

Alkis M. Hadjiosif

CONTACT INFORMATION	Harvard Neuromotor Control Lab 33 Oxford St., Cambridge, MA 02138	Voice: (617) 888-3349 alkis@seas.harvard.edu https://scholar.harvard.edu/alkis
RESEARCH INTERESTS	Motor Control and Motor Learning; Mechanisms, Assessment, and Rehabilitation of neurological disease; Post-stroke Hemiparesis; Retention and Generalization of Motor Memories.	
EDUCATION	Harvard University , Cambridge, Massachusetts Ph.D., Engineering Sciences, May 2015 Master of Science, May 2011 Advisor: Maurice A. Smith National Technical University of Athens (NTUA) , Athens, Greece Diploma, Electrical and Computer Engineering, July, 2008. GPA: 9.58/10.0	
ACADEMIC EXPERIENCE	Harvard University , Cambridge Massachusetts USA <i>Postdoctoral Research Associate</i> July, 2022 - present Researching motor adaptation in healthy individuals and patients with cerebellar disease. Johns Hopkins University , Baltimore Maryland USA <i>Postdoctoral Fellow</i> December, 2015 - June, 2022 Researched motor learning, control, and physiology after stroke in a number of patient studies under the mentorship of Drs. John Krakauer, Pablo Celnik, and Reza Shadmehr. Also studied the mechanisms of implicit adaptation and skill acquisition with Dr. Adrian Haith. Harvard University , Cambridge Massachusetts USA <i>Postdoctoral Fellow</i> July, 2015 - November, 2015 <i>Graduate Student</i> August, 2008 - May, 2015 Selected coursework: Neurobiology of Motor Control, Learning and Memory in Neural Systems, Decision Theory, Information Theory, Estimation and Control in Dynamical Systems, Robotics, Nonlinear Control, Systems Biology <i>Teaching Fellow</i> January - May and September - December, 2010 - ENC-SCI 53 Computational Physiology as a Basis for Bioengineering, Spring 2010 and Fall 2010. National Technical University of Athens , Athens, Greece <i>Teaching Lab Assistant</i> February - June, 2005 - Programming Techniques, Spring 2005.	
HONORS AND AWARDS	Travel scholarship from the Society for the Neural Control of Movement (NCM), 2019 to attend the NCM meeting in Toyama, Japan. Doctoral Thesis Achievement Award, The Circle of Hellenic Academics in Boston, 2018 (co-recipient). Silver Medal of the School of Electrical and Computer Engineering, NTUA, 2008. State Scholarships Foundation, Awards on the basis of academic performance, 2003-2008.	

DISSERTATION	Motor Memories for Expectation and Uncertainty in the Environment. Harvard University, Cambridge, MA, February 2015.
RESEARCH PAPERS	<i>* indicates co-first authors</i> Hadjiosif, A.M.*, Branscheidt, M.*, Anaya, M.A., Runnalls, K.D., Keller, J., Bastian, A.J., Celnik, P.A., Krakauer, J.W. Dissociation between abnormal motor synergies and impaired reaching dexterity after stroke. <i>Journal of Neurophysiology</i>, 127: 856–868, February 2, 2022. Hadjiosif, A.M., Krakauer, J.W., and Haith, A.M. Did we get sensorimotor adaptation wrong? Implicit adaptation as direct policy updating rather than forward-model-based learning. <i>Journal of Neuroscience</i> 41(12):2747–2761, March 24, 2021. Albert, S.T., Hadjiosif, A.M., Jang, J., Zimnik, A.J., Soteropoulos, D.S., Baker, S.N., Churchland, M.M., Krakauer, J.W., and Shadmehr, R. Postural control of arm and fingers through integration of movement commands <i>eLife</i> 9: e52507, February 11, 2020. Hadjiosif, A.M. and Smith, M.A. Flexible control of safety margins for action based on internal estimates of environmental variability <i>Journal of Neuroscience</i> 35(24): 9106-9121, June 17, 2015. Gonzalez-Castro, L.N.*, Hadjiosif, A.M.*, Hemphill, M. A. and Smith, M.A. Environmental Consistency Determines the Rate of Motor Adaptation. <i>Current Biology</i> 24, 1-12, May 19, 2014.
REVIEW PAPERS & COMMENTARIES	Hadjiosif, A.M. and Krakauer, J.W. The explicit/implicit distinction in studies of visuomotor learning: conceptual and methodological pitfalls. <i>European Journal of Neuroscience</i> 2021; 53: 499-503. https://doi.org/10.1111/ejn.14984 Krakauer, J.W., Hadjiosif, A.M., Xu, J., Wong, A.L., and Haith, A.M. Motor Learning. <i>Comprehensive Physiology</i> 9, pp.613-663, March 14, 2019.
PAPERS UNDER REVIEW OR IN PREPARATION	Hadjiosif, A.M., Morehead, J.R., and Smith, M.A. A double dissociation between savings and long-term memory in motor learning (under review - preprint at https://doi.org/10.1101/2022.08.18.504373). Branscheidt, M.*, Hadjiosif, A.M.*, Anaya, M.A., Keller, J., Widmer, M., Luft, A.R., Krakauer, J.W., Bastian, A.J., Celnik, P.A. Reinforcement but not error-based learning is impaired early after stroke (under review). Hadjiosif, A.M., Kita, K., Scheidt, R.A., Shadmehr, R., and Krakauer, J.W. Post-stroke postural abnormalities in the arm and their relationship to loss of dexterity (in preparation). Hadjiosif, A.M. and Smith, M.A. Cerebellar damage inhibits the formation of temporally-stable, but not temporally-labile motor memories (in preparation). Abraham, G.*, Hadjiosif, A.M.*, Mallett, K.E. and Smith, M.A. Visual Latency Impairs Implicit Adaptation and Local Generalization of Learning in a Visuomotor Rotation Task (working title, in preparation). Joiner, W.M., Najafi, B., Sing, G.C., Hadjiosif, A.M., Morehead, J.R., Hayashi, T., Adequyi, A., Fiore, G. and Smith, M.A. The identification and characterization of an implicit motor working memory (in preparation).
REFEREED CONFERENCE ABSTRACTS / PROCEEDINGS	Hadjiosif, A.M. , Krakauer, J.W. and Haith, A.M. Implicit adaptation is driven by the update of an

inverse model, not a forward model. Oral presentation at the 29th Annual Neural Control of Movement Conference, Toyama, Japan, April 2019. Brief commentary in the Journal of Neurophysiology, <https://www.physiology.org/doi/full/10.1152/jn.00484.2019>.

Albert, S.T., **Hadjiosif, A.M.**, Jang, J., Krakauer, J.W. and Shadmehr, R. Neural integration in the serial control of reaching and holding still. Translational and Computational Motor Control, San Diego, CA, November 2018.

Hadjiosif, A.M., Criscimagna-Hemminger, S.E., Gibo, T.L. and Smith, M.A. Cerebellar damage reduces the stability of motor memories. Translational and Computational Motor Control, Washington, D.C., November 2014.

Hadjiosif, A.M. and Smith, M.A. Savings is restricted to the temporally labile component of motor adaptation. Translational and Computational Motor Control, San Diego, CA, November 2013. Ranked 3rd among computational submissions.

Hadjiosif, A.M. and Smith, M.A. Variability-Driven Predictive Control of Grip Forces. Translational and Computational Motor Control, New Orleans, LA, October 2012. Ranked 2nd among computational submissions.

INVITED TALKS

Post-stroke Postural Abnormalities in the Arm and Their Relationship to Loss of Motor Control.

- Graduate Seminar Series, MU-MCW Joint Department of Biomedical Engineering. Marquette University, Milwaukee, WI (February 4, 2022, in-person).

Did we get sensorimotor adaptation wrong? Implicit adaptation as direct policy updating rather than forward-model-based learning.

- Sensorimotor Superlab Meeting, Western University; London, ON (April 8, 2021, virtual)
- Virtual Journal Club, University of Delaware; Newark, DE (June 3, 2021, virtual).

Post-stroke biases in arm resting posture reveal separable control of reaching vs. holding still.

- (Upcoming) Cognitive Neuroscience Club meeting at the Department of Neuroscience, Karolinska Institutet, Stockholm, SWE (March 29, 2022, virtual).

Examining the relationship between positive and negative signs of motor stroke.

- Weekly "Cheese and Wine" Sensorimotor Seminar Series, Newcastle University; Newcastle-upon-Tyne, UK. (April 21, 2021, virtual).

Motor control and motor learning in the healthy and post-stroke brain.

- 2018 Doctoral Thesis Award Lectures by the Circle of Hellenic Academics in Boston; Cambridge, MA. (March 9, 2019).

CONFERENCE ABSTRACTS

Hadjiosif, A.M., Kita, K., Albert, S.T., Scheidt, R.A., Shadmehr, R., Krakauer, J.W. Post-stroke postural abnormalities in the arm and their relationship to loss of motor control. 50th Society for Neuroscience Annual Meeting, November 2021 (virtual).

Branscheidt, M., **Hadjiosif, A.M.**, Anaya, M.A., Keller, J., Runnalls, K.D., Widmer, M., Luft, A.R., Krakauer, J.W., Bastian, A.J., Celnik, P.A. Reinforcement motor learning is impaired in acute stroke patients. 49th Society for Neuroscience Annual Meeting, Chicago, IL, November 2019.

Hadjiosif, A.M., Albert, S.T., Kita, K., Shadmehr, R., Krakauer, J.W. Examining the interplay between movement control and resting posture after stroke. 49th Society for Neuroscience Annual Meeting, Chicago, IL, November 2019.

Albert, S.T., **Hadjiosif, A.M.**, Jang, J., Zimmnik, A.J., Churchland, M.M., Krakauer, J.W., Shadmehr, R. Holding the arm still through integration of motor commands. 49th Society for Neuroscience Annual Meeting, Chicago, IL, November 2019.

Hadjiosif, A.M., Branscheidt, M., Anaya, M.A., Runnalls, K.D., Keller, J., Bastian, A.J., Celnik, P.A., Krakauer, J.W. The Fugl-Meyer scale does not capture recovery of motor control following stroke. 48th Society for Neuroscience Annual Meeting, San Diego, CA, November 2018.

Albert, S.T., **Hadjiosif, A.M.**, Jang, J., Krakauer, J.W., Shadmehr, R. Neural integration in the serial control of reaching and holding still. Advances in Motor Learning and Motor Control, San Diego, CA, November 2018.

Hadjiosif, A.M. and Haith, A.M. Implicit adaptation is driven by the update of an inverse model, not a forward model. 28th Annual Neural Control of Movement Conference, Santa Fe, NM, May 2018.

Hadjiosif, A.M. and Haith, A.M. Practicing a de novo skill alters the adaptive response to subsequent perturbations. 47th Society for Neuroscience Annual Meeting, Washington, DC, November 2017.

Hadjiosif, A.M. and Haith, A.M. Formation and adaptation of a de novo controller. 27th Annual Neural Control of Movement Conference, Dublin, Ireland, May 2017.

Hadjiosif, A.M. and Smith, M.A. Direct evidence for a trial by trial estimate of the variance of environmental dynamics in motor control. 45th Society for Neuroscience Annual Meeting, Chicago, IL, October 2015.

Smith, M.A. and **Hadjiosif, A.M.**. Time scales of motor memory in cerebellar ataxia. 44th Society for Neuroscience Annual Meeting, Washington, D.C., November 2014.

Hadjiosif, A.M., Mallett, K.E. and Smith, M.A. The effect of visual feedback latency on the retention and internal representation of visuomotor learning. 44th Society for Neuroscience Annual Meeting, Washington, D.C., November 2014.

Hadjiosif, A.M., Mallett, K.E. and Smith, M.A. Visual feedback latency reduces the retention of visuomotor learning and alters its internal representation. 24th Annual Neural Control of Movement Conference, Amsterdam, The Netherlands, April 2014.

Hadjiosif, A.M. and Smith, M.A. Generalization of the temporally-labile and temporally-stable components of motor memory. 43rd Society for Neuroscience Annual Meeting, San Diego, CA, November 2013.

Hadjiosif, A.M. and Smith, M.A. The motor system implements smart safety margins based on estimates of environmental variability for both grip force control and obstacle avoidance. 43rd Society for Neuroscience Annual Meeting, San Diego, CA, November 2013.

Hadjiosif, A.M., Biljana, P. and Smith, M.A. Motor Personalities and Motor Moods in the Retention of Visuomotor Adaptation 23rd Annual Neural Control of Movement Conference, San Juan, PR, April 2013.

Hadjiosif, A.M., Petreska, B. and Smith, M.A. Mechanisms underlying the temporal stability of visuomotor adaptation. 42nd Society for Neuroscience Annual Meeting, New Orleans, LA, October 2012.

Brennan, A.E., **Hadjiosif, A.M.** and Smith, M.A. Mechanisms for structural learning. 42nd Society for Neuroscience Annual Meeting, New Orleans, LA, October 2012.

Hadjiosif, A.M. and Smith, M.A. Learning rate modulation vs. dimensionality reduction as a mechanism for structural learning. 22nd Annual Neural Control of Movement Conference, Venice, Italy, April 2012.

Smith, M.A. and **Hadjiosif, A.M.**. Mechanisms for variability estimation in the motor system. 22nd Annual Neural Control of Movement Conference, Venice, Italy, April 2012.

Hadjiosif, A.M. and Smith, M.A. Variance and higher order statistics drive grip force adaptation. 41st Society for Neuroscience Annual Meeting, Washington, D.C., November 2011.

Hadjiosif, A.M. and Smith, M.A. The motor system estimates uncertainty and higher order statistics for the control of grip forces. 33rd Annual International IEEE EMBS Conference, Boston, MA, August-September 2011.

Hadjiosif, A.M., Brayanov, S.P. and Smith, M.A. Grip force adaptation during a reaching task reflects uncertainty on environmental dynamics. 40th Society for Neuroscience Annual Meeting, San Diego, CA, November 2010.

Hadjiosif, A.M., Brayanov, J.B., Orozco, S.P. and Smith, M.A. Uncertainty drives grip force adaptation during interaction with a novel object. 20th Annual Neural Control of Movement Conference, Naples, FL, April 2010.

REFERENCES	Professor John W. Krakauer, Johns Hopkins University (jkrakau1@jhmi.edu) Professor Maurice A. Smith, Harvard University (mas@seas.harvard.edu) Professor Adrian M. Haith, Johns Hopkins University (adrian.haith@jhu.edu)
PROFESSIONAL SERVICE	Ad-hoc reviewer for the National Science Foundation - Perception, Action, and Cognition Reviewer for the <i>Journal of Neurophysiology</i> , <i>European Journal of Neuroscience</i> , <i>Experimental Brain Research</i> , <i>PLOS One</i> , <i>Journal of Motor Behavior</i> , <i>Scientific Reports</i> , and <i>Brain Communications</i> .
OTHER ACADEMIC ACTIVITIES	Co-organizer, 2nd Student Conference for Electrical and Computer Engineers, Athens, April 2008.
COMPUTER SKILLS	Matlab, C++, Java, Adobe Illustrator.
SPOKEN LANGUAGES	English (fluent), Greek (native).