

Curriculum Vitae – January 2019

Jonathan A. Michaels

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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:

5/2017 – Present Postdoctoral Fellow, Laboratory of Krishna V Shenoy, Howard Hughes Medical Institute at 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 modeling.

Awards, Honours, and Funding:

Human Frontier Science Program Long-Term Fellow (2018 – 2019).
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:

Intveld RW, Dann B, **Michaels JA**, Scherberger H (2018). Neural coding of intended and executed grasp force in macaque areas AIP, F5, and M1. *Scientific Reports*, 8(17985). doi:10.1038/s41598-018-35488-z.

Michaels JA*, Dann B*, Intveld RW, Scherberger H (2018). Neural Dynamics of Variable Grasp-Movement Preparation in the Macaque Frontoparietal Network. *Journal of Neuroscience*, 38(25), 5759-5773. doi:10.1523/JNEUROSCI.2557-17.2018.

Michaels JA, Scherberger H (2018). Population coding of grasp and laterality-related information in the macaque fronto-parietal network. *Scientific Reports*, 8(1710). doi:10.1038/s41598-018-20051-7.

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, Schaffelhofer S, Agudelo-Toro A, Scherberger H (in prep). A modular neural network model of visuomotor processing resembles the fronto-parietal grasping circuit.

Dann B*, **Michaels JA***, Scherberger H (in prep). Information subspaces capture decision related population dynamics of the fronto-parietal grasping network.

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:

- WHAT'S IN THE BOX? - Interpretable neural nets for movement control (Workshop talk). COSYNE 2018. Breckenridge, CO, March 6th, 2018.
- Performance-driven recurrent neural networks for complex motor control (Workshop talk). COSYNE 2018. Breckenridge, CO, March 5th, 2018.
- A modular neural network model of the primate grasping circuit (nanosymposium). 46th Annual Meeting of the Society for Neuroscience. Washington, November 14th, 2017.
- 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:

- Willett F, Vyas S, Michaels JA, Henderson J, Shenoy KV (2019). Neural network models for closed-loop musculoskeletal arm control. COSYNE 2019. Lisbon, Portugal.
- Michaels JA, Schaffelhofer S, Agudelo-Toro A, Scherberger H (2018). A modular neural network model of the primate grasping circuit. COSYNE 2018. Denver, CO, USA.
- 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, Python, C/C++, Labview, Simulink, Java, Haskell, Prolog, html/css

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

Reviewed for: J Neuroscience, PLOS Comp Biol, NeurlPS.

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), French (Basic).

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.