugler**, D. A. Noe, "Measurement of Maximum Knee Flexion Following Total Knee Arthroplasty," Mid-American Orthopaedic Association conference presentation, April 23-27, 2003.

HONORS, AWARDS AND GRANTS

- 2016-present Ruth L. Kirschstein National Research Service Award (NRSA) Individual Postdoctoral Fellowship (F32) awarded by the NIDCD (National Institutes of Health)
- 2016 Postdoctoral Professional Development Travel Award, Northwestern Office of Postdoctoral Affairs
- 2016 3rd place, Best Poster Award, 4th Annual Northwestern University Postdoctoral Forum Symposium
- 2009–2013 Grant from the NSF's Integrative Graduate Education and Research Traineeship for thesis research - Grant No. 0549489
- 2011 Graduate Student Representative selected to represent the University of Illinois at Chicago - Computational Transportation Science IGERT in the National IGERT Trainee Poster Competition. (Chicago, IL, USA).
- 2010 Winner, Award for Innovation in the Student Poster Competition at the Fourth International BCI Meeting in Pacific Grove, CA.
- 2009 Graduate Student Representative selected to accompany UIC delegates to NSF-funded international intellectual exchange on "Nanoneuronics" at Trinity College Dublin (Dublin, Ireland) and University of Ulster (Ulster, Northern Ireland).
- 2008–2011 Graduate Student Representative of Biomedical Engineering Society (BMES)
Appointed to position by undergraduates; assisted in reviving UIC chapter
- 2008 Conference Travel Scholarship, 4th International Summer School on Emerging Technologies in Biomedicine, "Advanced Methods for the Estimation of Human Brain Activity and Connectivity, Applications to Rehabilitation Engineering," University of Patras (Patras, Greece).
- 2007–2009 Teaching Assistantship, 50% Appointment and Tuition Waiver
- 2006–2007 Fulbright Grant to Germany, Institute of International Education
- 2006 Dean's List, Pratt School of Engineering, Duke University (Durham, NC, USA).
- 2005–2006 Pratt Undergraduate Research Fellowship, Duke University (Durham, NC, USA).
- 2002 Dean's List, Pratt School of Engineering, Duke University (Durham, NC, USA).
- 2002 Emily and Donald Barlow Scholarship (Hudson, OH, USA).
- 2002 Hudson Bicentennial Scholarship (Hudson, OH, USA).

INVITED TALKS

- Jun 21 2016 **Invited Speaker** (Host: Leora Cherney, PhD) "Speech Production in ECoG," Center for Aphasia Research, Rehabilitation Institute of Chicago (Chicago, IL, USA).
- May 26 2016 **Invited Speaker** (Host: Edward Chang, MD, PhD) "Designing Brain-Computer Interface for Speech Communication," Sandler Neurosciences Center at Mission Bay, University of California San Francisco (San Francisco, CA, USA).
- Apr 15 2016 **Invited Speaker** (Host: Jonathan Viventi, PhD) "Brain-Computer Interface for Speech," Biomedical Engineering Department, Duke University (Durham, NC, USA).

INVITED TALKS Continued

- Nov 9 2015* **Invited Speaker** (Host: Ashley Glickman A. VanHaerents, MD) "From Student to Researcher," Info Career Series, Proviso East High School (Maywood, IL, USA).
- Nov 2 2015* **Invited Speaker** (Host: Stephen A. VanHaerents, MD) "Decoding speech production in electrocorticography," *Seizure Focus* Seminar, Northwestern Memorial Hospital (Chicago, IL, USA).
- Mar 4 2014* **Invited Speaker** (Host: Society of Women Engineers) "From Student to Researcher: My journey & lessons I learned along the way," College of Engineering, University of Illinois at Chicago (Chicago, IL, USA).
- Aug 14 2013* **Invited Speaker** (Host: Matthew Goldrick, PhD) "Advances for efficient communication in brain-computer interface," Department of Linguistics, Northwestern University (Evanston, IL, USA).
- Feb 19 2013* **Invited Speaker** (Host: Cara Stepp, PhD) "Advances for Efficient Communication in Brain-Computer Interface," Department of Speech, Language & Hearing Sciences, Sargent College of Health and Rehabilitation Sciences, Boston University (Boston, MA, USA).
- Oct 3 2012* **Keynote Speaker** (Host: Bonnie Williams, PhD) "From Student to Researcher: My Journey as an Integrated BioScientist," STEM Speaker Series at The University of Akron (Akron, OH, USA).
- Oct 4 2012* **Invited Speaker** (Host: Greg Smith, PhD) "Design and Implementation of a P-300-Based Brain-Computer Interface for Controlling an Internet Browser," Integrated Biosciences Colloquia, Biology Department, The University of Akron (Akron, OH, USA).
- Aug 12 2011* **Graduate Student Speaker** (Host: W. Zev Rymer, MD, PhD) "EMG and ECoG Interfaces for Speech and Spoken Communication" Sensory Motor Performance Program Seminar, Rehabilitation Institute of Chicago (Chicago, IL, USA).

TEACHING EXPERIENCE

- Oct 20 2016* **Guest lecturer** (Host: Hananeh Esmailbeigi, PhD) "Neural Prosthetics for Speech," Neural Engineering I, Bioengineering Department, University of Illinois at Chicago (Chicago, IL, USA).
- Apr 30 2014* **Guest lecturer** (Host: Piotr M. Szczurek, PhD) "MATLAB & Scientific Computing in the Real World," Scientific Computing, Mathematics and Computer Science Department, Lewis University (Romeoville, IL, USA).
- Apr 23 2014* **Guest lecturer** (Host: Farnaz Abdollahi, PhD) "Designing Brain-Computer Interface for Medical Applications," Human-Machine Interactions, Science Department, School of Art Institute of Chicago (Chicago, IL, USA).
- Apr 4 2013* **Guest lecturer** (Host: James L. Patton, PhD) "Poor signals and BMI prospects," Biocontrol, Bioengineering Department, University of Illinois at Chicago (Chicago, IL, USA).
- Aug 31 2012* **Guest lecturer** (Host: James L. Patton, PhD) "How to get the most out of the BioE Seminar course", Bioengineering Department, University of Illinois at Chicago (Chicago, IL, USA).
- Feb 16 2010* **Guest lecturer** (Host: John Hetling, PhD) "Fourier Transforms and Frequency Analysis", Bioengineering Department, University of Illinois at Chicago (Chicago, IL, USA).
- Spring 2010* **Teaching Assistant** Bioinstrumentation and Measurements I, Department of Bioengineering, University of Illinois at Chicago (Chicago, IL, USA).
- Spring 2009, Spring 2008* **Teaching Assistant** Introduction to Cell and Tissue Engineering, Department of Bioengineering, University of Illinois at Chicago (Chicago, IL, USA).
- Fall 2009* **Teaching Assistant** Modeling Physiological Data and Systems, Department of Bioengineering, University of Illinois at Chicago (Chicago, IL, USA).

TEACHING EXPERIENCE Continued

Fall 2008, Fall 2007 **Teaching Assistant** Introduction to Bioengineering, Department of Bioengineering, University of Illinois at Chicago (Chicago, IL, USA).

ACADEMIC SERVICE

2016-present **Reviewer** Brain & Language
2014-present **Reviewer** Frontiers in Systems Neuroscience
2014-present **Reviewer** Brain-Computer Interfaces
2013-present **Reviewer** Journal of Neural Engineering
2013-present **Reviewer** Neural Engineering Conference
2012-present **Reviewer** IEEE Engineering in Medicine and Biology Conference
April 2013 **Volunteer judge** Next Generation Innovators Challenge, Midwest Research Competition: Positive Impact, Wheeling High School, Wheeling, Illinois, USA.
August 2012 **Grant consultant** SBIR, Ensis Scientific Consulting

RELEVANT GRADUATE COURSEWORK

Neural Engineering I and II, Biological Signal Analysis, Brain Machine Interfaces: Theory and Practice, Models of the Nervous System, Biorobotics, Neural Networks, Sensory Prostheses, Materials in Bioengineering, Bioinstrumentation and Measurement, Machine Learning, Taking Responsibility for the Responsible Conduct of Research

OTHER TRAINING

Fluent in Matlab (Signal Processing Toolbox, Statistics Toolbox, Graphical User Interfaces), Adobe, BCI2000 and Microsoft Office
 Proficient in Python, LabView, Simulink, JavaScript, Unix, Latex, Flash, Neuron, SketchUp and HTML
 Fluent in German

PROFESSIONAL AFFILIATIONS

Brain Computer Interface Society – member
 Society for the Neurobiology of Language – member
 Society for Neuroscience - member
 Society of Women Engineers - member
 IEEE - member
 U.S. Lacrosse - Coach at high school level, member
 Chicago Acoustic Underground - Singer/Songwriter
 Delta Gamma Fraternity - President of Beta Theta chapter, Duke University, 2005; alumna member

SCHOLARLY INTERESTS

Brain-computer interface design and application; Increasing information transfer rate of brain-computer interfaces; Rehabilitation engineering; Error augmentation and biofeedback; Neuroscience of speech production

LONG-TERM GOAL

Establishing innovative brain-computer interface paradigms for communication to improve the quality of life for individuals with communication disorders as well as the general population