Curriculum Vitae – June 2017

# Jonathan A. Michaels

Neural Prosthetic Systems Laboratory
Clark Center
318 Campus Drive
Stanford, CA 94305

1-650-451-2363
JMichaels@stanford.edu
http://JMichaels.me
@JonAMichaels

***Education:***

Dr. rer. nat. Systems Neuroscience (summa cum laude), GGNB, Georg-August-Universität Göttingen (2017). Dissertation: *"Towards population coding principles in the primate premotor and parietal grasping network"*

Bachelor of Science (Honours), Queen's University (2011), Kingston, Canada. Dissertation: *"Influence of water maze learning on low-frequency-induced synaptic potentiation in the rat hippocampus"*

***Positions:***

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| 5/2017 – Present | Postdoctoral Fellow, Laboratory of Krishna V Shenoy, Stanford University, California, United States. |
| 5/2017 – Present | Research Associate, Howard Hughes Medical Institute, Stanford University, California, United States. |
| 1/2017 – 5/2017 | Transitional Postdoctoral Fellow, Neurobiology Lab of Hansjörg Scherberger, German Primate Center, Göttingen, Germany. |
| 9/2011 – 1/2017 | Graduate Student, Neurobiology Lab of Hansjörg Scherberger, German Primate Center, Göttingen, Germany. |
| 9/2010 – 5/2011 | Bachelor Student, Neuroplasticity Lab of Hans C. Dringenberg, Queen's University, Kingston, Canada. |
| 5/2009 – 8/2011 | Undergraduate Researcher, Integrative Motor Behaviour Lab of Stephen H. Scott, Queen's University, Kingston, Canada. |
| 9/2008 – 5/2009 | Research Assistant, Language and Cognition Lab of Stanka A. Fitneva, Queen's University, Kingston, Canada. |

***Research:***

Doctoral Research: Neural population dynamics of reaching and grasping movements in primary motor, premotor, and parietal cortex of monkeys using single-electrode and multi-electrode array electrophysiology. Recurrent neural network modelling and training. Dimensionality reduction methods.

Skills: Animal care, training, and surgery (monkey and rat). Neural data acquisition and processing (experimental design, recording, spike sorting, etc.). EMG recording. Kinematic tracking (video-based and magnetic-based) and musculoskeletal modelling.

***Awards and Honours:***

Sloan-Swartz Travel Scholarship (2016).

Neural Control of Movement Travel Scholarship (2016).

Doctoral Thesis awarded "summa cum laude" (2016).

Dean's Honour List, Queen's University, Kingston, Canada (2009 – 2011).

***Peer-reviewed publications:***

**Michaels JA**, Dann B, Scherberger H (2016). Neural population dynamics during reaching are better explained by a dynamical system than representational tuning. *PLOS Computational Biology*, *12*(11), e1005175. doi:10.1371/journal.pcbi.1005175.

**Michaels JA**, Scherberger H (2016). hebbRNN: A reward-modulated Hebbian learning rule for recurrent neural networks. *The Journal of Open Source Software*. doi:10.21105/joss.00060.

Dann B, **Michaels JA**, Schaffelhofer S, Scherberger H (2016). Uniting functional network topology and oscillations in the fronto-parietal single unit network of behaving primates. *eLife*. doi:10.7554/eLife.15719.

**Michaels JA**, Dann B, Intveld RW, Scherberger H (2015). Predicting reaction time from the neural state space of the premotor and parietal grasping network. *Journal of Neuroscience*, *35*(32), 11415–11432. doi:10.1523/JNEUROSCI.1714-15.2015.

Yang L, **Michaels JA**, Pruszynski JA, Scott SH (2011). Rapid motor responses quickly integrate visuospatial task constraints. *Experimental Brain Research, 211*(2): 231-242. doi:10.1007/s00221-011-2674-3.

***In-progress publications:***

**Michaels JA***, Dann B*, Intveld RW, Scherberger H (under review). Probing the continuum of immediate to withheld grasping movements in the macaque fronto-parietal network.

**Michaels JA**, Scherberger H (in prep). Population coding of grasp and laterality-related information in the macaque fronto-parietal network.

**Michaels JA**, Schaffelhofer S, Agudelo-Toro A, Scherberger H (in prep). A modular neural network model of the primate grasping circuit.

Dann B*, **Michaels JA***, Scherberger H (in prep). Three information subspaces explain the category-free population dynamics in the fronto-parietal network.

Agudelo-Toro A, **Michaels JA**, Sheng W, Fillipow A, Scherberger H (in prep). Continuous decoding of hand grips with a high dimensional brain computer interface.

Intveld RW, Dann B, **Michaels JA**, Scherberger H (in prep). Strong coding of grasp force planning and execution in macaque areas F5, M1, and AIP.

***Conference Proceedings:***

Dann B, **Michaels JA**, Scherberger H (2016). Separable decoding of cue, intention, and movement information from the fronto-parietal grasping-network. *Proceedings of the Sixth International Brain-Computer Interface Meeting: BCI Past, Present, and Future,* 218. doi:10.3217/978-3-85125-467-9.

***Talks:***

A recurrent neural network model of the visuomotor grasp generation circuit (nanosymposium). *45th Annual Meeting of the Society for Neuroscience*. San Diego, November 16th, 2016.

Continuous decoding of hand grips with a high dimensional brain computer interface (nanosymposium, presenting in place of Andres Agudelo-Toro). *45th Annual Meeting of the Society for Neuroscience*. San Diego, November 16th, 2016.

A recurrent neural network model of the visuomotor grasp generation circuit. *Sloan-Swartz Centers for Theoretical Neurobiology Annual Meeting*. Pasadena, August 3rd, 2016. Travel grant awarded.

Probing and modeling the continuum of immediate to withheld grasping movements in the macaque fronto-parietal network (invited talk). *Neural-Prosthetic Systems Laboratory*. Stanford, May 24th, 2016.

Probing the continuum of immediate to withheld grasping movements in the macaque fronto-parietal network. *26th Neural Control of Movement Conference*. Montego Bay, Jamaica. April 26th, 2016.

Grasping with and without motor preparation (nanosymposium). *45th Annual Meeting of the Society for Neuroscience*. Chicago, October 20th, 2015. Travel grant awarded.

Laterality of grasp-related activity in macaque areas AIP and F5. *8th Primate Neurobiology Meeting*. Göttingen, March 18th, 2015.

Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *24th Neural Control of Movement Conference*. Amsterdam, April 24th, 2014.

***Abstracts:***

Michaels JA, Schaffelhofer S, Agudelo-Toro A, Scherberger H (2017). A modular neural network model of the primate grasping circuit. *27th Neural Control of Movement Conference*. Dublin, Ireland.

Agudelo-Toro A, Michaels JA, Sheng W, Fillipow A, Scherberger H (2017). Continuous decoding of hand grips with a high dimensional brain computer interface. *10th Primate Neurobiology Meeting*. Göttingen, Germany.

Dann B, Michaels JA, Scherberger H (2016). Disentangling cue, intention, and movement information from the fronto-parietal network. *9th Primate Neurobiology Meeting*. Tübingen, Germany.

Michaels JA, Dann B, Scherberger H (2016). Emergent properties in a dynamical model of movement generation. *9th Primate Neurobiology Meeting*. Tübingen, Germany.

Dann B, Michaels JA, Schaffelhofer S, Scherberger H (2015). The single unit network for hand grasping has a small-world and rich-club topology with oscillators as hubs. *Neurizons*. Göttingen, Germany.

Michaels JA, Scherberger H. Laterality of grasp-related activity in macaque areas AIP and F5 (2015). *11th Göttingen Meeting of the German Neuroscience Society*. Göttingen, Germany.

Michaels JA, Scherberger H. Laterality of grasp-related activity in macaque areas AIP and F5 (2014). *44th Annual Meeting of the Society for Neuroscience*. Washington, DC, USA. Travel grant awarded.

Dann B, Michaels JA, Schaffelhofer S, Scherberger H (2014). Role of beta and low frequency oscillations in functional network connectivity of single units in the primate motor system. *10th Bernstein Conference*. Göttingen, Germany.

Michaels JA, Wellner B, Scherberger H (2014). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *7th Primate Neurobiology Meeting*. Tübingen, Germany.

Michaels JA, Wellner B, Scherberger H (2013). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *43rd Annual Meeting of the Society for Neuroscience.* San Diego, CA, USA. Travel grant awarded.

Michaels JA, Wellner B, Scherberger H (2013). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *EPFL Life Science Symposium (LSS)*. Lausanne, Switzerland.

Wellner B, Michaels JA, Wellner AW, Scherberger H (2013). Single trial neuronal correlates of decision-making for hand grasping in macaque area F5 and AIP. *10th Göttingen Meeting of the German Neuroscience Society*. Göttingen, Germany.

***Teaching experience, skills, and professional membership:***

Supervision:

- Master Thesis of Luis Ángel Pardo Sánchez, *Title: A recurrent neural network model of bimanual coordination and interference* (2017).
- Bachelor Thesis of Roman Eppinger*, Title: State space analysis and visualization of neuronal data in a delayed grasping task* (2015).

Teaching assistant, Motor Systems Lecture & Seminar of Hansjörg Scherberger (2013). University of Göttingen, Germany.

Programming: Matlab, Labview, Simulink, Java, Haskell, Prolog, html/css, Python, C/C++

Software: Plexon Spike Sorting Tool, Wave_Clus, SPSS (IBM), Adobe Photoshop/Illustrator, Microsoft Office

Journals reviewed for: *J Neuroscience*.

Member of: Bernstein Association for Computational Neuroscience (2014-2016), Society for Neural Control of Movement (2014-), Society for Neuroscience (2013-).

Languages: English (Native), German (Fluent), Hebrew (Advanced).

***Workshop participation:***

FieldTrip Workshop (2014). Göttingen, Germany.

Tübingen International Summer School for Neuroenhancement (2013). Cloister Heiligkreuztal, Germany

NWG Practical Course – Transcranial Magnetic and Electrical Stimulation (2013). Göttingen, Germany.

BBCI Summer School: Brain-Computer Interfacing and Neurotechnology (2012). Berlin, Germany.

Nerve Cell Culture and Patch-Clamp Recording (2012). Göttingen, Germany.

Bernstein R&D Workshop Cellular Electrophysiology (2012). Heidelberg, Germany.

***Rejections and failures:***

Academic:

Allison J. Doupe Fellowship (2017). Not awarded.
Simons Collaboration on the Global Brain Postdoctoral Fellowship (2017). Not awarded.
DPZ Sponsorship Award (2017). Not awarded.
GGNB Excellence Stipend (2011). Finalist, not awarded.
NSERC Undergraduate Research Award (2010). Not awarded.
Applied to Neuroscience PhD programs at eight North American institutions. No acceptances.