MÁTÉ LENGYEL

CURRICULUM VITÆ

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Contact

Computational and Biological Learning Lab
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Personal

Date of birth: 7 March 1975
Marital status: married, one child
Nationality: Hungarian

Research interests

The brain has a remarkable capacity to learn continuously about the environment and to use this knowledge flexibly to make predictions and guide its future decisions. I study learning and memory from computational, algorithmic/representational and neurobiological viewpoints. I also maintain an active interest in the possible computational functions of neural oscillations, particularly those present in the hippocampus and neocortex. Computationally and algorithmically, I use ideas from Bayesian approaches to statistical inference and reinforcement learning to characterize the goals and mechanisms of learning in terms of normative principles and behavioral results. I also perform dynamical systems analyses of reduced biophysical models to understand the mapping of these mechanisms into cellular and network models. I collaborate very closely with experimental neuroscience groups, doing in vitro intracellular recordings, multi-unit recordings in behaving animals, and human psychophysical experiments.

Research experience

2007–	Lecturer in Computational Neuroscience, Computational and Biological Learning Lab, Department of Engineering, University of Cambridge
2007	Visiting Research Fellow: Collegium Budapest Institute for Advanced Study, Budapest, Hungary host: Eörs Szathmáry
2004–2006	Postdoctoral Research Fellow: Gatsby Computational Neuroscience Unit, University College London, London, United Kingdom advisor: Peter Dayan

— Grants

2008–2010	Wellcome Trust Project Grant: 'Spike timing-based memory in the hippocampus' with Peter Dayan (UCL, UK) and Ole Paulsen (U Oxford, UK)
2006–2007	NWO - British Council Partnership Programme in Science with Francesco Battaglia (U Amsterdam, The Netherlands)
2006	British Council Franco-British Alliance Programme with Peter Dayan (Gatsby, UK) and Boris Gutkin (CNRS, France)

Teaching experience

2007	Lecturer: Selected Topics in Computational Neuroscience course, Budapest Semester in Cognitive Sciences, Eötvös Loránd University, Budapest, Hungary
2006	Guest Lecturer: 'Space and memory in the hippocampus', Theoretical Neuroscience course, Gatsby Computational Neuroscience Unit, University College London.
2005	Lecturer: 'Computational approaches to memory storage and retrieval in neural networks', 2005 GRK Summer School 'Neuroplasticity', London, U.K.
2005	Guest Lecturer: 'Theta oscillations and temporal coding in the hippocampus', Theoretical Neuroscience course, Gatsby Computational Neuroscience Unit, University College London
2004	Guest Lecturer: 'Autoassociative memory in the hippocampus', Topics in Neurobiology course, University College London, London, U.K.
2002–2003	Graduate Lecturer: Computational Neuroscience course, Faculty of Sciences, Eötvös Loránd University, Budapest, Hungary
2002	Teaching Assistant: Computational Neuroscience course, Center for Complex Systems Studies, Kalamazoo College, Kalamazoo, MI, USA
1999	Tutor: Romaversitas Invisible College, Roma Civil Rights' Foundation, Budapest, Hungary
1998–	Co-supervisor: 5 students, Computational Neuroscience Group, KFKI R.I.P.N.P, Hun. Acad. Sci., Budapest, Hungary
1998–2001	Teaching Assistant: Computational Neuroscience course, Faculty of Sciences, Eötvös Loránd University, Budapest, Hungary
1996	Lecturer: Computer Skills course, John Wesley Theological College, Budapest Hungary
1994	Teacher: Computer Science course, Berzsenyi Dániel High School, Budapest, Hungary

Other professional activities

Reviewing for European Journal of Neuroscience, Hippocampus, IEEE Transactions on Neural Networks, Journal of Computational Neuroscience, Journal of Neurophysiology, Neural Information Processing Systems, Physics Letters A.

— Professional memberships

2004–	Society for Neuroscience
2000–	Hungarian Neuroscience Society

Education

2002, 2003	EU Marie Curie Visiting Student: Neuroscience Sector, SISSA International School for Advanced Studies, Trieste, Italy; 4+4 months advisor: Alessandro Treves
2000–2003	Ph.D., Behavioral Neuroscience Program, Doctoral School of Biology, Faculty of Sciences, Eötvös Loránd University, Budapest, Hungary Thesis: 'The Theta Switch: Rate and Phase Coding in the Entorhino-Hippocampal System', advisor: Péter Érdi
1998–2000	M.Sc., Cell, Developmental and Neurobiology Program, Faculty of Sciences, Eötvös Loránd University, Budapest, Hungary Thesis: 'Differences Between Somatic and Dendritic Inhibition' (in Hungarian), advisor: Péter Érdi
1995–2004	Undergraduate Researcher, Assistant Researcher, Graduate Research Fellow, Research Fellow: Computational Neuroscience Group, KFKI Res. Inst. Part. Nucl. Phys., Hun. Acad. Sci., Budapest, Hungary advisor: Péter Érdi
1993–1998	B.Sc., Biology Program, Faculty of Sciences, Eötvös Loránd University, Budapest, Hungary

— Other training

2001	IBRO EU Advanced Course on Computational Neuroscience; Trieste, Italy, 4 weeks

— Awards

2000–2001	Distinguished Student of the Faculty Award
1999–2000	Scholarship of the Republic of Hungary
1999	2nd Prize, National Scientific Competition, Neurobiology II 'Differences Between Somatic and Dendritic Inhibition' (in Hungarian)
1998	1st Prize, University Scientific Competition, Neurobiology 'Differences Between Somatic and Dendritic Inhibition' (in Hungarian)

— Other scholarships

2003 Full scholarship for the 6th IBRO World Congress of Neuroscience; Prague (Czech Republic)

2002 Full scholarship for the 6th International Conference on Cognitive and Neural Systems; Boston (MA, USA)

2001 Full scholarship for the IBRO EU Advanced Course on Computational Neuroscience; Trieste (Italy)

Conference activities, presentations

— Organization

2007 Workshop on Statistical Inference in the Visual Cortex (Collegium Budapest Institute for Advanced Study, Budapest, Hungary)
co-organizer: József Fiser

2007 Budapest Computational Neuroscience Forum (Collegium Budapest Institute for Advanced Study, Budapest, Hungary)

2006 Workshop on Computing with Spikes (Cosyne 2006, Salt Lake City, UT, USA)
co-organizers: Sophie Deneve, Boris Gutkin

— Invited presentations

2007 **Lengyel M**, Dayan P. Emergent memories: matching storage and recall.
fellow seminar in Collegium Budapest Institute for Advanced Study, Budapest (Hungary), host: Eörs Szathmáry

2007 Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian ideal learning in human visual scene perception.
host: Eero Simoncelli (New York University, USA)

2006 **Lengyel M**, Dayan P. Uncertainty, phase and oscillatory hippocampal recall.
Workshop on 'Functional Models of the Hippocampal Formation' (CNS*2006), Edinburgh (UK); organizer: Laurenz Wiscott

2006 **Lengyel M**, Dayan P. Matching storage and recall: spike timing-dependent plasticity and phase response curves in the hippocampus.
Workshop on 'Phase Response Curves: Where Theory and Experiments Intersect' (CNS*2006), Edinburgh (UK); organizers: Tay Nettof, Horacio Rotstein

2006 **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
ENS/UCL Workshop on 'Computational Neuroscience: From Biophysics to Computation and Back', Paris (France); organizers: Sophie Deneve, Boris Gutkin

2006 **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
Workshop on 'Hippocampal Interactions Within the Medial Temporal Lobe', London (UK); organizer: Kate Jeffery

2006 **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
host: Francesco Battaglia (University of Amsterdam, The Netherlands)

2006 **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian model learning in human visual perception.
host: Fritz Sommer (University of California, Berkeley, USA)

2006 **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
host: Ildikó Aradi (Nortwestern University, Chicago, USA)

2006 Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian model learning in human visual perception.
host: Richard Aslin (University of Rochester, USA)

2006 Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian model learning in human visual perception.
host: Rich Zemel (University of Toronto, Canada)

2005 **Lengyel M**, Huhn Zs, Orbán G, Érdi P. Dynamically detuned oscillations account for rate and phase coding in the hippocampus.
host: Francesco Battaglia, CNRS, France

2004 **Lengyel M**, Dayan P. Matching storage and recall: constructing optimal rate- and phase-coded autoassociative memories.
host: Ole Paulsen, University of Oxford, UK

2004 **Lengyel M**, Huhn Zs, Orbán G, Érdi P. Dynamically detuned oscillations account for rate and phase coding in the hippocampus.
host: Michael Hausser, University College London, UK

2004 **Lengyel M**, Huhn Zs, Orbán G, Érdi P. Dynamically detuned oscillations account for rate and phase coding in the hippocampus.
Workshop on 'Theta Oscillations in the Brain: Neural Mechanisms and Functions', London (UK); organizers: Neil Burgess, John O'Keefe

— Selected regular attendance

2007 20th Neural Information Processing Systems Conference; Vancouver (BC, Canada)
- *o* **Lengyel M**, Dayan P. Hippocampal contributions to control: the third way

2007 1st Neural Coding, Computation and Dynamics Workshop; Hossegor (France)
- *p* **Lengyel M**, Dayan P. Back to the future: episodic memories for control.

2007 4th Computational and Systems Neuroscience Conference; Salt Lake City (UT, USA)
- *p* **Lengyel M**, Dayan P. Hippocampal contributions to control: a normative perspective
- *p* Orbán G, Fiser J, **Lengyel M**. V1 activity as optimal Bayesian inference
- *p* Fiser J, Orbán G, Aslin RN, **Lengyel M**. Ideal Bayesian learning in human scene perception

2006 19th Neural Information Processing Systems Conference; Vancouver (BC, Canada)
- *o* **Lengyel M**, Dayan P. Uncertainty, phase, and oscillatory hippocampal recall.

2006 3rd Computational and Systems Neuroscience Conference; Salt Lake City (UT, USA)
- *o* **Lengyel M**, Dayan P. Firing rates and times in the hippocampus: what are they good for?
- *p* Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian model learning in human visual perception.

2005 18th Neural Information Processing Systems Conference; Vancouver (BC, Canada)
- *p* Orbán G, Fiser J, Aslin RN, **Lengyel M**. Bayesian model learning in human visual perception.

2005 2nd Computational and Systems Neuroscience Conference; Salt Lake City (UT, USA)
- *p* **Lengyel M**, Jeehyun Kwag, Ole Paulsen, Peter Dayan. Matching storage and recall: constructing optimal rate- and phase-coded autoassociative memories.

2004 17th Neural Information Processing Systems Conference; Vancouver (BC, Canada)
- *p* **Lengyel M**, Dayan P. Rate- and phase-coded autoassociative memories: Bayesian inference.

2004 34th Annual Meeting of the Society for Neuroscience; San Diego (CA, USA)
- *o* **Lengyel M**, Dayan P. Rate- and phase-coded autoassociative memories: Bayesian inference.

2004 IBRO International Workshop on Neuronal Circuits: from Elementary to Complex Functions; Budapest (Hun.)
- *p* Huhn Zs, Orbán G, **Lengyel M**, Érdi P. Rate and temporal coding in a biophysical model of a hippocampal place cell

2003 6th IBRO World Congress of Neuroscience; Prague (Czech Republic)
- *p* **Lengyel M**, Érdi P, Treves A. Decoding the activity of neural networks: biological decoding and constant metric content.

2003 12th Annual Computational Neuroscience Meeting; Alicante (Spain)
- *p* **Lengyel M**, Érdi P, Treves A. Decoding the activity of neural networks: biological decoding and constant metric content.
- *p* Papp G, Huhn Zs, **Lengyel M**, Érdi P. Effects of dendritic location and different components of LTP expression on the firing activity of hippocampal CA1 pyramidal cells.

2002 11th Annual Computational Neuroscience Meeting; Chicago (IL, USA)
- *p* **Lengyel M**, Szatmáry Z, Érdi P. Sharpening the spatial tuning curves of place cells in a feed-forward network: the possible role of theta oscillation-based dynamics in the hippocampus.
- *p* Orbán G, Kiss T, **Lengyel M**, Érdi P. Controlling pyramidal cell activity by bistable gamma-frequency oscillations in a network of hippocampal interneurons.

2002 6th International Conference on Cognitive and Neural Systems; Boston (MA, USA)

p **Lengyel M**, Szatmáry Z, Érdi P. Feed-forward networks in the hippocampus: Analysis of the possible role of theta oscillation and the phase precession effect in sharpening the spatial tuning curves of place cells.

2000 9th Annual Computational Neuroscience Meeting; Brugge (Belgium)

p **Lengyel M**, Szatmáry Z, Érdi P. A detuned oscillator model of place unit phase precession in the rat hippocampus.

o Orbán G, Kiss T, **Lengyel M**, Érdi P. Intrahippocampal gamma and theta rhythm generation in a network model of inhibitory interneurons.

1999 29th Annual Meeting of the Society for Neuroscience; Miami (FL, USA)

p **Lengyel M**, Szatmáry Z, Érdi P. A detuned oscillator model of place unit phase precession in the rat hippocampus.

1998 7th Annual Computational Neuroscience Meeting; Santa Barbara (CA, USA)

o **Lengyel M**, Kepecs Á, Érdi P. Location dependent differences between somatic and dendritic IPSPs.

p: poster presentation, o: oral presentation