Griffin W. Milsap

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Education

2012–	**Johns Hopkins University** *Ph.D Candidate in Biomedical Engineering* Expected Graduation: Sept. 2018
2008–2012	**B.Sc., Rensselaer Polytechnic University,** *Cum Laude* *Electrical and Computer Systems Engineering* Overall GPA: 3.68/4.0

Professional/Research Experience

2012–	**Ph.D Candidate in Biomedical Engineering** *Johns Hopkins University Whiting School of Engineering* • Collected/Analyzed inpatient/intraoperative electrocorticographic (ECoG) recordings • Co-authored 10+ publications, co-authored a successful NIH R01 grant • Coursework in neuroscience, statistics, machine learning, and instrumentation
2012–2013	BCI2000 Consultant *Pacific Development and Technology, LLC* • Providing advice and programming help with remote deployment of BCI2000 system
2008–2012	**Software and Test Engineer/Undergraduate Researcher** *Wadsworth Center, Schalk Brain Computer Interfacing (BCI) Lab* • Developed, maintained and tested the BCI2000 software, used by hundreds of labs world-wide • Interfaced eyetracking, motionsensing, and signal acquisition hardware with BCI2000 • Implemented experimental paradigms, listed in several publications
2010–2012	**Principle Software Engineer/Partner** *Motalen Inc.* • Developed musical signal processing and procedural game engine architecture • Designed, programmed, and tested one "shipped" game title on Android, "Wave" • Deployed BCI2000 based system for internal BCI research and development
2010–2011	Undergraduate Researcher *Rensselaer Artificial Intelligence and Reasoning Laboratory* • Worked on audio signal-processing algorithms for a creative artifical intelligence agent in collaboration with machine learning scientists and musicians.

Professional Expertise

Research	Worked in collaborative research settings for a decade throughout undergraduate and Ph.D education under Dr. Nathan Crone (`https://cronelab.github.io`) and Dr. Gerwin Schalk (`https://schalklab.org`).
Clinical	Recorded research-quality human electrocorticography in a world-class clinical epilepsy monitoring unit, as well as intraoperatively during awake DBS surgeries while interacting directly with patients and clinicians. Familiar with surgical practices and HIPAA compliant data storage/de-identification procedures.
Computational	Extensive background writing real-time software packages to facilitate signal processing of audio and electrophysiolgy. Familiar with theory and practices for data mining and machine learning. Strong background in parallelization, realtime graphics, profiling, optimization, debugging, and net-code.
Writing	Authored articles, posters, technical communications, and patent applications. Co-authored a successful NIH R01 grant application, and familiar with IRB practices, grantsmanship, and peer-review procedures.
Engineering	Developed high performance real-time systems for neural signal processing, graphics, network-communication, and interactions with the outside-world via connected hardware and embedded systems. Strong background in software engineering, system design, computer architecture, networking, and reverse engineering.
Neuroscience	Made contributions to the state-of-the-art in cortical speech representations. Familiar with classical speech/language models, and ventral-stream image identification theories.

Technical Expertise

C/C++	13+ Years of Experience, Expert Level
Python	6+ Years of Experience, Expert Level
Java(Android)	4+ Years of Experience, Strong Background
Javascript	2+ Years of Experience, Full Stack
BCI2000	10+ Years of Experience, Active Contributor/Developer
OpenGL	12+ Years of Experience, Strong Background in Realtime Graphics
Matlab	Good Working Knowledge
Linux	6+ years sysadmin experience
Packages	Numpy, Scikit-Learn, Matplotlib, Qt, three.js, d3.js
Software	Jupyter, Unity, BCI2000, Chrome Developer Console, Visual Studio, Node.js, LaTeX, vim, git, svn, Blender, GIMP, Photoshop, Renoise, MS Office, Wireshark
Embedded	Arduino, Raspberry Pi, BeagleBone, TI MSP430, OpenBCI
Hardware	Written Realtime Software Interfaces with: Oculus/Vive, Tobii Eyetrackers, Nintendo Wii Remote, Clinical and Research EEG amplifiers, and audio interfaces.

Publications

Selected Articles

2018   Griffin Milsap, Max Collard, Chris Coogan, and Nathan Crone. BCI2000Web and WebFM: Browser-based Tools for Brain Computer Interfaces and Functional Brain Mapping. *IEEE Journal of Transactions on Biomedical Engineering*, (Feb 2018, Under Review)

Kiyohide Usami, Griffin W Milsap, Anna Korzeniewska, Maxwell J Collard, Yujing Wang, Ronald P Lesser, William S Anderson, and Nathan E Crone. Cortical Responses to Input From Distant Areas are Modulated by Local Spontaneous Alpha/Beta Oscillations. *Cerebral Cortex*, 2018

2017   Kyle Rupp, Matthew Roos, Griffin Milsap, Carlos Caceres, Christopher Ratto, Mark Chevillet, Nathan E Crone, and Michael Wolmetz. Semantic attributes are encoded in human electrocorticographic signals during visual object recognition. *NeuroImage*, 148:318–329, 2017

Carlos A Caceres, Matthew J Roos, Kyle M Rupp, Griffin Milsap, Nathan E Crone, Michael E Wolmetz, and Christopher R Ratto. Feature Selection Methods for Zero-Shot Learning of Neural Activity. *Frontiers in neuroinformatics*, 11:41, 2017

Ravindra Arya, J Adam Wilson, Hisako Fujiwara, Leonid Rozhkov, James L Leach, Anna W Byars, Hansel M Greiner, Jennifer Vannest, Jason Buroker, Griffin Milsap, and others. Presurgical language localization with visual naming associated ECoG high-gamma modulation in pediatric drug-resistant epilepsy. *Epilepsia*, 58(4):663–673, 2017

2016   Maxwell J Collard, Matthew S Fifer, Heather L Benz, David P McMullen, Yujing Wang, Griffin W Milsap, Anna Korzeniewska, and Nathan E Crone. Cortical subnetwork dynamics during human language tasks. *Neuroimage*, 135:261–272, 2016

2015   Vasileios G. Kanas, Iosif Mporas, Griffin W. Milsap, Kyriakos N. Sgarbas, Nathan E. Crone, and Anastasios Bezerianos. Time-Varying Parametric Modeling of ECoG for Syllable Decoding. In *Brain Informatics and Health*, number 9250 in Lecture Notes in Computer Science, pages 222–231. Springer International Publishing

Miaomiao Guo, Guizhi Xu, Lei Wang, Matthew Masters, Griffin Milsap, Nitish Thakor, and Alcimar Barbosa Soares. The anterior contralateral response improves performance in a single trial auditory oddball BMI. *Biomedical Signal Processing and Control*, 22:74–84, September 2015

2014   Nitish V Thakor, Matthew S Fifer, Guy Hotson, Heather L Benz, Geoffrey I Newman, Griffin W Milsap, and Nathan E Crone. Neuroprosthetic limb control with electrocorticography: approaches and challenges. In *Engineering in Medicine and Biology Society (EMBC), 2014 36th Annual International Conference of the IEEE*, pages 5212–5215. IEEE, 2014

2013   Griffin Milsap, Matthew Fifer, Nathan Crone, and Nitish Thakor. Listening to the music of the brain: Live analysis of ECoG recordings using digital audio workstation software. In *2013 6th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 682–685, 2013

M.S. Fifer, G.W. Milsap, E. Greenwald, D.P. McMullen, W.S. Anderson, N.V. Thakor, N.E. Crone, and R. Vinjamuri. Design and implementation of a human ECoG simulator for testing brain-machine interfaces. In *2013 6th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 1311–1314, November 2013

2011   Selmer Bringsjord, Colin Kuebler, Joshua Taylor, Griffin Milsap, Sean Austin, Jonas Braasch, Pauline Oliveros, Doug Van Nort, Adam Rosenkrantz, and Kasia Hayden. Creativity and conducting: handle in the CAIRA project. In *Proceedings of the 8th ACM conference on Creativity and cognition*, pages 319–320, New York, NY, USA, 2011. ACM

Posters

2017   P. Kudela, R. Oh, G. Milsap, N. E. Crone, and W. S. Anderson. A study of single-pulse cortical stimulation effects across cortical micro-domains. In *Society for Neuroscience Abstract*, page 291.03/G4, November 2017. Session: Session 291 - Signal Propagation; Session Type: Poster

       G. W. Milsap, M. J. Collard, K. Rupp, M. J. Roos, C. Caceres, C. Ratto, M. Wolmetz, and N. E. Crone. Intrinsic neural spaces from human electrocorticography. In *Society for Neuroscience Abstract*, page 589.12/GG7, November 2017. Session: Session 589 - Representation of Objects and Scenes; Session Type: Poster

2014   M.J. Collard, M.S. Fifer, Y. Wang, H.L. Benz, G.W. Milsap, A Korzeniewska, N.V. Thakor, and N.E. Crone. Identifying functional subnetworks in human language tasks using electrocorticography, November 2014

       G. Hotson, G. Milsap, D.P. McMullen, B.A. Wester, W.S. Anderson, J.W. Krakauer, N.E. Crone, and N. V. Thakor. Electrocorticographic decoding of high-level action goals following verbal instruction, November 2014

       A Korzeniewska, S. Dalvin, G. Milsap, A. Flinker, and N.E. Crone. The impact of lexical retrieval on high-gamma effective connectivity in human language networks, November 2014

2013   Griffin Milsap, Matt Fifer, Nathan Crone, and Nitish Thakor. Listening to the Music of the Brain: Live Analysis of ECoG Recordings using Digital Audio Workstation Software, November 2013

       P. Brunner, A. Gunduz, W.G. Coon, G. Milsap, A. L. Ritaccio, and G. Schalk. Toward real-time identification of selective auditory attention in a cocktail party using electrocorticographic signals (ECoG) in humans, November 2013

       M.S. Fifer, G.W. Milsap, E. Greenwald, D.P. McMullen, W.S. Anderson, N.V. Thakor, N.E. Crone, and R. Vinjamuri. Design and implementation of a human ECoG simulator for testing brain-machine interfaces. In *2013 6th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 1311–1314, November 2013

2012   Griffin Milsap, Beth Werbaneth, Colin Neville, Catherine Mickey, Justin Renga, and Mukkai Krishnamoorthy. Reroot: A novel method of using mobile devices as human computer interfaces. Third Annual Undergraduate Research Symposium, Rensselaer Polytechnic Institute, 2012

2010   Griffin Milsap, Gerwin Schalk, and Lester Gerhardt. Brain computer interfacing software development. First Annual Undergraduate Research Symposium, Rensselaer Polytechnic Institute, 2010

Invited Talks and Teaching

2017   Griffin Milsap and Peter Brunner. National Center for Adaptive Neurotechnologies Summer Course 2017: BCI2000 Fundamentals and Interfacing, July 2017

2016   Griffin Milsap and Peter Brunner. National Center for Adaptive Neurotechnologies Summer Course 2016: BCI2000 Fundamentals and Interfacing, July 2016

2013   Griffin Milsap, Nancy Hanrahan, Don Yanaitis, and Law Blank. Leading Edge Initiatives in Games and Health, October 2013

Notable Open Source Contributions

BCI2000	A notable brain computer interface research and development software suite used by hundreds of labs worldwide `http://www.bci2000.org/BCI2000/Home.html`
BCI2000Web	Connector between BCI2000 and Javascript via Node.js and high performance custom websocket protocols. Allows developers to communicate to/from BCI2000 using modern web browsers. `http://www.github.com/cronelab/bci2000web/`
WebFM	Co-Developed realtime bed-side functional mapping software built on top of BCI2000 and BCI2000Web supporting high channel-count clinical recordings; currently deployed at three medical institutions. `http://www.github.com/cronelab/webfm/`
btoven	An open-source BSD licensed real-time beat detection and musical analysis toolbox which runs on desktop and mobile platforms, developed in conjunction with Motalen. `https://github.com/griffinmilsap/btoven`
Reroot	A free and open Android application which allows mobile devices to act as human input devices for PC, Mac, and Linux computers. `https://github.com/griffinmilsap/reroot`
Hitest	An attempt at writing a high-performance, multi-threaded, cross platform OpenGL 3.0 based game engine with dynamically loaded run-time C++ code scriptability. `https://github.com/griffinmilsap/hitest`
AndARShaders	The freely available code base and modifications to AndAR which adds realtime reflections and refractions using screenspace information about the scene. `http://code.google.com/p/andarshaders/`

Discography and Recordings

2017	sinap.tc (credited as Stoßen). Reprise. On Glorp Records Summer 2017 Compilation, Glorp Records, 19x Digital Audio, `https://glorprecords.bandcamp.com/album/glorp-records-summer-2017-compilation`, July 7 2017
	sinap.tc. blackbox. On GENDER ENDER, Ambrasive Records, 32x Digital Audio, `https://ambrasivemusic.bandcamp.com/album/gender-ender`, May 1 2017
2016	sinap.tc. *Untitled EP*. Self Released, Cassette, `http://sinaptc.bandcamp.com/`, Aug 14 2016
	sinap.tc. Hello. On Exciting New Developments in ADHD, Ambrasive Records, 1X CDr, `https://ambrasivemusic.bandcamp.com/album/exciting-new-developments-in-adhd`, May 1 2016
2012	Sin(ap).tc. Dynamic(sta).tc (demo). Self Released, 17x Digital Audio, `http://sinaptc.bandcamp.com/`, June 10 2012
2011	Sin(ap).tc as malloc. Bang (sub)lime (malloc remix). On BMC:Remixed by Breakmaster Cylinder, 20x Digital Audio, `http://www.discogs.com/Breakmaster-Cylinder-BMCRemixed/release/3303307`, December 25 2011