Marcelo Gomes Mattar

marcelomattar@gmail.com www.marcelomattar.com marcelomattar mgmattar

Academic Positions

University of Cambridge – Cambridge, UK

Newton International Fellow, Department of Engineering (Advisor: Máté Lengyel) *2018 – Present*

Princeton University – Princeton, NJ, USA

Postdoctoral Research Associate, Princeton Neuroscience Institute (Advisor: Nathaniel Daw) *2016 – Present*

Education

University of Pennsylvania – Philadelphia, PA, USA

Ph.D. Psychology (Advisors: Danielle Bassett, Geoff Aguirre, Sharon Thompson-Schill) *2016*

M.A. Statistics *2016*

M.A. Psychology *2011*

Aeronautics Institute of Technology (ITA) – Sao Jose dos Campos, SP, Brazil

B.A. Electronics Engineering *2009*

Funding

- Newton International Fellowship (Royal Society, UK) *2018 – 2020*
- Fundação Estudar (Brazil) *2010 – 2016*

Publications

Submitted manuscripts

[1] Tang, E., **Mattar, M. G.**, Giusti, C., Thompson-Schill, S. L., & Bassett, D. S. (Provisionally accepted at *Nature Neuroscience*). Effective learning is accompanied by increasingly efficient dimensionality of whole-brain responses. *arXiv preprint arXiv:1709.10045*.

[2] Lee, R. S. **Mattar, M. G.**, Parker, N. F., Witten, I. B., Daw, N. D. (Under review). Value representations do not explain movement selectivity in DMS-projecting dopamine neurons. *bioRxiv, 447532.*

[3] Adebimpe, A., Bertolero, M., Khambhati, A. N., **Mattar, M. G.**, Romer, D., Thompson-Schill, S. L., Bassett, D. S. (Under review). Dynamic constraints on activity and connectivity during the learning of value. *bioRxiv, 448464.*

Journal articles

[4] **Mattar, M. G.**, Carter, M. V., Zebrowitz, M. S., Thompson-Schill, S. L., & Aguirre, G. K. (In Press). Individual differences in response precision correlate with adaptation bias. *Journal of Vision.*

[5] **Mattar, M. G.**, & Daw, N. D. (2018). Prioritized memory access explains planning and hippocampal replay. *Nature neuroscience*, 21, 1609–1617.

[6] **Mattar, M. G.***, Olkkonen, M.*, Epstein, R. A., & Aguirre, G. K. (2018). Adaptation decorrelates shape representations. *Nature Communications,* 9, 3812. (* Equal contribution)

[7] **Mattar, M. G.**, Thompson-Schill, S. L., & Bassett, D. S. (2018). The network architecture of value learning. *Network Neuroscience*, 2(02), 128-149.

[8] **Mattar, M. G.**, Wymbs, N. F., Bock, A. S., Aguirre, G. K., Grafton, S. T., & Bassett, D. S. (2018). Predicting future learning from baseline network architecture. *NeuroImage*, 172, 107-117.

[9] Reddy, P. G., **Mattar, M. G.**, Murphy, A. C., Wymbs, N. F., Grafton, S. T., Satterthwaite, T. D., & Bassett, D. S. (2018). Brain state flexibility accompanies motor-skill acquisition. *NeuroImage*, 171, 135-147.

[10] Khambhati, A. N., **Mattar, M. G.**, Wymbs, N. F., Grafton, S. T., & Bassett, D. S. (2018). Beyond modularity: Fine-scale mechanisms and rules for brain network reconfiguration. *NeuroImage*, 166, 385-399.

[11] Bassett, D. S., & **Mattar, M. G.** (2017). A network neuroscience of human learning: potential to inform quantitative theories of brain and behavior. *Trends in cognitive sciences*, 21(4), 250-264.

[12] Ashourvan, A., Gu, S., **Mattar, M. G.**, Vettel, J. M., & Bassett, D. S. (2017). The energy landscape underpinning module dynamics in the human brain connectome. *Neuroimage*, 157, 364-380.

[13] Gu, S., Betzel, R. F., **Mattar, M. G.**, Cieslak, M., Delio, P. R., Grafton, S. T., Pasqualetti, F. and Bassett, D. S. (2017). Optimal trajectories of brain state transitions. *Neuroimage*, 148, 305-317.

[14] **Mattar, M. G.***, Kahn, D. A.*, Thompson-Schill, S. L., & Aguirre, G. K. (2016). Varying timescales of stimulus integration unite neural adaptation and prototype formation. *Current Biology*, 26(13), 1669-1676. (* Equal contribution)

[15] **Mattar, M. G.***, Betzel, R. F.*, & Bassett, D. S. (2016). The flexible brain. *Brain*, 139(8), 2110-2112. (* Equal contribution)

[16] Kahn, A. E., **Mattar, M. G.**, Vettel, J. M., Wymbs, N. F., Grafton, S. T., & Bassett, D. S. (2016). Structural pathways supporting swift acquisition of new visuomotor skills. *Cerebral cortex*, 27(1), 173-184.

[17] Chai, L. R., **Mattar, M. G.**, Blank, I. A., Fedorenko, E., & Bassett, D. S. (2016). Functional network dynamics of the language system. *Cerebral Cortex*, 26(11), 4148-4159.

[18] **Mattar, M. G.**, Cole, M. W., Thompson-Schill, S. L., & Bassett, D. S. (2015). A functional cartography of cognitive systems. *PLoS computational biology*, 11(12), e1004533.

[19] Pegors, T. K.*, **Mattar, M. G.***, Bryan, P. B., & Epstein, R. A. (2015). Simultaneous perceptual and response biases on sequential face attractiveness judgments. *Journal of Experimental Psychology: General*, 144(3), 664. (* Equal contribution)

[20] Wyble, B., Potter, M. C., & **Mattar, M.** (2012). RSVP in orbit: Identification of single and dual targets in motion. *Attention, Perception, & Psychophysics*, 74(3), 553-562.

[21] Aguirre, G. K., **Mattar, M. G.**, & Magis-Weinberg, L. (2011). de Bruijn cycles for neural decoding. *NeuroImage*, 56(3), 1293-1300.

BOOK CHAPTERS

[22] **Mattar, M. G.**, & Bassett, D. S. (2016). Brain network architecture: Implications for human learning. To appear in the volume *Network Science in Cognitive Psychology* (Routledge).

[23] Yaden, D. B., Anderson, D. E., **Mattar, M. G.**, & Newberg, A. B. (2015). Psychoactive stimulation and psychoactive substances: Conceptual and ethical considerations. *The psychedelic policy quagmire: Health, law, freedom, and society*, 219-236.

Conference abstracts

[1] Lee, R. **Mattar, M. G.**, Parker, N. F., Witten, I. B., Daw, N. D. (2018). Dopamine neurons targeting dorsomedial striatum are modulated by reward and choice independently. Poster to be presented at Society for Neuroscience (SfN), Nov 03-07, 2015, San Diego, CA, USA.

[2] **Mattar, M. G.**, Talmi, D., & Daw, N. D. (2018). Memory mechanisms predict sampling biases in sequential decision tasks (2018). Poster presented at Annual conference on cognitive computational neuroscience (CCN), September 05-08, 2018, Philadelphia, PA, USA.

[3] **Mattar, M. G.**, & Daw, N. D. (2018) Prioritized memory access explains planning and hippocampal replay (2018). Poster presented at Computational and Systems Neuroscience (Cosyne), March 01-04, 2018, Denver, CO, USA.

[4] Tang, E., **Mattar, M. G.**, Giusti, C., Thompson-Schill, S. L., & Bassett, D. S. (2018). Effective learning is accompanied by high dimensional efficient representations of neural activity. Poster presented at Computational and Systems Neuroscience (Cosyne), March 01-04, 2018, Denver, CO, USA.

[5] Khambhati, A. N., **Mattar, M. G.**, & Bassett, D. S. (2017). Non-negative matrix factorization uncovers topological modes of dynamic brain networks, 2017. Poster presented at Organization for Human Brain Mapping (OHBM), June 25-29, 2017, Vancouver, BC, Canada.

[6] **Mattar, M. G.**, & Daw, N. D. (2017). A rational model of prioritized experience replay. Poster presented at 3rd Multidisciplinary Conference on Reinforcement Learning and Decision Making (RLDM), June 11-14, 2017, Ann Arbor, MI, USA.

[7] Bock, A., Benson, N., **Mattar, M. G.**, & Aguirre, G. (2016). Template fitting to automatically derive V1-V3 retinotopy from inter-areal functional correlations. Poster presented at the Vision Sciences Society (VSS), May 13-18, 2016, St Petersburg, FL, USA.

[8] **Mattar, M. G.**, Wymbs, N. F., Bock, A. S., Aguirre, G. K., Grafton, S. T., & Bassett, D. S. (2015) Predicting future learning from baseline network architecture, 2015. Poster presented at Society for Neuroscience (SfN), Oct 17-21, 2015, Chicago, IL, USA.

[9] Chai, L. R., **Mattar, M. G.**, Blank, I. A., Fedorenko, E., & Bassett, D. S. (2015). Functional network dynamics of the language system. Poster presented at Society for Neuroscience (SfN), Oct 17-21, 2015, Chicago, IL, USA, 2015.

[10] Chai, L. R., **Mattar, M. G.**, Blank, I. A., Fedorenko, E., & Bassett, D. S. (2015). Functional network dynamics of the language system. Poster presented at Biomedical Engineering Society Annual Meeting (BMES), Oct 7-10, 2015, Tampa, FL, USA, 2015.

[11] **Mattar, M. G.**, Olkkonen, M., Aguirre, G. K., & Epstein, R. A. (2015). Adaptation decorrelates object representations: Evidence from Multivoxel Pattern Analysis. Poster presented at the Vision Sciences Society (VSS), May 15-20, 2015, St Petersburg, FL, USA.

[12] Olkkonen, M., **Mattar, M. G.**, Aguirre, G. K., & Epstein, R. A. (2015). Adaptation sharpens object representations: Evidence from shape discrimination thresholds. Poster presented at the Vision Sciences Society (VSS), May 15-20, 2015, St Petersburg, FL, USA.

[13] **Mattar, M. G.**, Carter, M. V., Zebrowitz, M. S., Thompson-Schill, S. L., & Aguirre, G. K. (2015). Individual differences in response precision correlate with adaptation bias. Poster presented at the Vision Sciences Society (VSS), May 15-20, 2016, St Petersburg, FL, USA.

[14] **Mattar, M. G.**, Cole, M. W., Thompson-Schill, S. L., & Bassett, D. S. (2014). A functional cartography of cognitive systems. Poster presented at Society for Neuroscience (SfN), Nov 15-19, 2014, Washington, DC, USA.

[15] Baker, D., Gu, S., Khambhati, A. N., **Mattar, M. G.**, Muldoon, S. F., Telesford, W, Yang, M., and Bassett, D. S. (2014) The network community architecture toolbox (ncat). Poster presented at Society for Neuroscience (SfN), Nov 15-19, 2014, Washington, DC, USA.

[16] Pegors, T., Bryan, P., **Mattar, M G.**., & Epstein, R. A. (2014). Decoupling perceptual and response biases in a sequential face judgment task. Poster presented at the Vision Sciences Society (VSS), May 14-19, 2014, St Petersburg, FL, USA., St Petersburg, FL, USA.

[17] **Mattar, M. G.***, Kahn, D. A.*, & Aguirre, G. K. (2014). A single mechanism of temporal integration unites neural adaptation and norm-based coding. Poster presented at the Vision Sciences Society (VSS), May 14-19, 2014, St Petersburg, FL, USA. (* Equal contribution)

[18] **Mattar, M. G.**, Magis-Weinberg, L., and Aguirre, G. K. De Bruijn cycles for neural decoding (2011). Poster presented at the Vision Sciences Society (VSS), May 06-11, 2011, Naples, FL, USA.

Invited talks

- Kavli Summer Institute in Cognitive Neuroscience, Santa Barbara, CA, US – Jun 2019
- Max Planck UCL Centre (Computational Psychiatry seminar series), London, UK – Jan 2019
- Institute of Molecular Biology and Biotechnology, Heraklion, Crete – Oct 2018
- Cognitive Science Society (CogSci 2018), Madison, WI, US– Jul 2018
- University College London, London, UK – Jan 2018
- Manhattan Area Memory Meeting (MAMM), New York, NY, US – Jun 2017
- Princeton Neuroscience Institute Retreat, Avalon, NJ, US – May 2017
- International Convention of Psychological Science (ICPS), Vienna, Austria – Mar 2017
- Princeton University, Princeton, NJ, US – Mar 2016
- Max Planck UCL Centre (Computational Psychiatry seminar series), London, UK – Feb 2016
- Harvard University, Boston, MA, US – Feb 2016

Select awards

- **Travel grant**, Cosyne 2018
- **Fellowship**, Summer Institute in Cognitive Neuroscience
- **Best poster award**, Repetition Suppression Summer School

Peer-review contribution

Guest editor

- PLoS computational biology

Reviewer

- Medical Research Council (MRC)
- PLoS computational biology
- Neuroimage
- Cerebral Cortex
- Nature Scientific Reports
- Neuropsychologia
- Human Brain Mapping
- Biomedical Signal Processing Control

Teaching and mentoring

Guest lecturer

- BE 566 – Network Neuroscience (University of Pennsylvania, Sep 2017)
- BE 566 – Network Neuroscience (University of Pennsylvania, Feb 2016)

TEACHING ASSISTANT

- PSYC151 – Language and Thought (University of Pennsylvania, Spring 2012)
- PSYC111 – Perception (University of Pennsylvania, Fall 2011)

STUDENT SUPERVISION

- Jyotsna Grandhi (Princeton, 2018-Present)
- Rachel Lee (Princeton, 2017-Present)
- Pranav Reddy (University of Pennsylvania, 2015-2016)
- Lucy Chai (University of Pennsylvania, 2015-2016)
- Marie Carter (University of Pennsylvania, 2014-2015)
- Siera Martinez (University of Pennsylvania, 2014-2015)
- Marc Zebrowitz (University of Pennsylvania, 2013-2014)
- Jan Savinc (University of Pennsylvania, 2012)