

JOSEPH GERARD MAKIN

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EMPLOYMENT

Purdue University, School of Electrical and Computer Engineering Assistant Professor	2020–
UCSF, Center for Integrative Neuroscience Research Scientist (advisor: Edward Chang)	2017–2020
Postdoctoral Researcher (advisor: Philip Sabes)	2010–2017

EDUCATION

University of California, Berkeley Ph.D., Electrical Engineering and Computer Sciences (advisors: Srin Narayanan and Jerry Feldman)	2003–2008
Swarthmore College B.A., Philosophy and B.S., Engineering	1999–2003

PROFESSIONAL AND HONORARY SOCIETY MEMBERSHIPS

Society for Neuroscience	2010
Tau Beta Pi (top 1/5 of engineering class)	2003–

HONORS

Finalist, BCI Award	2020
Institutional candidate, Rhodes Scholarship, Swarthmore College	2003

FUNDING

Brain Research Foundation Seed Grant (\$80,000) PI; JGM responsible for \$80,000.	2021–2023
Ralph W. and Grace M. Showalter Research Trust Award (\$75,000) Co-PI (with M.C. Dadarlat [BME], PI); JGM responsible for \$0.	2020–2021
Swartz Foundation for Theoretical Neuroscience, Fellowship (\$85,000) Fellow (P.N. Sabes, PI); J.G. Makin responsible for \$50,000	2016–2017

PROFESSIONAL ACTIVITIES

COSYNE

Workshop co-organizer (with Philip Sabes) “Multisensory Processing in the Cortex.” Mar. 2014

Center for Integrative Neuroscience, UCSF

Organizer, Theory Journal Club 2013–2015

Ad hoc reviewer for *Nature Neuroscience*, *Neuron*, *Neural Computation*, *Journal of Neural Engineering*, *Frontiers in Human Neuroscience*, *PLoS One*, *IJNMBE*

STUDENTS CURRENTLY BEING SUPERVISED

Bryan Jimenez	PhD	exp. 2026
Bilal Ahmed	PhD	exp. 2026

NON-STUDENTS CURRENTLY BEING SUPERVISED

Ramya Banda research assistant (with M.C. Dadarlat, BME)

COURSES DEVELOPED

ECE69500 (Purdue)	Inference & Learning in Generative Models	Spring 2021
NS219 (UCSF)	Computational Neuroscience	Spring 2013

COURSES “IN CHARGE OF”

NS300 (UCSF)	Inference & Digital Signal Processing	Spring 2021
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SERIAL JOURNAL PAPERS

- [1] D.A. Moses, S.L. Metzger, J.R. Liu, G.K. Anumanchipalli, J.G. Makin, P.F. Sun, J. Chartier, M.E. Dougherty, P.M. Liu, G.M. Abrams, A. Tu-Chan, K. Ganguly, and E.F. Chang. Neuro-prosthesis for decoding speech in a paralyzed person with anarthria. *New England Journal of Medicine*, 385:217–227, 2021.
- [2] J.G. Makin, D. A. Moses, and E. F. Chang. Machine translation of cortical activity to text with an encoder-decoder framework. *Nature Neuroscience*, 23:575–582, 2020. **Top 0.02% of all papers ever tracked by Altmetric.**
- [3] D.A. Moses, M.K. Leonard, J.G. Makin, and E.F. Chang. Real-time decoding of question-and-answer speech dialogue using human cortical activity. *Nature Comm.*, 10(3096), July 2019.
- [4] J.G. Makin, J.E. O’Doherty, M.M.B. Cardoso, and P.N. Sabes. Superior arm-movement decoding with a new, unsupervised-learning algorithm. *J. Neural Engin.*, 15(2), Jan. 2018.
- [5] J.G. Makin*, B.K. Dichter*, and P.N. Sabes. Learning to estimate dynamical state with probabilistic population codes. *PLoS Computational Biology*, 11(11), 2015. (*equal contribution).
- [6] J.G. Makin and S. Narayanan. A hybrid-system model of the coagulation cascade: Simulation, sensitivity, and validation. *J. Bioinform. Comput. Biol.*, 11(5), Oct. 2013.
- [7] J.G. Makin*, M.R. Fellows*, and P.N. Sabes. Learning multisensory integration and coordinate transformation via density estimation. *PLoS Computational Biology*, 9(4):1–17, April 2013. (*equal contribution).

- [8] J.G. Makin and S. Narayanan. Real-time control of human coagulation. *IET Control Theory and Applications*, 6(17):2630–2643, Nov. 2012.

CONFERENCE PAPERS

- [1] J.G. Makin and P.N. Sabes. Sensory integration and density estimation. In Z. Ghahramani, M. Welling, C. Cortes, N.D. Lawrence, and K.Q. Weinberger, editors, *Advances in Neural Information Processing Systems (NIPS) 27: Proceedings of the 2014 Conference*, 2014.
- [2] J.G. Makin and S. Narayanan. A hybrid-system model of the coagulation cascade. In F. Saheed and B. DasGupta, editors, *Proceedings of the 5th International Conference on Bioinformatics and Computational Biology (BICOB-2013)*, pages 205–212, Honolulu, HA, Mar 2013. **Best Paper Award.**
- [3] J.G. Makin and L.A. Molter. Generalized switching, splitting, and multiplexing operations using circular arrays of coupled waveguides. In *Optical Fiber Communications (OFC) Conference*, volume 1, pages 47–50, Atlanta, GA, March 2003.

SELECTED CONFERENCE PRESENTATIONS

- [1] J.G. Makin, D.A. Moses, and E.F. Chang. Machine translation of cortical activity to text with an encoder-decoder framework. **Poster**, Center for Neural Engineering and Prosthetics, U.C. Berkeley, December 2019.
- [2] J.G. Makin and E.F. Chang. End-to-end decoding of speech from human cortex. **Poster**, Society for Neuroscience, November 2018.
- [3] J.G. Makin, J.E. O’Doherty, and P.N. Sabes. Superior limb-movement decoding from cortex with a new, unsupervised-learning algorithm. **Poster**, COSYNE, February 2017.
- [4] J.G. Makin, J.E. O’Doherty, and P.N. Sabes. Decoding limb movement from BMIs with a new, unsupervised-learning algorithm. **Poster**, Swartz Meeting (CalTech), August 2016.
- [5] J.G. Makin, B.K. Dichter, and P.N. Sabes. Predictions for parietal cortex from a neural-network model of state estimation. **Poster**, Swartz Meeting (Janelia), August 2015.
- [6] J.G. Makin. Computational models of posterior parietal cortex and their application to BMIs. **Talk**, Center for Neural Engineering and Prosthetics, U.C. Berkeley, December 2014.
- [7] J.G. Makin and P.N. Sabes. Computational models of posterior parietal cortex. **Poster**, Society for Neuroscience, November 2014.
- [8] J.G. Makin and P.N. Sabes. Models of computation in posterior parietal cortex. **Talk**, Sloan Swartz meeting (U.W.), June 2014.
- [9] J.G. Makin and P.N. Sabes. What is neural “integration”? **Talk**, COSYNE Workshops, March 2014.
- [10] J.G. Makin, Dichter B.K. and P.N. Sabes. Learning to track moving stimuli with population codes. **Talk (< 6.4% of submissions)**, COSYNE, February 2014.
- [11] Dichter B.K. J.G. Makin, and P.N. Sabes. Learning to perform state estimation with populations of model neurons. **Poster**, Society for Neuroscience, November 2013.
- [12] J.G. Makin, Chaisanguanthum K.S. and P.N. Sabes. Models of intersensory recalibration. **Poster**, Society for Neuroscience, October 2012.
- [13] M.R. Fellows, J.G. Makin, and P.N. Sabes. Multisensory integration via density estimation. **Poster**, COSYNE, February 2011.

SELECTED OTHER WORKS

- [1] J.G. Makin. *Statistical Learning Theory in Computational Neuroscience*. Unpublished textbook; available at <https://engineering.purdue.edu/MakinLab/SLTCN>, 2021.
- [2] J.E. O’Doherty, M.M.B. Cardoso, J.G. Makin, and P.N. Sabes. Nonhuman Primate Reaching with Multichannel Sensorimotor Cortex Electrophysiology. Online electrophysiology data set; available at <https://zenodo.org/record/583331#.XZ0eE9-YU5m>, 2017.
- [3] J.G. Makin, B.K. Dichter, and P.N. Sabes. Recurrent Exponential-Family Harmoniums without Backprop-Through-Time. **In revision**, JMLR; preprint available at <https://arxiv.org/abs/1605.05799>, 2016.
- [4] J.G. Makin and S. Narayanan. Human Coagulation: Stability, Model Reduction, and Control. In preparation, 2012.
- [5] J.G. Makin. *Theology as Grammar*. Unpublished, 2010.
- [6] J.G. Makin. *A Computational Model of Human Blood Clotting: Simulation, Analysis, Control, and Validation*. PhD thesis, University of California, Berkeley, 2008.
- [7] J.G. Makin, S. Narayanan, and R. Ramamoorthi. Hybrid System Modeling Human Blood Clotting, 2005. Patent Pending US60/716,585.

INVITED TALKS

- [1] Density Estimation and Information Retention for Dynamical Stimuli. Workshop on Dynamic Probabilistic Inference in the Brain, Bernstein Conference, Sept. 2020.
- [2] Statistical Learning for Neuroscience. School of Electrical and Computer Engineering, Purdue, May 2020.
- [3] Workshop on Learning Body Models, Lorentz Center, U. Leiden. **Invited Talk**, Oct. 2018.
- [4] Computational Modeling of Multisensory Integration and Coordinate Transformation. Department of Neuroscience, Baylor College of Medicine, April 2018.
- [5] Sensory Integration, Density Estimation, and Information Retention. Redwood Center for Theoretical Neuroscience, U.C. Berkeley, Jan. 2018.
- [6] Computation and Learning in Posterior Parietal Cortex. Center for Neural Science, NYU, March 2016.
- [7] Computation and Learning in Posterior Parietal Cortex. Center for Perceptual Systems, U.T. Austin, Feb. 2016.