

# Joseph E. O'Doherty, PhD

## Curriculum Vitæ

### Higher Education

- 2001–2011 Duke University** (Durham, NC, USA)  
PhD, Biomedical Engineering. Advisor: Miguel A. L. Nicolelis.  
Dissertation title: *Brain-Machine-Brain Interface*
- 1999–2001 East Carolina University** (Greenville, NC, USA)  
BS, Physics, *Magna Cum Laude*
- 1997–1999 University of North Carolina at Chapel Hill** (Chapel Hill, NC, USA)  
Coursework in Applied Science

### Research Positions & Employment

- Apr 2019–Present Neuroscience Team Lead** Neuralink (San Francisco, CA, USA)
- 2017–Present Member of Technical Staff** Neuralink (San Francisco, CA, USA)  
Developing ultra high bandwidth brain-machine interfaces to connect humans and computers.
- 2011–2017 Postdoctoral Scholar** Department of Physiology, University of California (San Francisco, CA, USA)  
Developed technologies for bidirectional brain-machine interfaces. (Advisor: Philip N. Sabes)
- June–Aug 2011 Research Scholar** Department of Neurobiology, Duke University (Durham, NC, USA)  
Developed technologies for sensory feedback for brain-machine interfaces. (Advisor: Miguel A. L. Nicolelis)
- 2001–2011 Doctoral Student** Department of Biomedical Engineering, Duke University (Durham, NC, USA)  
Developed computational algorithms for the training and control of brain-machine interfaces; studied the cortical basis of movement control and somatosensation in behaving rhesus macaques; explored cortical microstimulation for brain-machine interface feedback. (Advisor: Miguel A. L. Nicolelis)
- May–Aug 1997 Summer Research Fellow** Department of Pharmacology, East Carolina University (Greenville, NC, USA)  
Assessed the impact of Neuropeptide Y antisense on cardiac function in Sprague-Dawley rats. Funding provided by the Howard Hughes Medical Institute SEPP Summer Research Internship program. (Advisor: Wallace R. Wooles)

### Awards & Honors

- 2016** Ripple Promising Investigator Research Award
- 2013** Annual BCI Research Award (Dadarlat, O'Doherty & Sabes)
- 2013** Student and Postdoc Scholarship, Fifth International BCI Meeting
- 2012** Penn Fellowship in Neuroscience & Society, University of Pennsylvania
- 2012** Conference Travel Scholarship, Society for the Neural Control of Movement
- 2010** Graduate Student Extended Abstract Award, Biomedical Engineering Society
- 2010** Workshop Travel Award, IEEE Engineering in Medicine and Biology Society
- 2010** Conference Travel Fellowship, Duke University Graduate School
- 2009** Competitively selected participant, NIH National Graduate Student Research Festival
- 2008** Conference Travel Fellowship, Duke University Graduate School
- 2001** Burroughs Welcome Fellowship, UNC Graduate School (declined)
- 2001** James Fenly Spear, Jr. Memorial Award
- 2000** Phi Kappa Phi National Honor Society

## Awards & Honors (continued)

- 2000 Thomas A. Bayliss Scholarship in Physics
- 1998 State Employees' Association of North Carolina, Statewide 4-year college scholarship
- 1998 State Employees' Association of North Carolina, District 65 scholarship
- 1997 Howard Hughes Medical Institute SEPP Summer Research Internship

## Other Training

- 2012 **Penn Fellowship in Neuroscience & Society** (Philadelphia, PA, USA)  
Summer Course in Neuroethics, directed by Dr. Martha Farah
- 2002 **The Neurosciences Institute** (La Jolla, CA, USA)  
Summer Course in Neural Engineering, directed by Dr. Andrew Schwartz

## Grant Support

- 2016 **NVIDIA Corporation** (GPU Grant)  
*Real-time decoding of limb movements using a novel unsupervised-learning algorithm*
- 2014–2015 **Paralyzed Veterans of America Research Foundation** (Fellowship)  
*Restoring Somatosensory Function through Intracortical Microstimulation*

## Professional Societies

- 2015–Present Founding Member, BCI Society
- 2012–Present Member, Society for Neural Control of Movement
- 2012–Present Member, Society for Neuroscience
- 2004–2011 Student Member, Society for Neuroscience
- 2003–2011 Student Member, Biomedical Engineering Society

## Teaching

- 27 Mar & 28 Mar 2017 **Guest Lectures — Motor Systems**  
University of California, San Francisco, Department of Physiology (San Francisco, CA, USA)  
Lecture and Discussion for NS201C, *Intro to Systems and Behavioral Neuroscience*. (Host: Andrea Hasenstaub)
- 25 Mar 2014 **Seminar Leader — Motor Systems**  
University of California, San Francisco, Department of Physiology (San Francisco, CA, USA)  
Discussion for NS201C, *Intro to Systems and Behavioral Neuroscience*. (Host: Philip Sabes)
- 8 Dec 2010 **Guest Lecture — Motor Theory of Reaching and Pointing**  
Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
Lecture for BME 265–09, *Neuronal Control of Movement*. (Host: Marc Sommer)
- 24 Sep & 15 Oct 2009 **Guest Lectures — Introduction to Neuroengineering**  
Duke University, Pratt School of Engineering (Durham, NC, USA)  
Lectures for EGR 10, *Introduction to Engineering*. (Host: Linda Franzoni)
- 9 Apr 2009 **Guest Lecture — Fundamentals of CNS Recording**  
Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
Lecture for BME 265, *Advanced Topics in Neural Prosthetic Systems*. (Host: Warren Grill)

## Teaching (continued)

- 2 Apr 2008** **Guest Lecture — *From Action Potential to Action***  
 Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
 Lecture for BME 253, *Computational Neuroengineering*. (Host: Craig Henriquez)
- 25 Oct 2007** **Guest Lecture — *From Action Potential to Action***  
 Duke University, Pratt School of Engineering (Durham, NC, USA)  
 Lecture for EGR 10, *Introduction to Engineering*. (Host: Marcus Henderson)
- 28 Mar 2006** **Guest Lecture — *BMI for Restoring Motor Function***  
 Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
 Lecture for BME 253, *Computational Neuroengineering*. (Host: Craig Henriquez)
- 2003–2007** **Laboratory Animal Coordinator — “Frogmaster”**  
 Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
 Instructed students in the ethical and regulatory issues associated with animal research and supervised procedures involving animal tissues conducted in the Bioelectricity laboratory course (BME 101-L).
- 2002–2003** **Teaching Assistant — Bioelectricity**  
 Duke University, Department of Biomedical Engineering (Durham, NC, USA)  
 Taught Bioelectricity laboratory section (BME 101-L), three semesters.
- 2000–2001** **Tutor — Mechanics and Electromagnetism**  
 East Carolina University, Department of Physics (Greenville, NC, USA)  
 Tutored university students in Physics (classical mechanics and electromagnetism).

## Mentoring

### Undergraduate Students

- 2008–2012** **Max Hodak** — BSE 2012, Duke University. Now: President, Neuralink
- 2007–2009** **David McMullen** — MD 2014, Rutgers Robert Wood Johnson Medical School. Now: Program Officer, NIMH
- 2006–2009** **Ian Peikon** — PhD 2015, Cold Spring Harbor Laboratory. Now: Senior Scientist, Kallyope
- 2006–2009** **Benjamin Grant** — PhD 2016, Rice University. Now: Research Scientist, Intellectual Ventures

### Masters Students

- 2015–2016** **Julien Rechenmann** — MS 2016, EPFL. Now: Doctoral Student, EPFL
- 2016–2017** **Diana Avalos** — MS 2017, Grenoble INP Phelma Now: Neosensory

## Academic Service

*Ad-hoc* Reviewer for:

Nature	PLoS ONE	IEEE Trans. Haptics
Neuron	Frontiers in Systems Neuroscience	IEEE Trans. Inf. Technol. Biomed.
Philosophical Transactions B	Neurobiology of Disease	IEEE Trans. Neural Syst. Rehabil.
Journal of Neurophysiology	IEEE J. Transl. Eng. Health Med.	Eng
Journal of Neural Engineering	IEEE Trans. Biomed. Circuits Syst.	

## Selected Press Coverage

- 2015 KQED  
 2011 BBC News, The Guardian, Los Angeles Times, MIT Technology Review, Nature News, New Scientist, NPR News, Scientific American, Sydney Morning Herald, The Telegraph, Wired

## Inventions

- 2016 PCT/US2018/022457 *Removal of stimulation artifact in multi-channel neural recordings*, patent pending

## Talks & Scholarly Presentations

- 4 Dec 2019 **Invited Speaker** (Host: Maria C. Dadarlat) *A brain-machine interface with thousands of channels*. Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, USA.
- 26 July 2019 **Special Seminar** (Host: John H. Morrison) *A brain-machine interface with thousands of channels: rodents, nonhuman primates and plans for human translation*. California National Primate Research Center, Davis, CA.
- 14 Nov 2016 **Nanosymposium Speaker** *Towards artificial proprioception for brain-machine interfaces*. Society for Neuroscience 46th Annual Meeting, San Diego, CA.
- 13 Dec 2013 **Retreat Speaker** *Toward stimulation-based therapies: harnessing neuroscientific principles and new technologies*. Fall Retreat, Center for Neural Engineering and Prostheses, UC Berkeley / San Francisco, Berkeley, CA, USA.
- 6 Jun 2013 **Workshop Speaker** *Somatosensory feedback for neuroprosthesis conveyed with temporal patterns of intracortical microstimulation*. The 5th International Brain-Computer Interface Meeting, Pacific Grove, CA, USA.
- 24 Sep 2012 **Invited Speaker** (Host: Masayuki Hirata) *Bringing the World of Touch to Brain-Machine Interfaces*. Department of Neurosurgery, Osaka University, Osaka, Japan.
- 20 Sep 2012 **Symposium Speaker** *Bringing the World of Touch to Brain-Machine Interfaces*. The 35th Annual Meeting of the Japan Neuroscience Society, Nagoya, Japan.
- 1 May 2012 **Invited Speaker** (Host: José del R. Millán) *Bringing the World of Touch to Brain-Machine Interfaces*. Interfaculty Institute Bioengineering and the EPFL Center for Neuroprosthetics, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.
- 27 Apr 2012 **Panel Participant** (Organizer: Aaron Suminski) *Encoding of somatosensory percepts with temporal patterns of intracortical microstimulation*. 22nd Annual Meeting of the Society for the Neural Control of Movement, Venice, Italy.
- 9 Dec 2011 **Retreat Speaker** *Artificial Somatosensory Feedback for Movement Control*. Fall Retreat, Center for Neural Engineering and Prostheses, UC Berkeley / San Francisco, San Francisco, CA, USA.
- 15 Feb 2011 **Invited Speaker** (Host: Philip Sabes) *Exploring the world of touch with a brain-machine interface*. Keck Center for Integrative Neuroscience, University of California San Francisco, San Francisco, CA, USA.
- 7 Oct 2010 **Platform Presentation** *A Bidirectional Brain-Machine Interface with Motor Recordings and Sensory Microstimulation Feedback*. Annual fall meeting of the Biomedical Engineering Society, Austin, TX, USA.
- 21 Jun 2010 **Poster Blitz Talk** *A Bidirectional Brain-Machine Interface Using Simultaneous Recording and Intracortical Microstimulation Feedback*. Neural Interfaces Conference 2010, Long Beach CA, USA.
- 3 Apr 2009 **Invited Speaker** (Host: Warren Grill) *Direct Brain-Machine-Brain Communication Through Simultaneous Cortical Stimulation and Recording*. Grill Lab Seminar, Department of Biomedical Engineering, Duke University, Durham, NC, USA.
- 3 Nov 2008 **Invited Speaker** (Host: Krishna Shenoy) *Closed-Loop Brain-Controlled Reaching Guided by Cortical Microstimulation*. Neural Prosthetic Systems Laboratory, Stanford University, Palo Alto, CA, USA.
- 24 Jun 2008 **Invited Speaker** (Host: Dianne Kindel) *Monkeys and Robots Together at Last: An Overview of the Brain-Machine Interface*. Bioscience and Engineering Camp 2008, Duke University, Durham, NC, USA.
- 17 Jun 2008 **Platform Presentation** *Closed-Loop Brain-Controlled Reaching Guided by Cortical Microstimulation*. Neural Interfaces Conference 2008, Cleveland, OH, USA.

## Talks & Scholarly Presentations (continued)

- 28 Jul 2006 **Invited Speaker** (Host: Warren Grill) *BMIs for Restoring Motor Function*. Grill Lab Seminar, Department of Biomedical Engineering, Duke University, Durham, NC, USA.
- 8 Jul 2005 **Invited Speaker** (Host: Iyad Obeid) *Overview of Brain-machine Interface Software Algorithms*. Neural Rehabilitation Engineering Lab, Université catholique de Louvain, Brussels, Belgium.
- 5 Jul 2005 **Invited Speaker** (Host: Joseph McIntyre) *Brain-machine Interfaces for Restoring Motor Function*. Laboratoire de Physiologie de la Perception et de l'Action. Collège de France, Paris, France.
- 30 Jun 2005 **Invited Speaker** (Host: Matthew Diamond) *Brain-machine Interfaces for Restoring Motor Function*. Cognitive Neuroscience Sector, Scuola Internazionale Superiore di Studi Avanzati, Trieste, Italy.
- Mar 2005 **Speaker** *Predicting Time With Ensembles: Interhemispheric Transfer of Knowledge*. Nicolelis Lab Seminar, Duke University, Durham, NC, USA.
- 14 Oct 2004 **Platform Presentation** *Data Reduction of Simultaneous Multi-electrode Neural Recordings Using Principal Component Analysis*. Annual fall meeting of the Biomedical Engineering Society, Philadelphia, PA, USA.
- Feb 2004 **Invited Speaker** *Neuroengineering a Brain-Machine Interface*. Department Of Biomedical Engineering Seminar Series, Duke University, Durham, NC, USA.

## Publications

### Peer-Reviewed Journal Articles

- 2019 **O'Doherty, J.E.**, Shokur, S., Medina, L.E., Lebedev, M.A. and M.A.L. Nicolelis. (2019). Creating a neuroprosthesis for active tactile exploration of textures. *Proceedings of the National Academy of Sciences of the United States of America*, 116(43): 21821–21827. doi:10.1073/pnas.1908008116
- 2018 Makin, J.G., **O'Doherty, J.E.**, Cardoso, M.M.B, and P.N. Sabes. (2018). Superior arm-movement decoding from cortex with a new, unsupervised-learning algorithm. *Journal of Neural Engineering*, 15(2): 026010. doi:10.1088/1741-2552/aa9e95
- 2015 Dadarlat, M.C., **O'Doherty, J.E.** and P.N. Sabes. (2015). A learning-based approach to artificial sensory feedback leads to optimal integration. *Nature Neuroscience*, 18(1): 138–144. doi:10.1038/nn.3883
- 2013 Shokur, S., **O'Doherty, J.E.**, Winans, J.A., Bleuler, H., Lebedev, M.A., and M.A.L. Nicolelis. (2013). Expanding the primate body schema in sensorimotor cortex by virtual touches of an avatar. *Proceedings of the National Academy of Sciences of the United States of America*, 110(37): 15121–15126. doi:10.1073/pnas.1308459110
- 2012 Medina, L.E., Lebedev, M.A., **O'Doherty, J.E.** and M.A.L. Nicolelis. (2012). Stochastic facilitation of artificial tactile sensation in primates. *The Journal of Neuroscience*, 32(41): 14271–14275. doi:10.1523/JNEUROSCI.3115-12.2012
- 2012 Hanson, T.L., Ómarsson, B., **O'Doherty, J.E.**, Peikon I.D., Lebedev M.A. and M.A.L. Nicolelis. (2012). High-side digitally current controlled biphasic bipolar microstimulator. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 20(3): 331–340. doi:10.1109/TNSRE.2012.2187219
- 2012 **O'Doherty, J.E.**, Lebedev, M.A., Li, Z. and M.A.L. Nicolelis. (2012). Virtual active touch using randomly patterned intracortical microstimulation. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 20(1): 85–93. doi:10.1109/TNSRE.2011.2166807 (Recommended by Faculty of 1000)
- 2011 **O'Doherty, J.E.**, Lebedev, M.A., Ifft, P.J., Zhuang, K.Z., Shokur, S. Bleuler, H. and M.A.L. Nicolelis. (2011). Active tactile exploration using a brain-machine-brain interface. *Nature*, 479(7372): 228–231. doi:10.1038/nature10489
- 2011 Li, Z., **O'Doherty, J.E.**, Lebedev, M.A. and M.A.L. Nicolelis. (2011). Adaptive decoding for brain-machine interfaces through Bayesian parameter updates. *Neural Computation*, 23(12): 3162–3204. doi:10.1162/NECO\_a\_00207
- 2011 Lebedev, M.A., Tate, A.J., Hanson, T.L., Li, Z., **O'Doherty, J.E.**, Winans, J.A., Ifft, P.J., Zhuang, K.Z., Fitzsimmons, N.A., Schwarz, D.A., Fuller, A.M., An, J.H. and M.A.L. Nicolelis. (2011). Future developments in brain-machine interface research. *Clinics (São Paulo)*, 66(S1): 25–32. PMID: PMC3118434
- 2009 **O'Doherty, J.E.**, Lebedev, M.A., Hanson, T.L., Fitzsimmons, N.A. and M.A.L. Nicolelis. (2009). A brain-machine interface instructed by direct intracortical microstimulation. *Frontiers in Integrative Neuroscience*, 3: 20. doi:10.3389/neuro.07.020.2009

### Peer-Reviewed Journal Articles (continued)

- 2009 Li, Z., **O'Doherty, J.E.**, Hanson, T.L., Lebedev, M.A., Henriquez, C.S. and M.A.L. Nicolelis. (2009). Unscented Kalman filter for brain-machine interfaces. *PLoS ONE*, 4(7): e6243. doi:10.1371/journal.pone.0006243
- 2008 Lebedev, M.A., **O'Doherty, J.E.** and M.A.L. Nicolelis. (2008). Decoding of temporal intervals from cortical ensemble activity. *The Journal of Neurophysiology*, 99(1): 166–186. doi:10.1152/jn.00734.2007
- 2007 Zacksenhouse, M., Lebedev, M.A., Carmena, J.M., **O'Doherty, J.E.**, Henriquez, C.S. and M.A.L. Nicolelis. (2007). Cortical modulations increase in early sessions with brain-machine interface. *PLoS ONE*, 2(7): e619. doi:10.1371/journal.pone.0000619
- 2005 Lebedev, M.A., Carmena, J.M., **O'Doherty, J.E.**, Zacksenhouse, M., Henriquez, C.S., Principe, J.C. and M.A.L. Nicolelis. (2005). Cortical ensemble adaptation to represent actuators controlled by a brain machine interface. *The Journal of Neuroscience*, 25(19): 4681–4693. doi:10.1523/JNEUROSCI.4088-04.2005
- 2003 Carmena, J.M., Lebedev, M.A., Crist, R.E., **O'Doherty, J.E.**, Santucci, D.M., Dimitrov, D.F., Patil, P.G., Henriquez, C.S. and M.A.L. Nicolelis. (2003). Learning to control a brain-machine interface for reaching and grasping by primates. *PLoS Biology*, 1(2): e42. doi:10.1371/journal.pbio.0000042
- 1999 Gumber S.C. and **J.E. O'Doherty**. (1999). Digestive disease resources on the Internet. *The American Journal of Gastroenterology*, 94(8): 2022–2032. doi:10.1016/S0002-9270(99)00329-9

### Peer-Reviewed Conference Papers

- 2019 Bloch, J.A., Khateeb, K., Silversmith, D.B., **O'Doherty, J.E.**, Sabes, P.N., and A. Yazdan-Shahmorad. (2019). Cortical stimulation induces network-wide coherence change in non-human primate somatosensory cortex. *41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 6556–6449. doi:10.1109/EMBC.2019.8856633

### Book Chapters

- 2014 Dadarlat, M.C., **O'Doherty, J.E.** and P. N. Sabes. (2014). A learning-based approach to artificial sensory feedback, in *Brain-Computer Interface Research: A State of the Art Summary 3*. Guger, C., Vaughan, T. and B. Allison, Editors. Springer.
- 2007 Hanson, T.L., Fitzsimmons, N.A. and **J.E. O'Doherty**. (2007). Technology for Multielectrode MicroStimulation of Brain Tissue, in *Methods for Neural Ensemble Recordings, Second Edition*. M.A.L. Nicolelis, Editor. CRC Press.

### Submitted Manuscripts

- 2017 **O'Doherty, J.E.** and P.N. Sabes. (2017). Analysis of electrical stimulation artifacts and their removal for bidirectional neural interfaces.

### Preprints

- 2019 **O'Doherty, J.E.**, Shokur, S., Medina, L.E., Lebedev, M.A. and M.A.L. Nicolelis. (2019). Creating a neuroprosthesis for active tactile exploration of textures. *bioRxiv* 594994. doi:10.1101/594994

### Datasets

- 2017 **O'Doherty, J.E.**, Cardoso, M.M.B., Makin, J.G. and P.N. Sabes. (2017). Nonhuman Primate Reaching with Multichannel Sensorimotor Cortex Electrophysiology. doi:10.5281/zenodo.583331

## Abstracts

- 2017 Rechenmann, J.D., **O'Doherty, J.E.**, and P.N. Sabes. (2017). Quantifying the information rate of sensory feedback. In *Computational and Systems Neuroscience (Cosyne) Meeting*, Salt Lake City, UT.
- 2017 Makin, J.G., **O'Doherty, J.E.**, and P.N. Sabes. (2017). Superior limb-movement decoding from cortex with a new, unsupervised-learning algorithm. In *Computational and Systems Neuroscience (Cosyne) Meeting*, Salt Lake City, UT.
- 2016 **O'Doherty, J.E.** and P.N. Sabes. (2016). Towards artificial proprioception for brain-machine interfaces. In *Society for Neuroscience 46th Annual Meeting*, San Diego, CA.
- 2016 Rechenmann, J.D., **O'Doherty, J.E.**, and P.N. Sabes. (2016). Quantifying the information rate of sensory feedback for neuroprosthesis. In *Society for Neuroscience 46th Annual Meeting*, San Diego, CA.
- 2016 Makin, J.G., **O'Doherty, J.E.**, and P.N. Sabes. (2016). Decoding for brain-machine interfaces with a new, unsupervised-learning algorithm. In *Society for Neuroscience 46th Annual Meeting*, San Diego, CA.
- 2015 Makin, J.G., **O'Doherty, J.E.**, and P.N. Sabes. (2015). Decoding limb movement from BMIs with a new, unsupervised-learning algorithm. Swartz Meeting, CalTech, Pasadena, CA.
- 2014 **O'Doherty, J.E.** and P.N. Sabes. (2014). Mitigating electrical stimulation artifacts for bidirectional neural interfaces. In *Society for Neuroscience 44th Annual Meeting*, Washington, DC.
- 2014 **O'Doherty, J.E.**, and P.N. Sabes. (2014). Mitigating electrical stimulation artifacts for bidirectional neural interfaces. In *2014 DFG-NSF Research Conference: "New Perspectives on Neuroengineering and Neurotechnologies"*, Arlington, VA.
- 2013 Dadarlat, M.C., **O'Doherty, J.E.**, and P.N. Sabes. (2013). A learning-based approach to artificial sensory feedback: intracortical microstimulation (ICMS) replaces and augments vision. In *6th International IEEE EMBS Conference on Neural Engineering*, San Diego, CA.
- 2013 Dadarlat, M.C., **O'Doherty, J.E.**, and P.N. Sabes. (2013). Multisensory integration of vision and intracortical microstimulation for sensory feedback. In *Computational and Systems Neuroscience (Cosyne) Meeting*, Salt Lake City, UT.
- 2012 Medina, L.E., Lebedev, M.A., **O'Doherty, J.E.**, and M.A.L. Nicolelis. (2012). Noise-enhanced intracortical microstimulation for virtual touch. In *Society for Neuroscience 42nd Annual Meeting*, New Orleans, LA.
- 2012 Dadarlat, M.C., **O'Doherty, J.E.**, and P.N. Sabes. (2012). Multisensory integration of vision and intracortical microstimulation for sensory substitution and augmentation In *Society for Neuroscience 42nd Annual Meeting*, New Orleans, LA.
- 2012 Shokur, S., Winans, J.A., **O'Doherty, J.E.**, Lebedev, M.A., and M.A.L. Nicolelis. (2012). Beyond the homunculus: Visual responses of primary somatosensory cortex (S1) neurons to virtual touch of a virtual arm. In *Society for Neuroscience 42nd Annual Meeting*, New Orleans, LA.
- 2012 An, J.H., **O'Doherty, J.E.**, Lebedev, M.A., and M.A.L. Nicolelis. (2012) Active exploration of invisible targets assisted by an artificial touch sensation based on intracortical microstimulation. In *8th FENS Forum of Neuroscience*, Barcelona, Spain.
- 2011 **O'Doherty, J.E.**, Lebedev, M.A., Li, Z., and M.A.L. Nicolelis. (2011). Towards a brain-machine-brain interface with virtual active touch using randomly patterned intracortical microstimulation. In *Society for Neuroscience 41st Annual Meeting*, Washington, DC.
- 2011 Zhuang, K.Z., **O'Doherty, J.E.**, Lebedev, M.A., and M.A.L. Nicolelis. (2011). Joint cross-correlation analysis reveals dynamic relationship between cortical activity and EMG. In *Society for Neuroscience 41st Annual Meeting*, Washington, DC.
- 2011 An, J.H., **O'Doherty, J.E.**, Lebedev, M.A., and M.A.L. Nicolelis. (2011). Active exploration of invisible targets assisted by an artificial touch sensation based on intracortical microstimulation. In *Society for Neuroscience 41st Annual Meeting*, Washington, DC.
- 2011 Raghavan, R.T., Lebedev, M.A., **O'Doherty, J.E.**, and M.A.L. Nicolelis. (2011). Emergent preparatory neural activity underlying learning in premotor and primary motor cortex. In *Society for Neuroscience 41st Annual Meeting*, Washington, DC.

**Abstracts (continued)**

- 2010 O'Doherty, J.E., Ifft, P.J., Zhuang, K.Z., Lebedev, M.A. and M.A.L. Nicolelis. (2010). Brain-machine-brain interface using simultaneous recording and intracortical microstimulation feedback. In *Society for Neuroscience 40th Annual Meeting*, San Diego, CA.
- 2010 Li, Z., O'Doherty, J.E., Lebedev, M.A., and M.A.L. Nicolelis. (2010). Closed-loop adaptive decoding using Bayesian regression self-training. In *Society for Neuroscience 40th Annual Meeting*, San Diego, CA.
- 2010 Shokur, S., O'Doherty, J.E., Lebedev, M.A., Bleuler, H. and M.A.L. Nicolelis. (2010). Integration of a virtual reality based arm in primary somatosensory cortex. In *Society for Neuroscience 40th Annual Meeting*, San Diego, CA.
- 2010 Zhuang, K.Z., O'Doherty, J.E., Lebedev, M.A. and M.A.L. Nicolelis. (2010). Extraction of EMGs from cortical ensemble activity during a motor timing task In *Society for Neuroscience 40th Annual Meeting*, San Diego, CA.
- 2010 Han, Z., O'Doherty, J.E., Lebedev, M.A. and M.A.L. Nicolelis. (2010). Decoding self-timed motor behavior with hidden Markov models In *Society for Neuroscience 40th Annual Meeting*, San Diego, CA.
- 2010 O'Doherty, J.E., Ifft, P.J., Zhuang, K.Z., Lebedev, M.A. and M.A.L. Nicolelis. (2010). A Bidirectional Brain-Machine Interface with Motor Recordings and Sensory Microstimulation Feedback. In *Annual Fall Meeting of the Biomedical Engineering Society*, Austin, TX.
- 2010 O'Doherty, J.E., Ifft, P.J., Zhuang, K.Z., Lebedev, M.A. and M.A.L. Nicolelis. (2010). A Bidirectional Brain-Machine Interface Using Simultaneous Recording and Intracortical Microstimulation Feedback. In *Neural Interfaces Conference 2010*, Long Beach, CA.
- 2010 O'Doherty, J.E., Ifft, P.J., Zhuang, K.Z., Lebedev, M.A. and M.A.L. Nicolelis. (2010). A Bidirectional Brain-Machine Interface Using Simultaneous Recording and Intracortical Microstimulation Feedback. In *Beyond Brain Machine Interface Workshop: From Senses to Cognition*, Long Beach, CA.
- 2009 O'Doherty, J.E., Lebedev, M.A. and M.A.L. Nicolelis. (2009). Closed-loop brain-controlled reaching guided by direct intracortical microstimulation. In *NIH National Graduate Student Research Festival*, Bethesda, MD.
- 2009 Li, Z., O'Doherty, J.E., Lebedev, M.A. and M.A.L. Nicolelis. (2009). Simultaneous BMI decoding and tuning model update using Bayesian regression. In *Society for Neuroscience 39th Annual Meeting*, Chicago, IL.
- 2009 Zacksenhouse, M., Beiser, K., O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2009). Optimal control framework successfully explains changes in neural modulations during experiments with Brain Machine Interfaces. In *2009 Advances in Computational Motor Control*, Chicago, IL.
- 2008 O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2008). Closed-loop brain-controlled reaching guided by cortical microstimulation. In *Society for Neuroscience 38th Annual Meeting*, Washington, DC.
- 2008 Grant, B.D., Li, Z., Hanson, T.L., O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2008). Multipurpose, expandable suite for brain-machine interfaces. In *Society for Neuroscience 38th Annual Meeting*, Washington, DC.
- 2008 Li, Z., O'Doherty, J.E., Hanson, T.L., Lebedev, M.A., Henriquez, C.S., Nicolelis, M.A.L. (2008). Unscented Kalman filter for brain-machine interfaces. In *Society for Neuroscience 38th Annual Meeting*, Washington, DC.
- 2008 Hodak, M.J., O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2008). Transformational mapping in an online brain-machine interface for reaching. In *Society for Neuroscience 38th Annual Meeting*, Washington, DC.
- 2008 O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2008) Closed-loop brain-controlled reaching guided by cortical microstimulation. In *Neural Interfaces Conference 2008*, Cleveland, OH.
- 2007 O'Doherty, J.E., Hanson, T.L., Dimitrov, D.F., Lebedev, M.A., Nicolelis, M.A.L. (2007). Brain-machine interface with somatosensory feedback. In *Society for Neuroscience 37th Annual Meeting*, San Diego, CA.
- 2007 Grant, B.D., Hanson, T.L., O'Doherty, J.E., Lebedev, M.A., Nicolelis, M.A.L. (2007). Automated spike sorting of multiunit data for brain-machine interface applications. In *Society for Neuroscience 37th Annual Meeting*, San Diego, CA.
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