

## CURRICULUM VITAE

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Prof. Dr. Dirk Ostwald  
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## RESEARCH INTEREST

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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 Bayesian statistics, machine learning, and decision science. On the neuroscientific side, we employ this computational framework 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). 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, Ostwald 2016 in prep.). Finally, we contribute to the development of a variational Bayesian approach for stochastic time-series analysis (Ostwald et al. 2014, Starke & Ostwald, 2016). Variational Bayes is a deterministic-approximate inference framework for statistical models, which in the brain imaging field enjoys widespread popularity as a general theory of brain function and as an inversion scheme for models of functional neural connectivity.

## PROFESSIONAL APPOINTMENTS

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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

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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, FELLOWSHIPS, & AWARDS

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2016	Central Teaching Award of Freie Universität Berlin (€10,000)
2016	NeuroImage Editor's Choice Award
2015 – 2016	Freie Universität Berlin – E:Club Anschubfinanzierung für Brückenprojekte (€ 14,800)
2011 – 2013	Postdoctoral research fellowship (£ 134,151) by the Hadwen Trust for Humane Research (declined)
2007 – 2009	Graduate Studies Fellowship, University of Birmingham
2001 – 2006	German Academic Scholarship Foundation

## PUBLICATIONS

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### Working Papers

1. Krohn S, Froeling M, Leemans A, **Ostwald D**, Jiménez J, Villoslada P, Esteban FJ (2017) Sampling stability and processing parameter-dependent characteristics of the 3D fractal dimension as a marker of structural brain complexity in magnetic resonance images *BioRxiv* dx.doi.org/10.1101/124206
2. Starke L, **Ostwald D** (2016) Variational Bayesian parameter estimation techniques for the general linear model *BioRxiv* dx.doi.org/10.1101/077461

### Journal Articles

1. Krohn S, **Ostwald D** (2017) Computing integrated information *Neuroscience of Consciousness* arXiv:1610.03627
2. **Ostwald D**, Starke L (2016) Probabilistic delay differential equation modelling of event-related potentials *NeuroImage* 136: 227–257

3. 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]
4. 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
5. **Ostwald D**, Starke L, Hertwig R (2015) A normative inference approach for optimal sample sizes in decisions from experience *Frontiers in Psychology* 10.3389/fpsyg.2015.01342
6. 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
7. 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
8. 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
9. **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
10. Herzog SM, **Ostwald D** (2013) Sometimes Bayesian statistics are better *Nature* 494(7435):35 [Correspondence]
11. 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
12. **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
13. **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
14. 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
15. **Ostwald D**, Bagshaw AP (2011) Information theoretic approaches to functional neuroimaging *Magnetic Resonance Imaging* 29:1417-1428
16. 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
17. **Ostwald D**, Porcaro C, Bagshaw AP (2011) Voxel-wise information theoretic EEG-fMRI feature integration *NeuroImage* 55(3):1270-86
18. 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

19. 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
20. 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
21. **Ostwald D**, Porcaro C, Bagshaw AP (2010) An information theoretic approach to EEG-fMRI integration of visually evoked responses *NeuroImage* 49: 498 – 516
22. **Ostwald D**, Lam J, Li S, Kourtzi Z (2008) Neural coding of global form in the human visual cortex *J Neurophysiology* 99:2456-2469
23. 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
24. 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
25. **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
26. 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

## SELECTED TALKS

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1. 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”
2. 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”
3. CCNB Workshop: Pattern Recognition in Neuroimaging (2015) “An Introduction to Support Vector Classification”
4. Frankfurt Institute for Advanced Studies/Max-Planck-Institute for Brain Research/Goethe University Frankfurt (2015) – NeuroBioTheory seminar talk
5. Interdisciplinary College in Günne at Lake Möhne (IK 2015) – Special course comprising six sessions on “The Free Energy Principle for Perception: An Introduction”
6. 20<sup>th</sup> 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”
7. 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”

8. 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”
9. Max-Planck-Institute for Human Development, Summer School on Bounded Rationality (2013) – Talk on “Statistical Physics for Social Heuristics”
10. Max-Planck-Institute for Human Development, Center for Lifespan Psychology (2013) Colloquium talk on “Neurocognition - Towards a Formal Approach for Cognitive Neuroimaging”
11. University of Basel, Department of Psychology, Center for Cognitive and Decision Sciences (2011) – Colloquium Talk
12. 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

## AD-HOC REVIEWING

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### *Journals*

Cerebral Cortex, NeuroImage, Human Brain Mapping, Frontiers in Human 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

### *Research Grant Agencies*

The Royal Society, Hong Kong Research Grant Council, Medical Research Council

## ACADEMIC TEACHING

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2017

- Summer school German Academic Scholarship Foundation
- Digital Open Science (2 SWS)

2014 – 2017

- Module Statistical Methods, MSc Program Social, Cognitive, and Affective Neuroscience, Freie Universität Berlin (2 SWS)
- Module Neurocognitive Methods & Programming, MSc Program Social, Cognitive, and Affective Neuroscience, Freie Universität Berlin (2 SWS)
- Resesarch Workshop (1 SWS)

2015

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

2013 – 2014

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

2011 – 2013

- Module Advanced Neurocognitive Methods, MSc Program SCAN, Freie Universität Berlin

2010 – 2012

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

2008 – 2010

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

## **ACADEMIC SERVICE & SUPERVISION**

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### Committee Membership

2015 – Head of MSc Social, Cognitive, and Affective Neuroscience Examination Board  
Department of Education and Psychology, Freie Universität Berlin

### Sponsored PhD students

2015 – Lilla Horvath (Elsa-Neumann Fellowship)

### PhD defense Committees

2017 Shuang Guo  
2017 Dr. Julia Rodriguez Buritica  
2017 Dr. Tim Genewein  
2017 Dr. Simon Ludwig  
2016 Dr. Johannes Freiherr Heereman von Zuydtwyck  
2016 Dr. Clemens Maidhof  
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 – Jan Herding, Bernstein Center for Computational Neuroscience, Berlin  
2014 – Timo Schmidt, GRK Sensory Systems, Berlin

### Master Thesis Supervision

2016 – Ann Xavier (Cognitive Science, Universität Osnabrück)  
2016 – Stefan Appelhoff (SCAN, Freie Universität Berlin)  
2016 – Yasmin Kim Georgie (SCAN, Freie Universität Berlin)  
2016 – Sein Yeung (SCAN, Freie Universität Berlin)  
2016 – Maaly Nassar (MSc Mind and Brain, Berlin)  
2015 – 2016 Martin Spitzenpfeil (Statistics, Freie Universität Berlin & Humboldt Universität Berlin)  
2014 – 2015 Lilla Horvath (Psychology, Humboldt Universität Berlin)

### BSc Thesis Supervision

2017 – Jonas Schäfer (Physik, Humboldt Universität Berlin)

### Student Assistants and Interns

2016 – Stefan Appelhoff  
2015 – 2016 Martin Rosellen  
2013 – 2016 Ludger Starke