

Kazutaka Takahashi

Postdoctoral scholar
Department of Organismal Biology and Anatomy
University of Chicago
1027 E 57th St, Chicago IL 60637
TEL: 773-702-5594 Email: kazutaka@alum.mit.edu

General Information

Nationality: Japanese Citizen
Date of Birth: 15 September 1972
Marital Status: Married

EDUCATION

Ph. D. in Control and Estimation February 2007
Massachusetts Institute of Technology, Cambridge MA
Major: Control and Estimation Minor: Biomedical Engineering
Thesis title: *Modeling cerebrocerebellar control in horizontal planar arm movements of humans and the monkey*

Bachelor in Aerospace Engineering and Mechanics with distinction August 1997
University of Minnesota, Twin Cities, Minneapolis, MN

EXPERIENCE

Postdoctoral scholar Oct. '06 - Present
Nicholas Hatsopoulos Laboratory, Department of Organismal Biology and Anatomy
University of Chicago, Chicago, IL

- Spatiotemporal and network analysis of motor cortical activities recorded using multielectrode arrays and of interactions of local field potentials and unit spiking activities.
- Characterization of cortical activities during reaching and grasping
- Analysis of neural activity during chewing behaviors (joint work with Prof. Ross in OBA at University of Chicago)
- Large scale dynamic network characterization of spiking neurons using high performance computing systems
- Modeling of skeletomuscular system of an upper extremity

Research Assistant Jan. '00 - Jan. '06
Computer Science and Artificial Intelligence Laboratory (CSAIL) and
Laboratory for Information and Decision Systems (LIDS), MIT Cambridge, MA

- Analysis and modeling of primate neuromuscular systems: Modeling of cerebrocerebellar function for limb control, application of optimal or nonlinear control for primate motor system, analysis and characterization of limb kinematics.

Teaching Assistant / Recitation Instructor Sep. '00 - May '06
Dept. of Electrical Engineering and Computer Science (EECS) MIT, Cambridge MA

- Recitation instructor for Signals and Systems (6.003) for one semester
- Head teaching assistant for Signals and Systems (6.003) for five semesters
- Teaching assistant for Signals and Systems (6.003), Introduction to Communication, Control, and Signal Processing (6.011), Dynamic Systems and Control (6.241) for one semester respectively

Teaching assistant for High Performance Computation (SMA5221) Jan. '00 - May '00
Singapore MIT Alliance (SMA), MIT, Cambridge, MA

Research Assistant Jan. '98 - Jan '00
Information Control Engineering Group
Dept. Aeronautics and Astronautics, MIT, Cambridge, MA

- Dynamical system modeling of rotating machinery and turbomachinery blades
- DSP implementation of MIMO optimal controllers for gas turbine compressor blades

Teaching assistant for Advanced Aircraft Control (16.333) Jan. '98 - May '98
Dept. of Aeronautics and Astronautics, MIT, Cambridge, MA

Undergraduate Research Project Jan. '97

Dept. of Aerospace Engineering and Mechanics, U of Minnesota, Minneapolis, MN

- System identification of shape memory alloy as active sensor and actuator for flexible structural control application.

Undergraduate Research Project Jan. '96 - Aug. '96
Dept. of Aerospace Engineering and Mechanics, U of Minnesota, Minneapolis, MN

- Developing algorithm and visualization C++ codes for Particle Velocimetry for mixing flows.

PUBLICATIONS **Journal papers**

- Saleh M. **Takahashi K.**, and Hatsopoulos N.G., "Encoding of coordinated reach and grasp trajectories in primary motor cortex", J. of Neuroscience, 2012 Jan 25;32(4):1220-32..
- **Takahashi K.**, Saleh M., Penn R.D., and Hatsopoulos N.G., "Propagating waves in human motor cortex", Front. Hum. Neurosci, 2011 Apr: 5(40).
- Saleh M. **Takahashi K.**, Amit Y. and Hatsopoulos N.G., "Grasping in Primary Motor Cortex: Encoding Using a Generalized Linear Model Framework", J. of Neuroscience, 2010 Dec:30(50):17079-90.
- Roitman A.V., Massaquoi S.G., **Takahashi K.**, Ebner T.J., "Kinematic analysis of manual tracking in monkeys: characterization of movement intermittencies during a circular tracking task", J.Neurophysiol. 2004 Feb;91(2):901-11.
- **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Purkinje cell simple spike activity during circular arm movement I: Kinematic signal content", in preparation to submit to Cerebellum
- **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Purkinje cell simple spike activity during circular arm movement II: Reconciliation with a computational model of cerebrotocerebellar arm control", in preparation to submit to Cerebellum

Book chapters

- Hatsopoulos N.G., Olmedo L., **Takahashi K.**, (2010) "Proximal-to-distal sequencing behavior and motor cortex" in Motor Control: Theories, Experiments, and Applications, Danion, F. and Latash, M.L ed.
- Jo S. and **Takahashi K.** (2010). "Neurobiologically inspired distributed and hierarchical system for control and learning", Biomimetics Learning From Nature, Amitava Mukherjee (Ed.), INTECH, ISBN: 978-953-307-025-4, Available from: <http://sciyo.com/articles/show/title/neurobiologically-inspired-distributed-and-hierarchical-system-for-control-and-learning> (**both authors contributed equally**).

Peer reviewed conference papers

- **Takahashi K.**, Pesce L., Best M., Iriarte-Díaz J., Kim S., Coleman T.P., Hatsopoulos N.G., and Ross C.F., "Granger causality analysis of state dependent functional connectivity of neurons in orofacial motor cortex during chewing and swallowing", presented and won the best paper award at IEEE the 6th International Conference on Soft Computing and Intelligent Systems , Kobe, Hyogo, Japan Nov., 2012
- **Takahashi K.**, Pesce L., Iriarte-Díaz J., Kim S., Coleman T.P., Hatsopoulos N.G., and Ross C.F., "Granger causality analysis of functional connectivity of spiking neurons in orofacial motor cortex during chewing and swallowing", presented IEEE Conference Engineering in Medicine and Biology Society, San Diego, CA., 2012
- Kim S., **Takahashi K.**, Hatsopoulos N.G. and Coleman, T. , "Information transfer between neurons in the motor cortex triggered by visual cues", IEEE Conference Engineering in Medicine and Biology Society, Boston, MA., Aug./Sep., 2011:7278-81
- **Takahashi K.**, Massaquoi S.G., "Neuroengineering Model of human limb control - gainscheduled feedback control approach", 46th IEEE Conference on Decision and Control, New Orleans, LA., Dec., 2007
- Massaquoi, S.G., Jo, S. and **Takahashi, K.**, "Cerebro-cerebellar implementation of gainscheduled feedback control", 45th Annual Allerton Conference, Urbana-Champaign, IL 2007

Conference talks/posters

- (talk) **Takahashi K.**, Brown K., Kim S., Coleman T., and Hatsopoulos N.G., "A network of subpopulation of neurons in primary motor cortex and beta oscillation waves exhibit similar spatiotemporal patterns.", in Nanosymposium on Signal Propagation, The annual meeting, Society for Neuroscience, New Orleans, LA., Oct., 2012
- (talk) **Takahashi K.**, Pesce L., Iriarte-Díaz J., Kim S., Coleman T., Hatsopoulos N.G., and Ross C.F., "Granger causality analysis of functional connectivity of spiking neurons in orofacial motor cortex during chewing and swallowing", in Nanosymposium on Oral Movements, The annual meeting, Society for Neuroscience, New Orleans, LA., Oct., 2012
- (talk) Arce F.I., Hatsopoulos N.G., **Takahashi K.**, Pesce L., Sessle B., and Ross C.F., "Direction information in the primate orofacial sensorimotor cortex", in Nanosymposium on Oral Movements, The annual meeting, Society for Neuroscience, New Orleans, LA., Oct., 2012
- (talk) Suminski A.J. **Takahashi K.**, and Hatsopoulos N.G., "Differential modulation of beta local field potentials in motor cortex during multi-sensory action observation", in Nanosymposium on Cortical Neurophysiology for Movement Control, The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (talk) **Takahashi K.**, Ross C., Hatsopoulos N.G., Iriarte-Díaz J., and Lemberg J., "Relation between local field potentials in M1 and feeding behavior in macaque monkeys" in Nanosymposium on Dynamics of Large Neuron Assemblies, The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (talk) **Takahashi K.**, and Massaquoi S.G., "Neuroengineering Model of human limb control - gainscheduled feedback control approach", 46th IEEE Conference on Decision and Control, New Orleans, LA., Dec., 2007

- (talk) **Takahashi K.**, and Hatsopoulos N.G., "Copropagating waves of local field potentials and single-unit spiking in motor cortex", The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2007
- (poster) Vaidya M., Saleh M., **Takahashi K.**, Kording K., and Hatsopoulos N.G., "Coordination between reaching- and grasping-related neural activity in primary motor cortex", The annual meeting, Society for Neuroscience, New Orleans, LA., Oct., 2012
- (poster) Best M., Brown K., **Takahashi K.**, Pesce L., Saleh M., and Hatsopoulos N.G., "The temporal dynamics of functional connectivity networks in M1 during reach to grasp movements", The annual meeting, Society for Neuroscience, New Orleans, LA., Oct., 2012
- (poster) **Takahashi K.**, and Hatsopoulos N.G., "Unit spiking activities of a subpopulation of neurons follow spatiotemporal dynamics of beta oscillations in primary motor cortex", The annual meeting, Society for Neuroscience, Washington D.C., Nov., 2011
- (poster) **Takahashi K.** and Pesce L., Iriarte-Diaz J., Kim S., Coleman T., Hatsopoulos N.G. and Ross C.F., "State-dependent spiking neuronal network characterization using Granger causality based generalized linear models", The 6th Motor control workshop, Okazaki, Aichi, Japan, June., 2012
- (poster) Olmedo L., **Takahashi K.**, Rajan A. and Hatsopoulos N.G., "Proximal to distal sequencing behavior and spatiotemporal dynamics of beta oscillations in primary motor cortex during self-paced simulated climbing" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) **Takahashi K.**, Iriarte-Diaz J., Ross C., and Hatsopoulos N.G., "Various phases of feeding behaviors in macaque monkeys are signaled by multiple bands of local field potentials in M1o" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Saleh M., **Takahashi K.**, Amit Y., Hatsopoulos N.G., "Grasping in primary motor cortex: Encoding study using the generalized linear model framework" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Brown, K.A., **Takahashi K.**, Ross C., Iriarte-Diaz J., Hatsopoulos N.G., "MI-orofacial neurons modulate activity with stage of chewing sequence and phase of chewing cycle, The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Ross C., Hatsopoulos N.G, Konecki M., Iriarte-Diaz J., **Takahashi K.**, "M1o neuron activity modulates to phases of the gape cycle during feeding in macaque monkeys" The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (poster) Saleh M., **Takahashi K.**, Amit Y., Hatsopoulos N.G., "Encoding of grasping kinematics in primary motor cortex" The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (poster) **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Nonlinear anatomical cerebrocerebellar model of Purkinje cell simple spiking", The annual meeting, Society for Neuroscience, Washington D.C., Nov., 2005
- (poster) **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Nonlinear models of Purkinje cell simple spike and cerebrocerebellar control during primate circular arm movement", The Society of the Neural Control of Movement Annual Meeting, Key Biscayne, FL., April, 2005

AWARDS

- Best paper award - At IEEE The 6th International Conference on Soft Computing and Intelligent Systems, The 13th International Symposium on Advanced Intelligent Systems, Kobe, Hyougo, Japan (2012)
- University of Chicago finalist for Burroughs Wellcome Fund Career Awards at the Scientific Interface (2009)
- MIT EECS - Department Special Recognition Award (2005)
- MIT EECS - Frederick C. Hennie III Teaching Award (2002)

PROFESSIONAL ACTIVITIES	<i>Session Co-organizer and Co-chair</i> Neural control of feeding behaviors, Neuro2013, Kyoto, Kyoto, Japan	Jun. '13
	<i>Session organizer and Co-chair</i> Computational Methods in Neuroscience, The 6th International Conference on Soft Computing and Intelligent Systems, The 13th International Symposium on Advanced Intelligent Systems, Kobe, Hyougo, Japan	Nov. '12
	<i>Session Co-organizer and Co-chair</i> Nanosymposium on Oral Movements, The annual meeting, Society for Neuroscience, New Orleans, LA.,	Oct. '12
	<i>Session Co-organizer and Co-chair</i> Nanosymposium on Signal Propagation, The annual meeting, Society for Neuroscience, New Orleans, LA.,	Oct. '12
	<i>Session Co-chair</i> Session on Locomotion and Posture control, The 6th Motor control workshop, Okazaki, Aichi, Japan, June., 2012	Jun. '12
	<i>Session Co-organizer and Co-chair</i> Nanosymposium on motor control of orofacial function, The annual meeting, Society for Neuroscience, Washington D.C.,	Nov. '11
	<i>Session Organizer and Chair</i> Advances in mastication motor control session, 5th Japanese Neural Control of Movement Annual meeting, Okazaki, Aichi, Japan	Jun. '11
	<i>Participant</i> International Workshop on Timing and Dynamics in Biological Systems at Max-Planck Institute, Dresden, Germany	Sep-Oct. '10
	<i>Participant</i> International Workshop in Synchronization and Multiscale Complex Dynamics in the Brain at Max-Planck Institute, Dresden, Germany	Nov. '09
	<i>Participant</i> Summer course in Neuroinformatics at Marine Biology Laboratory, Woods Hole, MA	Aug. '06
	<i>Session Organizer and Chair</i> Control and estimation applications in neuroscience session, 48th IEEE Conf. on Decision and Control, Shanghai, China	Dec. '09
	<i>Session Organizer and Chair</i>	Dec. '09

Control and estimation applications in neuroscience session, 47th IEEE Conf. on Decision and Control, Cancun, Mexico

Invited instructor

Dec. '08

Workshop on control and estimation applications in neuroscience, 47th IEEE Conf. on Decision and Control, Cancun, Mexico

Chicago Chapter Chair IEEE Engineering in Medicine and Biology Society

INVITED TALKS

- ATR, Kyoto, Japan, Nov 2012
- Kyoto University, Department of Medicine, Kyoto, Japan, Nov 2012
- Osaka University, Department of Oral Anatomy and Neurobiology, May 2012
- Showa University, Department of Oral Physiology, May 2012
- Neuromechanics symposium, University of Chicago, Apr 2012
- Northeastern University, Mar 2012
- Tokyo Metropolitan Institute for Neuroscience, Japan, June 2011
- National Center for Neurology and Psychiatry, Japan, June 2011
- National Center for Neurology and Psychiatry, Japan, Mar 2010
- National Institute for Physiological Sciences, Japan, Mar 2010
- Northeastern University, Sep 2008
- University of Illinois Urbana-Champaign, Apr 2008
- Tokyo Metropolitan Institute for Neuroscience, Dec 2007
- Tamagawa University, Japan, Dec 2007

PROFESSIONAL ASSOCIATIONS

- IEEE Control System Society
- IEEE Engineering in Medicine and Biology Society
- The Neural Control of Movement Society
- Society for Neuroscience

REFERENCES

Nicholas G. Hatsopoulos, Associate Professor, Dept. of Organismal Biology and Anatomy, University of Chicago

Address: 1027 E 57th St Chicago, IL 60637

Email: nicho@uchicago.edu Tel: 773-702-5594

Callum Ross, Professor, Dept. of Organismal Biology and Anatomy, University of Chicago

Address: 1027 E 57th St Rm 401 Chicago, IL 60637

Email: rossc@uchicago.edu Tel: 773-834-7858

Alan S. Willsky, Edwin S Webster Professor of Electrical Engineering, MIT

Address: 32 Vassar St. 32-D582 Cambridge, MA 02139

Email: willsky@mit.edu Tel: 617-253-2356

Steve G. Massaquoi, Research Affiliate, Laboratory for Information and Decision Systems, MIT

Address: 32 Vassar St. 32-D732 Cambridge, MA 02139

Email: sgm248@gmail.com Tel: 617-253-3892

Timothy J. Ebner, Professor and Head, Department of Neuroscience, Visscher Chair in
Physiology, University of Minnesota
Address: 421 Lions Research Building 2001 Sixth St. S.E. Minneapolis, MN 55455
Email: ebner001@umn.edu Tel: 612-626-2205

Munther A. Dahleh, Professor of EECS, MIT
Address: 32 Vassar St. 32-D732 Cambridge, MA 02139
Email: dahleh@mit.edu Tel: 617-253-3892