Richard Hardstone

Email: rhardstone@gmail.com
Website: https://rhardstone.netlify.app/

Education:

- 2010 – 2016: VU University Amsterdam, Netherlands – **Neuroscience PhD**
  Thesis: Neuronal oscillations as a critical phenomenon and its implications for information processing
  Courses: Included functional neuroanatomy, cognitive neuroscience, statistics
- 2007 – 2010: Leiden University, Netherlands – Media Technology
  Courses: Included neuroinformatics, cognitive neuroscience of language
- 2002 – 2006: Imperial College, London, England – **Computing MEng** (**Honours**)
  Thesis: Policy prediction for swarm robotics
  Courses: Included complexity, intelligent data and probabilistic inference

Employment:

- 2016 – 2020: Perception and brain dynamics lab, Neuroscience Institute, NYU Grossman School of Medicine, NYU Langone Health, New York NY, Post-doctoral fellow
- 2015 – 2016: Perception and brain dynamics lab, National Institute of Neurological Disorders and Stroke, NIH, Bethesda MD, Pre-doctoral fellow
- 2010 – 2015: Neuronal oscillations and cognition lab, Dept. of Integrative Neurophysiology, VU University Amsterdam, Researcher
- 2005: IT department, Mintel International Group Ltd. Intern

Grants awarded:

- 2010: Neuroscience Campus Amsterdam: Young talent grant. 15 months funding to develop computational model of critical-state dynamics and neuronal oscillations

Published papers:

- A.-E. Avramiea*, **R. Hardstone***, J.-M. Lueckmann, J. Bim, H. D. Mansvelder, K. Linkenkaer-Hansen 2020: Pre-stimulus phase and amplitude regulation of phase-locked responses is maximized in the critical state. *eLife, 9, e53016* (*Joint first author) (Google Scholar: 2 citations)
- H. Bruining***, R. Hardstone***, E. Juarez-Martinez*, J. Sprengers*, A.-E Avramiea, S. Simpraga, S. Houtman, S.-S Poil, E. Dallares, S. Palva, B. Oranje, J. Palva, H. D. Mansvelder 2020. Measurement of excitation-inhibition ratio in autism spectrum disorder using critical brain dynamics. *Scientific Reports 10, 9195* (*Joint first author) (Google Scholar: 2 citations)
- M.W. Founders, C. Gonzalez-Garcia, **R. Hardstone**, B.J. He 2019: Neural dynamics of visual ambiguity resolution by perceptual prior. *eLife, 8, e41861*. (Google Scholar: 9 citations)
- B. Diaz, **R. Hardstone**, H. D. Mansvelder, E. Van Someren & K. Linkenkaer-Hansen 2016: Resting-state subjective experience and EEG biomarkers are associated with sleep-onset latency. *Frontiers in Psychology, 7, 492*. (Google Scholar: 8 citations)
- B. Diaz, S. Van Der Sluis, J. Benjamins, D. Stoffers, **R. Hardstone**, H. D. Mansvelder, E. Van Someren, & K. Linkenkaer-Hansen 2014: The ARSQ 2.0 reveals age and personality effects on mind-wandering experiences. *Frontiers in Psychology, 5, 271.* (Google Scholar: 38 citations)
- B. Diaz, S. Van Der Sluis, S. Moens, J. Benjamins, F. Migliorati, D. Stoffers, A. Den Braber, S.-S. Poil, **R. Hardstone**, D. Van 't Ent, D. Boomsma, E. De Geus, H. D. Mansvelder, E. Van Someren, & K. Linkenkaer-Hansen 2013: The Amsterdam Resting-State Questionnaire reveals multiple Phenotypes of Resting-State Cognition. *Frontiers in Human Neuroscience,* 7, 446-446. (Google Scholar: 102 citations)
- **R. Hardstone**, S.-S. Poil, G. Schiavone., R. Jansen, V. V. Nikulin, H. D. Mansvelder, & K. Linkenkaer-Hansen 2012: Detrended fluctuation analysis: a scale-free view on neuronal oscillations. *Frontiers in Physiology, 3, 1–13.* (Google Scholar: 258 citations)
- S.-S. Poil*, **R**. **Hardstone***, H. D. Mansvelder, & K. Linkenkaer-Hansen 2012: Critical-state dynamics of avalanches and oscillations jointly emerge from balanced excitation/inhibition in

neuronal networks. *The Journal of Neuroscience*, *32, 9817–23.* (*Joint first author) (Google Scholar: 232 citations)

Book chapters:

- **R. Hardstone**, H. Mansvelder, K. Linkenkaer-Hansen 2014: The neuronal network oscillation as a critical phenomenon. *Criticality in neural systems, 293-318, John Wiley & Sons.* (Google Scholar: 1 citation)

Papers in preparation:

- **R. Hardstone**, M. Zhu, A. Flinker, L. Melloni, S. Devore, D. Friedman, P. Dugan, W.K. Doyle, O. Devinsky, B.J. He: Lifelong priors bias visual perception through recruitment of long-range feedback (Under Review)
- **R. Hardstone**, M. W. Flounders, M. Zhu, B.J. He: Neural signatures of perceptual content and memory trace during bistable perception
- M. Zhu*, **R. Hardstone***, B.J. He: tDCS effects on switching dynamics in bistable perception
- W. Muñoz, D. Levenstein, K. Manson, **R. Hardstone**, B. Rudy: M1-type cholinergic receptor modulation couples changes in arousal to network activation during wakefulness
- B. Leeman-Markowski, L. Lohnas, **R. Hardstone**, B. Cowan, L. Davachi, W. Doyle, P. Dugan, D. Friedman, L. Melloni, I. Selesnick, B. Wang, O. Devinsky, K. Meador: Effects of timing, duration, and spatial extent of hippocampal interictal discharges on free recall
- TJ Baumgarten**,** J.L. Lee, B. Maniscalco, **R. Hardstone**, A. Flinker, D. Friedman, P. Dugan, W.K. Doyle, L. Melloni, O. Devinsky, B.J. He: Neural stimulus integration underlying naturalistic sequence prediction

Conference proceedings:

- SFN, San Diego CA, 2018: Neural signatures of perceptual content and memory trace during bistable perception
- Neuroscience Institute Retreat, Mohonk NY, 2017: Large scale neural dynamics in bistable perception
- Resting state conference, Boston MA, 2014: EEG correlates of resting state cognition
- Biomag, Halifax NS, 2014: Critical-state dynamics of neuronal oscillations leads to optimal range of evoked responses and information processing
- Biomag, Halifax NS, 2014: EEG correlates of resting state cognition
- Brainmodes, Amsterdam, 2013: Critical-state dynamics of spontaneous oscillations leads to optimal range of stimulus-evoked phase locking
- Criticality in Neural Systems, NIH Bethesda MD, 2012: Critical-state dynamics of avalanches and oscillations jointly emerge from balanced excitation/inhibition in neuronal networks
- FENS, Amsterdam, 2010: Multi-scale criticality in neuronal network models of ongoing oscillations

Talks:

- Group Meeting, Max Planck Institute, Leipzig, 2020: Non-invasive estimation of excitation/inhibition balance in humans
- iEEG Meeting, NYUMC, 2018: Resolving ambiguous perception through frequency-dependent feedforward and feedback communication
- Group Meeting talk, Neuroscience Institute, NYUMC, 2017: Large-scale neural dynamics in bistable perception
- iEEG Meeting, NYUMC, 2016: Neuronal population dynamics in bistable perception
- Department Seminar, CNCR VU Amsterdam, 2015: Implications of scale-free neuronal oscillations for perception and behaviour
- Post-doctoral candidate seminar, NINDS NIH Bethesda, 2015: Implications of scale-free neuronal oscillations for perception and behavior
- Graduate School Neurosciences Amsterdam Rotterdam, 2014: Understanding complex variability in stimulus response

- Swammerdam Master Class, University of Amsterdam, 2014: Stimulus-evoked responses depend on criticality of spontaneous neuronal oscillations
- Annual meeting, Neuroscience Campus Amsterdam, 2014: To make or break connections
- Foundations meeting, Radboud University, 2013: A scale-free view on neural dynamics

Patents:

- PCT/NL2019/050167: Method of determining brain activity. Priority Date 16 March 2018

Teaching:

- 2011 – 2014 Human neurophysiology 2011-2014, VU University Amsterdam, Tutor
- 2011 – 2014 Advanced human neurophysiology, VU University Amsterdam, Tutor
- 2013 – 2015 Mind and machine, VU University Amsterdam, Tutor

Reviewer:

- Neuroimage
- Frontiers in computational neuroscience
- Journal of Neuroscience (with advisor)

Mentoring (6+ months)**:**

- Brain Stimulation and Perception:
  - Michael Zhu (Now Data Science Masters Student, Berkeley)
- MEG analysis:
  - Matthew flounders (Now Medical student, PCOM)
- Computational modelling:
  - Jan-Matthis Lueckmann (Now PhD student with Prof. J. Macke)
  - Jan Bim (Completed PhD with Prof. S. Panzeri)
  - Istvan Nador (Completed MSc computer science)
- Neurofeedback for Insomnia:
  - Michele Columbo (Completed PhD with Prof. E. van Someren)
  - Kim Meijer (Completed PhD with Prof. J. Geurts)
  - Thijs Rinsma (Completed MSc neuroscience)
- Brain-Computer Interfaces:
  - Lorena Freitas (Now PhD student with Prof. D. Van De Ville and Prof. P. Hüppi)

Technical skills:

- Human neural recordings, stimulation and analysis: EEG (Experienced), MEG (Experienced), ECOG (Experienced), fMRI (Basic), Laminar electrodes and UTAH array (Basic), Neuropace RNS (Basic), tDCS (Basic)
- Experiment software: Eprime, PsychToolbox, PsychoPy, Presentation
- Programming Languages: Java (Experienced), Matlab (Experienced), C/C++ (Basic), Python (Basic)
- Development team Neurophysiological Biomarker Toolbox: www.nbtwiki.net
- Linux: Server administrator for Lab Servers
- High Performance Computing: SLURM, SGE scheduling

References:

- PhD Advisor: Klaus Linkenkaer-Hansen, PhD (k.linkenkaerhansen@vu.nl), PI in Dept. of Integrative Neurophysiology, CNCR, VU University Amsterdam
- Post-Doc Advisor: Biyu Jade He, PhD (biyu.he@nyulangone.org), PI in Neuroscience Institute, NYU Langone Health
- Collaborator: Beth A. Leeman-Markowski, MD (Beth.Leeman-Markowski@nyulangone.org), Assistant Professor, Department of Neurology, NYU Langone Health