

CURRICULUM VITAE

Prof. Dr. Dirk Ostwald
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RESEARCH MISSION

The mission of the Computational Cognitive Neuroscience group is to formulate mathematical models of human brain function and to empirically validate these using non-invasive functional neuroimaging (EEG and fMRI). Our current work clusters in four project areas that are fundamentally related by a probabilistic modelling approach and combines methodologies from statistics, machine learning, and artificial intelligence. On the neuroscientific side, we employ computational frameworks to understand the neural dynamics of statistical learning in sensory systems (e.g., Ostwald et al. 2008, Ostwald et al. 2012a) and decision making (e.g., Ostwald et al. 2012b, Ostwald et al. 2015, Georgie et al., 2018). On the data-analytical side, we have previously used a set of information-theoretic functionals defined on a model-free probabilistic model to study the correlative structure of simultaneous EEG-fMRI and behavioral data features (Ostwald et al. 2010, 2011a, 2011b). In more recent work, we use a model-based approach that embeds delay differential equation systems describing the interaction between cortical units in fully probabilistic forward models for EEG-fMRI (Ostwald & Starke 2016). Finally, we contribute to the development of a variational Bayesian approach for stochastic time-series analysis (Ostwald et al. 2014, Starke & Ostwald, 2017). Variational Bayes is a deterministic-approximate inference framework for probabilistic models. Variational Bayes enjoys widespread popularity as a general theory of brain function in the brain imaging field (“free energy principle”) and similar popularity in the field of artificial intelligence as a general learning tool (“variational autoencoders”).

PROFESSIONAL APPOINTMENTS

| | |
|-------------|--|
| 2014 – | Assistant Professor (W1) Computational Cognitive Neuroscience Department of Education and Psychology Freie Universität Berlin |
| 2014 – | Associated Scientist Center for Adaptive Rationality Max-Planck-Institute for Human Development |
| 2012 – 2014 | Research Scientist Center for Adaptive Rationality Max-Planck-Institute for Human Development |
| 2010 – 2012 | Research Scientist Bernstein Center for Computational Neuroscience Berlin |
| 2007 – 2010 | PhD Student School of Psychology University of Birmingham |

EDUCATION AND DEGREES

| | | |
|-------------|----------------------------------|--------------------------|
| 2005 – 2012 | BSc Mathematics | FernUniversität in Hagen |
| 2007 – 2010 | PhD Psychology | University of Birmingham |
| 2004 – 2006 | MSc Neuroscience | University of Tübingen |
| 2002 – 2003 | First State Examination Medicine | University of Hamburg |
| 2000 – 2002 | Preclinical Studies Medicine | University of Hamburg |

RESEARCH FUNDING

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|-------------|---|
| 2018 – 2019 | Berlin University Alliance OX/BER Research Partnership grant (€30,000) Project participant with Ulrich Dirnagl, Laura Fortunato, Dorothy Bishop <i>Berlin-Oxford Summer School on Open and Reproducible Research</i> |
| 2018 – 2020 | DFG research grant (€269,630) Co-PI with Klaus Obermayer <i>Risk-sensitive choice and reinforcement learning under uncertainty</i> |
| 2015 – 2016 | Freie Universität Berlin Center for Research Strategy grant (€14,800) Co-PI with Timo Schmid <i>Improving statistical inference in big data sets with spatiotemporal structure</i> |
| 2011 – 2013 | Hadwen Trust research grant (£134,151) Postdoctoral research fellowship (declined) <i>Development and experimental validation of an information theoretic approach to the multimodal integration of human EEG and fMRI data</i> |

FELLOWSHIPS AND AWARDS

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|-------------|--|
| 2017 | Wikimedia Open Science Fellows Program (€5,000) <i>Legal and ethical boundary conditions for the open exchange of neuroimaging data in basic research</i> |
| 2016 | Central Teaching Award of Freie Universität Berlin (€10,000) Co-PI with Ulf Toelch <i>Digital open science: A master-level course</i> |
| 2016 | NeuroImage Editor's Choice Award with Stephen Mayhew, Karen Mullinger, Andrew Bagshaw et al. <i>Global signal modulation of single-trial fMRI response variability: effect on positive vs. negative BOLD response relationship</i> |
| 2007 – 2009 | Graduate Studies Fellowship, University of Birmingham (£36,000) |
| 2001 – 2006 | German Academic Scholarship Foundation (~ €20,000) |

Working Papers

1. Tisdall L, Frey R, Horn A, **Ostwald D**, Horvath L, Blankenburg F, Hertwig R, Mata R (2018) Group and individual differences in the neural representation of described and experienced risk *PsyArxiv* DOI: 10.31234/osf.io/3sc9j
2. **Ostwald D**, Schneider S, Bruckner R, Horvath L (2018) Random field theory-based p-values: a review of the SPM implementation *arXiv: 1808.04075*
3. Georgie YK, Porcaro C, Mayhew SD, Bagshaw AP, **Ostwald D** (2018) A perceptual decision-making EEG/fMRI data set *BioRxiv* DOI:10.1101/253047
4. Krohn S, Froeling M, Leemans A, **Ostwald D**, Villoslada P, Finke C, Esteban FJ (2018) Evaluation of the 3D fractal dimension as a marker of structural brain complexity in multiple-acquisition MRI *BioRxiv* DOI:10.1101/124206

Journal Articles

5. Toelch U, **Ostwald D** (2018) Digital Open Science – Teaching digital tools for reproducible and transparent research *PLoS Biology* 16(7): e2006022
6. Starke L, **Ostwald D** (2017) Variational Bayesian parameter estimation techniques for the general linear model *Frontiers in Neuroscience | Brain Imaging Methods* doi:10.3389/fnins.2017.00504
7. Krohn S, **Ostwald D** (2017) Computing integrated information *Neuroscience of Consciousness* doi:10.1093/nc/nix017
8. **Ostwald D**, Starke L (2016) Probabilistic delay differential equation modelling of event-related potentials *NeuroImage* 136: 227–257
9. Mayhew S, Mullinger KJ, **Ostwald D**, Porcaro C, Bowtell R, Bagshaw AP, Francis ST (2016) Global signal modulation of single-trial fMRI response variability: effect on positive vs. negative BOLD response relationship *NeuroImage* 133: 62–74 [NeuroImage Editor’s Choice Award 2016]
10. Rollings DT, Asseondi S, **Ostwald D**, Porcaro C, McCorry D, Bagary M, Soryal I, Bagshaw AP (2016) Early haemodynamic changes observed in patients with epilepsy, in a visual experiment and in simulations *Clinical Neurophysiology* 127: 245-253
11. **Ostwald D**, Starke L, Hertwig R (2015) A normative inference approach for optimal sample sizes in decisions from experience *Frontiers in Psychology | Decision Neuroscience* doi:10.3389/fpsyg.2015.01342
12. Asseondi S, **Ostwald D**, Bagshaw AP (2015) Reliability of information-based integration of EEG and fMRI data: a simulation study *Neural Computation* 27(2): 281-305
13. Horn AG, **Ostwald D**, Reisert M, Blankenburg F (2014) The Structural-Functional Connectome and the Default Network of the Human Brain *NeuroImage* 102: 142–151

14. Schmidt TT, **Ostwald D**, Blankenburg F (2014) Imaging tactile imagery: Changes in brain connectivity support perceptual grounding of mental images in primary sensory cortices *NeuroImage* 98: 216–224
15. **Ostwald D**, Kirilina E, Starke, Blankenburg F (2014) A tutorial on variational Bayes for latent linear stochastic time-series models *Journal of Mathematical Psychology* 60, 1–19
16. Herzog SM, **Ostwald D** (2013) Sometimes Bayesian statistics are better *Nature* 494(7435):35 [Correspondence]
17. Mayhew SD, **Ostwald D**, Porcaro C, Bagshaw AP (2013) Spontaneous EEG alpha oscillation interacts with positive and negative BOLD responses in the visual-auditory cortices and default-mode network *NeuroImage* 76: 362–372
18. **Ostwald D**, Spitzer B, Guggenmos B, Schmidt T, Kiebel S, Blankenburg F (2012) Evidence for neural encoding of Bayesian surprise in human somatosensation *NeuroImage* 1;62(1):177-88
19. **Ostwald D**, Porcaro C, Mayhew SD, Bagshaw AP (2012) EEG-fMRI based information theoretic characterization of the human perceptual decision system *PLoS ONE* 7(4): e33896
20. Lei X, **Ostwald D**, Hu J, Qiu C, Porcaro C, Bagshaw AP, Yao D (2011) Multimodal functional network connectivity: an EEG-fMRI fusion in network space *PLoS ONE* 6(9):e24642
21. **Ostwald D**, Bagshaw AP (2011) Information theoretic approaches to functional neuroimaging *Magnetic Resonance Imaging* 29:1417-1428
22. Porcaro C, **Ostwald D**, Hadjipapas A, Barnes GA, Bagshaw AP (2011) The relationship between the visual evoked potential and the gamma band investigated by blind and semi-blind methods *NeuroImage* 56(3):1059-71
23. **Ostwald D**, Porcaro C, Bagshaw AP (2011) Voxel-wise information theoretic EEG-fMRI feature integration *NeuroImage* 55(3):1270-86
24. Noppeney U, **Ostwald D**, Werner S (2010) Perceptual decisions formed by accumulation of audiovisual evidence in prefrontal cortex *Journal of Neuroscience* 30(21):7434-46
25. Wühle A, Mertiens L, Rüter J, **Ostwald D**, Braun C (2010) Cortical processing of near-threshold tactile stimuli – an MEG study *Psychophysiology* 47: 523–534
26. Porcaro C, **Ostwald D**, Bagshaw AP (2010) Functional source separation improves the quality of single trial visual evoked potentials recorded during concurrent EEG-fMRI *NeuroImage* 50: 12–123
27. **Ostwald D**, Porcaro C, Bagshaw AP (2010) An information theoretic approach to EEG-fMRI integration of visually evoked responses *NeuroImage* 49: 498 – 516
28. **Ostwald D**, Lam J, Li S, Kourtzi Z (2008) Neural coding of global form in the human visual cortex *J Neurophysiology* 99:2456-2469
29. Li S, **Ostwald D**, Giese M, Kourtzi Z (2007) Flexible coding for categorical decisions in the human brain *Journal of Neuroscience* 27(45):12321-30

30. Karpac J, **Ostwald D**, Bui S, Hunnewell P, Hochgeschwender U (2006) Proopiomelanocortin heterozygous and homozygous null mutant mice develop pituitary adenomas *Cellular and Molecular Biology (Noisy-le-grand)* 30;52(2):47-52
31. **Ostwald D**, Karpac J, Hochgeschwender U (2006) Effects on hippocampus of lifelong absence of glucocorticoids in the proopiomelanocortin null mutant mouse reveal complex relationship between glucocorticoids and hippocampal structure and function *Journal of Molecular Neuroscience* 28(3):291-302
32. Karpac J, **Ostwald D**, Bui S, Hunnewell P, Shankar M, Hochgeschwender U (2005) Development, maintenance, and function of the adrenal gland in early postnatal proopiomelanocortin-null mutant mice *Endocrinology* 146(6):2555-62

EDITORIAL AND REVIEWING CONTRIBUTIONS | [PUBLONS PROFILE](#)

Editorial Board Membership

PLOS ONE, Frontiers in Neuroinformatics, Frontiers in Human Neuroscience

Journal Reviews

PNAS, Cerebral Cortex, NeuroImage, Human Brain Mapping, Scientific Reports, Frontiers in Human Neuroscience, Frontiers in Computational Neuroscience, Frontiers in Psychology, European Journal of Neuroscience, PLOS ONE, Cortex, Psychophysiology, Neurocomputing, Journal of Neural Engineering, Psychonomic Bulletin & Review, Psychiatry Research: Neuroimaging, Artificial Intelligence in Medicine, Cognitive Neurodynamics, Mathematical Biosciences, BioMed Research International, Entropy, Neuroinformatics

Research Grant Agencies Reviews

The Royal Society, Hong Kong Research Grant Council, UK Medical Research Council, Netherlands Organization for Scientific Research, Wikimedia Deutschland Open Science Fellows Program, Stiftung Charité

Conference Reviews

Cognitive Computational Neuroscience

ACADEMIC TEACHING | [YOUTUBE](#)

2014 –

- Statistical methods, MSc Program SCAN, Freie Universität Berlin (2 SWS)
- Neurocognitive methods and programming, MSc Program SCAN, Freie Universität Berlin (2 SWS)
- Research workshop MSc Program SCAN, Freie Universität Berlin (1 SWS)

2017

- Decision neuroscience, BSc Program Psychology, Freie Universität Berlin (2 SWS)
- Digital open science, Freie Universität Berlin (2 SWS)

2015

- Neuroeconomics, MSc Program Psychology, University of Basel (2 SWS)

2013 – 2014

- Statistical methods, MSc Program SCAN, Freie Universität Berlin (2 SWS)

2011 – 2013

- Advanced neurocognitive methods, MSc Program SCAN, Freie Universität Berlin

2010 – 2012

- Non-invasive methods in Neuroscience, MSc Program Computational Neuroscience, Bernstein Center for Computational Neuroscience Berlin

2008 – 2010

- Teaching assistant and teaching instructor providing support in undergraduate and graduate teaching in statistics, biological psychology, cognitive psychology, and student tutoring, School of Psychology, University of Birmingham

ACADEMIC SERVICE

Committee Management

- 2018 – Deputy Head of the Joint Committee MSc Data Science, Department of Mathematics and Computer Science and Department of Education and Psychology, Freie Universität Berlin
- 2015 – Head of MSc Social, Cognitive, and Affective Neuroscience Examination Board
Department of Education and Psychology, Freie Universität Berlin

PhD Student Supervision

- 2015 – Lilla Horvath
- 2016 – Rasmus Bruckner (co-supervised with Prof. Dr. Hauke Heekeren)

PhD Defense Committees

- 2019 Dr. Vahid Rahmati (Second Review)
- 2018 Dr. Kathrin Tertel (Second Review)
- 2018 Dr. Robert Ullrich
- 2018 Dr. Kai Zhuang
- 2018 Dr. Timo Torsten Schmidt
- 2017 Dr. Julia Huntenburg
- 2017 Dr. Joram Soch (Second Review)
- 2017 Dr. Jan Herding
- 2017 Dr. Shuang Guo (Second Review)
- 2017 Dr. Julia Rodriguez Buritica
- 2017 Dr. Tim Genewein (Third Review)
- 2017 Dr. Simon Ludwig
- 2016 Dr. Johannes Freiherr Heereman von Zuydtwyck
- 2016 Dr. Clemens Maidhof (Second Review)
- 2015 Dr. Jakub Limanowski
- 2015 Dr. Yulia Oganian
- 2015 Dr. Yan Fan
- 2014 Dr. Chun-Ting Tsu

PhD Advisory Committees

- 2016 – Lisa Venelosi, Bernstein Center for Computational Neuroscience, Berlin
- 2014 – 2018 Timo Schmidt, GRK Sensory Systems, Berlin
- 2014 – 2017 Jan Herding, Bernstein Center for Computational Neuroscience, Berlin

Master Thesis Supervision

- 2018 – Anna Gunia (SCAN, Freie Universität Berlin)
- 2018 – Nadine Spychalla (Philosophie, Carl von Ossietzky Universität Oldenburg)
- 2016 – 2019 Yasmin Kim Georgie (SCAN, Freie Universität Berlin)
- 2017 – 2018 Sebastian Schneider (SCAN, Freie Universität Berlin)
- 2017 – 2018 Elena Pavlenko (SCAN, Freie Universität Berlin)
- 2016 – 2018 Sein Yeung (SCAN, Freie Universität Berlin)
- 2016 – 2017 Stefan Appelhoff (SCAN, Freie Universität Berlin)
- 2015 – 2016 Stephan Krohn (SCAN, Freie Universität Berlin)
- 2015 – 2016 Martin Spitzenpfeil (Statistics, Freie Universität Berlin/Humboldt Universität Berlin)
- 2014 – 2015 Lilla Horvath (Psychology, Humboldt Universität Berlin)

BSc Thesis Supervision

- 2017 – 2018 Jonas Schäfer (Physik, Humboldt Universität Berlin)

Student Assistants and Interns

- 2015 – 2016 Martin Rosellen
- 2013 – 2016 Ludger Starke

SELECTED TALKS

1. Berlin | Oxford Summer School on open, transparent, and reproducible research in the life sciences (2018) Workshops on COBIDAS, BIDS, and Copyright and Creative Commons licenses, lecture on Open Data, co-organization with Ulf Toelch and Verena Heise
2. Decision Neuroscience Workshop Montreal Neurological Institute and McGill University (2018) “Computational mechanisms of state-action-reward value learning behaviour”
3. Berlin Institute of Health - Digital Health Forum - Panel Discussion (2018) “AI-driven Support in Healthcare – Beyond the Buzzwords”
4. 7th Winter School Ethics and Neuroscience of the Bernstein Center for Computational Neuroscience Berlin and the Berlin School of Mind and Brain (2018) “Open Neuroimaging”
5. International Max Planck Research School LIFE und Psychologisches Institut der Universität Zürich (2017) Workshop “Open Science” (with Ulf Tölch)
6. German Academic Scholarship Foundation Summer School (2017) “The free energy principle – a unified brain theory?” (with Felix Blankenburg)
7. Joint Symposium “Interdisciplinary Perspectives on Decision Making“ of the Berlin Social Science Center and the Freie Universität Berlin (2015) “A normative inference approach for optimal sample sizes in decisions from experience”
8. 10th International Conference on Basic and Clinical Multimodal Imaging (BACI 2015) – Symposium talk on EEG-fMRI feature matching “An information theoretic approach for EEG-fMRI integration”
9. CCNB Workshop: Pattern Recognition in Neuroimaging (2015) “An Introduction to Support Vector Classification”
10. Frankfurt Institute for Advanced Studies/Max-Planck-Institute for Brain Research/Goethe University Frankfurt (2015) – NeuroBioTheory seminar talk

11. Interdisciplinary College in G nne at Lake M hne (IK 2015) – Special course comprising six sessions on “The Free Energy Principle for Perception: An Introduction”
12. 20th Annual meeting of the Organization for Human Brain Mapping (OHBM 2014) – Talk at the Oral Session on Perception and Attention “On the neural dynamics of Bayesian model updating in the somatosensory system”
13. Berlin Graduate School of Mind and Brain, Free Energy Workshop (2013) – Symposium talk on “A Beginner’s Guide to Variational Bayes for Latent Stochastic Time-Series Models”
14. Berlin Center of Advanced Neuroimaging, World Technology Evaluation Center Neuroimaging Panel Site Visit (2013) – Talk on “Integrating Cognitive and Biophysical Modeling of Neuroimaging Data using Bayesian Time-Series Inference”
15. Max-Planck-Institute for Human Development, Summer School on Bounded Rationality (2013) – Talk on “Statistical Physics for Social Heuristics”
16. Max-Planck-Institute for Human Development, Center for Lifespan Psychology (2013) Colloquium talk on “Neurocognition - Towards a Formal Approach for Cognitive Neuroimaging”
17. University of Basel, Department of Psychology, Center for Cognitive and Decision Sciences (2011) – Colloquium Talk
18. Max-Planck Institute for Human Development, Center for Lifespan Psychology (2011) – Two-day workshop on functional neuroimaging analysis in the group of Shu-Chen Li with Dr. Felix Blankenburg