

Griffin W. Milsap

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Summer 2019

Education

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| 2012–2018 | Johns Hopkins University
<i>Ph.D in Biomedical Engineering</i>
Research in speech-related brain-machine-interface with Dr. Nathan Crone |
| 2008–2012 | B.Sc., Rensselaer Polytechnic University, <i>Cum Laude</i>
<i>Electrical and Computer Systems Engineering</i>
Overall GPA: 3.68/4.0 |

Professional/Research Experience

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| 2018– | Senior Professional Neuroscientist/Biomedical Engineer
<i>Johns Hopkins University Applied Physics Laboratory</i> <ul style="list-style-type: none">• Developing and characterizing state-of-the-art non-invasive neuroimaging technology• Applying artificial intelligence and machine learning techniques to electrophysiology• Mentoring students as part of the Engineering for Professionals distance learning program |
| 2012–2018 | Ph.D Research in Biomedical Engineering
<i>Johns Hopkins University Whiting School of Engineering</i> <ul style="list-style-type: none">• 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
<i>Pacific Development and Technology, LLC</i> <ul style="list-style-type: none">• Providing advice and programming help with remote deployment of BCI2000 system |
| 2008–2012 | Software and Test Engineer/Undergraduate Researcher
<i>Wadsworth Center, Schalk Brain Computer Interfacing (BCI) Lab</i> <ul style="list-style-type: none">• 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
<i>Motalen Inc.</i> <ul style="list-style-type: none">• 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
<i>Rensselaer Artificial Intelligence and Reasoning Laboratory</i> <ul style="list-style-type: none">• Worked on audio signal-processing algorithms for a creative artificial 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 electrophysiology. 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.
Machine Learning	Application and training of classical ML and modern deep neural network architectures on neural data.

Awards

2018	Invention of the Year <i>Johns Hopkins University Applied Physics Lab REDD Achievement Awards</i> Coherent, Optical System for Noninvasive, Real-Time Imaging of Neural Tissue and Other Biological Systems
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Technical Expertise

C/C++	Expert
Python	Expert
Linux	Expert
Javascript	Strong Background, Full Stack
Java(Android)	Strong Background
BCI2000	Active Contributor/Developer
OpenGL	Strong Background in Realtime Graphics
Packages	Numpy, Pytorch, Scikit-Learn, Matplotlib, Qt, three.js, d3.js
Software	Jupyter, Docker, Gigantum, Unity, BCI2000, Chrome Developer Console, Visual Studio/VSCode, Node.js, L ^A T _E X, 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.
Matlab	Working Knowledge

Publications

Selected Articles

- 2019 | **Milsap, Griffin**, Maxwell Collard, Christopher Coogan, Qinwan Rabbani, Yujing Wang, and Nathan E. Crone. Keyword Spotting Using Human Electrographic Recordings. *Frontiers in Neuroscience*, 13, 2019
- Milsap, Griffin**, Max Collard, Christopher Coogan, and Nathan E. Crone. BCI2000web and WebFM: Browser-Based Tools for Brain Computer Interfaces and Functional Brain Mapping. *Frontiers in Neuroscience*, 12, 2019
- Qinwan Rabbani, **Milsap, Griffin**, and Nathan E. Crone. The Potential for a Speech BrainComputer Interface Using Chronic Electrographic. *Neurotherapeutics*, 16(1):144–165, 2019
- 2018 | Kiyohide Usami, **Milsap, Griffin W**, 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, **Milsap, Griffin**, Carlos Caceres, Christopher Ratto, Mark Chevillet, Nathan E Crone, and Michael Wolmetz. Semantic attributes are encoded in human electrographic signals during visual object recognition. *NeuroImage*, 148:318–329, 2017
- Carlos A Caceres, Matthew J Roos, Kyle M Rupp, **Milsap, Griffin**, 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, **Milsap, Griffin**, 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, **Milsap, Griffin W**, Anna Korzeniewska, and Nathan E Crone. Cortical subnetwork dynamics during human language tasks. *Neuroimage*, 135:261–272, 2016
- 2015 | Vasileios G. Kanas, Iosif Mporas, **Milsap, Griffin W.**, 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, **Milsap, Griffin**, 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, **Milsap, Griffin W**, and Nathan E Crone. Neuroprosthetic limb control with electrographic: 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 | **Milsap, Griffin**, 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, **Milsap, G.W.**, 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, **Milsap, Griffin**, 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, **Milsap, G.**, 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
- Milsap, G. W.**, 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, **Milsap, G.W.**, A Korzeniewska, N.V. Thakor, and N.E. Crone. Identifying functional subnetworks in human language tasks using electrocorticography, November 2014
- G. Hotson, **Milsap, G.**, 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, **Milsap, G.**, A. Flinker, and N.E. Crone. The impact of lexical retrieval on high-gamma effective connectivity in human language networks, November 2014
- 2013 **Milsap, Griffin**, 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, **Milsap, G.**, 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, **Milsap, G.W.**, 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 **Milsap, Griffin**, 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 **Milsap, Griffin**, Gerwin Schalk, and Lester Gerhardt. Brain computer interfacing software development. First Annual Undergraduate Research Symposium, Rensselaer Polytechnic Institute, 2010

Invited Talks and Teaching

- 2017 **Milsap, Griffin** and Peter Brunner. National Center for Adaptive Neurotechnologies Summer Course 2017: BCI2000 Fundamentals and Interfacing, July 2017
- 2016 **Milsap, Griffin** and Peter Brunner. National Center for Adaptive Neurotechnologies Summer Course 2016: BCI2000 Fundamentals and Interfacing, July 2016
- 2013 **Milsap, Griffin**, 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/>

Discography and Recordings

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| 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. <i>Untitled EP</i> . 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 |