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Curriculum Vitae

DR. ROMY LORENZ

EDUCATION

2013 – 2017	**PhD Neurotechnology** Thesis: *Neuroadaptive Bayesian optimization – Implications for the Cognitive Sciences* Supervisors: Dr. Robert Leech & Dr. Aldo Faisal	Imperial College London London, UK
2009 – 2012	**MSc Human Factors (Distinction)** neuro-cognitive psychology, neuroergonomics, brain-computer interfaces	Technical University of Berlin Berlin, Germany
2011	Study abroad biomedical engineering, system and computational neuroscience	Tsinghua University Beijing, China
2006 – 2009	**BSc Business Psychology (First Class Honours)** cognitive psychology, cognitive ergonomics, engineering psychology, Human Factors	Leuphana University Lüneburg, Germany
2008	Study abroad industrial psychology, usability engineering	Judson University Elgin, USA

RESEARCH POSITIONS

Jul 2017 – today	**Postdoctoral Research Fellow**, Department of Medicine Advancing neuroadaptive Bayesian optimization technology	Imperial College London London, UK
Sep 2017– Oct 2017	**Visiting Researcher**, Computational Brain Imaging Group of Prof. BT Thomas Yeo Advancing text-mining of cognitive neuroimaging literature and towards evaluating top-down cognitive ontologies using neuroadaptive Bayesian Optimization	National University of Singapore Singapore
Oct 2013 – Jun 2017	**Brain Science & Engineering PhD Training Fellow**, Department of Medicine & Department of Bioengineering, Development of novel framework for optimizing experimental design in cognitive neuroscience using closed loop real-time fMRI and Bayesian optimization.	Imperial College London London, UK
Mar 2013 – May 2013	**Visiting Researcher**, Department of Cognitive Science & Swartz Center for Computational Neuroscience In-depth analyses of EEG data and application of machine-learning techniques for single-trial detection of error potentials for potential real-world application.	University of California San Diego (UCSD) San Diego, USA
Dec 2012 – Feb 2013	**Research Associate**, Berlin Brain-Computer Interface Group, Machine Learning Department Acquiring and analyzing EEG data and applying machine learning to identify individual stable brain patterns, which allow a reliable brain-computer interface based neuroprosthetic control.	Technical University of Berlin Berlin, Germany
Mar 2012 – Oct 2012	**Graduate Thesis**, Berlin Brain-Computer Interface Group, Department of Neurotechnology Evaluating usability and user experience of EEG-controlled brain-computer interface for prospective neuroprosthetic control within the EU-project MUNDUS.	Technical University of Berlin Berlin, Germany
Feb 2011 – Jun 2011	**Lab Work**, Institute for Neural Engineering, Department of Biomedical Engineering, School of Medicine Planning, conducting and analyzing EEG and fMRI experiments.	Tsinghua University Beijing, China
2010 – 2012	**Research Assistant**, Berlin Center of Mechatronical Medical Engineering Designing & evaluating user interfaces of surgical assistance systems with orthognathic surgeons. Workflow analyses in the operating room to inform design of novel X-ray.	Fraunhofer Gesellschaft/ Charité Berlin Berlin, Germany
Jul 2009 – Sep 2009	**Research Assistant**, Human Factors Group Analyzing eye-tracking and driving simulator data within the EU-project ISi-PADAS.	German Aerospace Center Braunschweig, Germany
Jan 2009 – Jul 2009	**Research Intern**, Customer Research Center Planning, conducting and analyzing usability studies of driving assistance systems.	Daimler AG (Mercedes Benz) Böblingen, Germany

TEACHING

Feb 2017 | Feb 2018	**Teacher for 'Non-invasive brain-computer interfaces'** (MSc Translational Neuroscience), Designing and teaching of one-day course, Department of Medicine, Imperial College London
Oct 2015 – Dec 2015	**Tutor for 'The World Today'** (1st year undergraduates), Imperial Horizons programme, Imperial College London (the team I was tutoring won one of the final prizes)
Feb 2015 – Apr 2015	**Teaching Assistant for 'Brain-Machine Interfaces'** (MSc Biomedical Engineering/MRes Neurotechnology), Department of Bioengineering, Imperial College London
Oct 2015 – Jan 2015	**Teaching Assistant for 'Modelling in Biology'** (BEng Biomedical Engineering), Department of Bioengineering, Imperial College London

SUPERVISION

2017 – today **Supervision:**
Meghan Good **MRes Experimental Neuroscience** (Imperial College London)
Jiewon Kang **MRes Neurotechnology** (Imperial College London)

2014 – today **Co-Supervision**:
Pedro Costa **MSc Biomedical Engineering** (Lisbon University)
James Pickering **MRes Experimental Neuroscience** (Imperial College London)
Lisa Evans **MRes Experimental Neuroscience** (Imperial College London)
Amanda da Silva **BEng Biomedical Engineering** (Lisbon University)
Paulina Majewska **BSc Medical Biosciences** (Imperial College London)

GRANTS & FELLOWSHIPS

2017 **Sir Henry Wellcome Postdoctoral Fellowship** (**£ 250k** incl. salary), Wellcome Trust
2017 **Future Leader Fellowship** (**£ 300k** incl. salary), BBSRC [DECLINED]
2017 **EPSRC Doctoral Prize Fellowship** (**£ 56,711** incl. salary), Imperial College London
2016 **Travel Grant** (**€ 225**), 6th International Conference on Transcranial Brain Stimulation
2015 **ITMAT Funding Award** (**£ 68,990**), NIHR Imperial Biomedical Research Centre, project: *Tailored non-invasive brain stimulation for rehabilitation of TBI using real-time fMRI* (co-author & named researcher, PI: Dr. Violante)
2015 **Student Travel Grant** (**$ 1,250**), Real-time Functional Imaging & Neurofeedback Conference 2015
2013 **Brain Science & Engineering PhD Training Fellowship** (**£ 22,500 p.a.** incl. salary), Imperial College London
2013 **Multimodal Neuroimaging Training Program Scholarship** (**$ 3,250**), Carnegie Mellon University
2013 **G.A.-Lienert Scholarship** (**€ 3,000**), Justus-Liebig University Giessen
2013 **VRC Corporation Exchange Grant** (**€ 900**), HFES Europe
2011 **Chinese Government Scholarship** (**RMB 37,100**)

AWARDS & PRIZES

2017 **Merit Abstract Award** (**$ 2,000**), Organization for Human Brain Mapping 2017
2016 **Best Paper Award** (**€ 200**), Workshop on Pattern Recognition in Neuroimaging 2016
2016 **Shortlisted for NeuroImage Best Paper Award 2016**, Organization for Human Brain Mapping 2016
2016 **Highlighted Poster Presentation**, 6th International Conference on Transcranial Brain Stimulation
2014 **1st place Early Career Best Paper Award** (**€ 500**), HFES Europe
2013 **Graduate Student Excellence Award**, VDI Association of German Engineers
2013 **2nd place Poster Competition**, 6th Hamlyn Symposium on Medical Robotics
2013 **1st place 'Clara von Simson' Prize** (**€ 2,500**), best thesis of a female graduate, Technical University of Berlin

PUBLIC ENGAGEMENT

Jan 2018 **Imperial Fringe Evening** *Intelligence Redesigned*
Free evening of discovery for general public (across all age groups) by scientists of Imperial College London. I headed our team and was in charge of designing our hands-on demo: participants could test their mental skills on an iPad with "Cognitron" – the world's first AI web server to test human intelligence developed by our team (PI: Dr. Adam Hampshire).

Nov 2016 **Future Forum Talk** *Zapping your teacher's brain to explore the potential of neurotechnology*, King's College School Wimbledon, London
Future Forum Talks is for teens (13-16 years) to ask questions and explore ideas. I gave an interactive presentation on how the brain works and how neurotechnology can help to treat the 'diseased' or injured brain.

Sept 2016 **NeuroTechX panel discussion** *A skeptical look into neurotech*, THECUBE, London
I initiated, organized and chaired a panel discussion about the fast growing field of neurotechnology that has created a lot of hype, misinformation and unrealistically high expectations. The aim of the panel was to better under the limits of the field. Invited experts: NeuroSkeptic, Prof Eduardo Miranda, Dr InesViolante, Luke Mason and Tre Azam.

2014-2016 **Brain Injury Meet the Scientist Day**
Yearly event to engage patients suffering from traumatic brain injury and their families in our research. The event featured tours through our labs. I demonstrated EEG and brain stimulation as potential rehabilitation methods and designed questionnaires to measure the patient everyday technology usage and their readiness to learn and use new technology.

Aug 2014 **STEM World Summer School**
This scheme offers hand-on enrichment activities in STEM subjects. I performed a live demonstration of my real-time functional brain imaging setup for a group of students (15-18 years). The students could track how brain activity changes in the motor cortex due to executed and even imagined finger movements. By this we could highlight the potential for using real-time neuroimaging for decoding cognitive states in humans.

July 2014 **Royal Society Summer Science Exhibition**
The Summer Science Exhibition is an annual display of the most exciting cutting-edge science and technology research. I was part of the organization team and in charge of the production of the video explaining our research addressing a non-expert audience. During the one-week exhibition we interactively engaged the interested public in our research.

MEDIA OUTREACH

Mar 2018 **TEDxNTUA talk** *Understanding the human mind without a human mind: The AI neuroscientist*

Feb 2018 **Plexal**, video interview with Pete Trainor on *AI & Ethics*

Nov 2017 **WIRED Live talk** *AI & Research*, London, UK

Oct 2017 **On Augmentation**, online interview (https://on-augmentation.co/interview-with-romy-c2158f8b063f)

Sep 2017 **WIRED Magazine**, featured in article *This AI could hold the key to decoding human intelligence* by Roger Highfield (http://www.wired.co.uk/article/automatic-neuroscientist-ai-brain-experiments)

Feb 2017 **Imperial College News**, featured in article *Artificial intelligence could increase speed and reliability of brain research* (http://www.goo.gl/jJXYdD)

ART & NEUROSCIENCE

2016 - 2018 **Director and Public Engagement Curator of AXNS Collective - Art x Neuroscience**

AXNS is a not-for-profit, curatorial collective that explores the intersection between art, neuroscience & technology. We are four women working across the arts and sciences and curate exhibitions, events and workshops (http://axnscollective.org/), such as:

- *SINES - an LSD brain wave and sound art hackathon* with Imperial College London at Somerset House (Mar 2017)
- Panel Discussion *Quantifying Aesthetic Emotions: What are the Implications for the Arts?* STATE Festival Berlin (Nov 2016)
- Multi-sensory installation *Transitions of Consciousness-Dynamic Body Perceptions* with University of Cambridge (Spring 2018)

ACADEMIC COMMUNITY INVOLVEMENT

2016 - 2017 **Administrator of NeuroTechX (London Chapter)** – International Neurotechnology Network

NeuroTechX is a non-profit organization whose mission is to build a strong global neurotechnology community. I co-organize meet-ups and events to bring together researchers, experts, hackers and enthusiasts (http://meetup.com/NeuroTechLDN).

2015 - 2018 **Initiator and Organiser of 'P3NL'** – the Peer-reviewed and Published Papers News Loop

Monthly scheme to present recently published papers by lab members and to provide insights into the publishing process. P3NL is about promoting communication and transparency and stimulate new collaborations (http://c3nl.com/events/p3nl).

Reviewer **NeuroImage, Wellcome Open Research, Journal of Neural Engineering, IEEE Transactions on Neural Systems & Rehabilitation Engineering**

PROJECT WORK

2016 **Freelance consultant** for project *Technology Watch*, OutSmart Insights Ltd, London, UK

Tracking and summarizing latest breakthrough developments across science, technology and engineering themes.

2012 **Freelance consultant** for project *Brain-Computer Interfacing in Robotic Surgery,* collaboration between Hamlyn Centre for Robotics (ICL) and Technical University of Berlin

Main advisory consultant on study design and EEG setup. The study aimed to showcase the potential of brain-computer interfaces in robotic surgery and was conducted with resident surgeons.

SKILLS

Programming	MATLAB, Python, BASH
Software	FSL, SPM, EEGLAB, FieldTrip, AFNI, SPSS, LaTeX, Adobe Illustrator, Wordpress
Lab Skills	fMRI, EEG, transcranial electrical brain stimulation, eye tracking
Languages	German (native), English (fluent)

INVITED TALKS

Mar 2018 **UCL**, Gatsby Computational Neuroscience Unit, London, UK

Feb 2018 **Technical University Berlin**, Neuroergonomics Group, Berlin, Germany

Jan 2018 **Birkbeck University**, Centre for Brain and Cognitive Development, London, UK

Dec 2017 **NIPS Workshop** "Bayesian Optimization for Science & Engineering", LA, USA (slides: https://figshare.com/articles/RomyLorenz_NIPS_Workshop2017/5687128)

Oct 2017 **National University of Singapore**, Clinical Imaging Centre, Singapore

Aug 2017 **Cardiff University**, School of Psychology, Cardiff, UK

Apr 2017 **King's College London**, Department of Neuroimaging, London, UK

Dec 2016 **King's College London**, Department of Bioengineering, London, UK

Apr 2015 **UCL**, Wellcome Trust Centre for Neuroimaging, London, UK

PUBLICATIONS

Open Access Code available Preprint available

Journal papers

Lorenz R, Violante IR, Monti RP, Montana G, Hampshire A, Leech R (2018). Dissociating frontoparietal networks using neuroadaptive Bayesian optimization. *Nature Communications*, 9(1): 1227, doi: 10.1038/s41467-018-03657-3

Lorenz R, Hampshire A, Leech R (2017). Neuroadaptive Bayesian optimization and hypothesis testing. *Trends in Cognitive Sciences*, 21(3): 155-167, doi: 10.1016/j.tics.2017.01.006

Lorenz R, Monti RP, Violante IR, Anagnostopoulos C, Faisal AA, Montana G, Leech R (2016). The Automatic Neuroscientist: A framework for optimizing experimental design with closed-loop real-time fMRI. *NeuroImage* 129: 320-334, doi: 10.1016/j.neuroimage.2016.01.032

Lorenz R, Pascual J, Blankertz B, Vidaurre C (2014). Towards a holistic assessment of the user experience with hybrid BCIs. *Journal of Neural Engineering*, 11(3): 035007, doi: 10.1088/1741-2560/11/3/035007

Lancaster J, **Lorenz R**, Leech R & Cole JH (2018). Bayesian Optimization for Neuroimaging Pre-processing in Brain Age Classification and Prediction, *Frontiers in Aging Neuroscience*, 10:28, doi: 10.3389/fnagi.2018.00028

Monti RP, **Lorenz R**, Braga RM, Anagnostopoulos C, Leech R, Montana G (2017). Real-time estimation of dynamic functional connectivity networks, *Human Brain Mapping*, 38:202-220, doi: 10.1002/hbm.23355

Monti RP, **Lorenz R**, Hellyer P, Leech R, Anagnostopoulos C, Montana G (2017). Decoding time-varying functional connectivity networks via linear graph embedding methods. *Frontiers in Computational Neuroscience*, 11:14, doi: 10.3389/fncom.2017.00014

Dinov M, **Lorenz R**, Scott G, Fagerholm E, Sharp DJ, Leech R (2016). Novel modeling of task versus rest brain state predictability using dynamic time warping: comparisons and contrasts with DFT, EEG avalanches, EEG microstates and BOLD dynamics, *Frontiers in Computational Neuroscience*, 10:46, doi: 10.3389/fncom.2016.00046

Fagerholm E, **Lorenz R**, Scott G, Dinov M, Hellyer P, Mirzaei N, Lesson C, Carmichael D, Sharp D, Shew W, Leech R (2015). Cascades and cognitive state: focused attention incurs subcritical brain dynamics. *Journal of Neuroscience*, 35(11): 4626-4634, doi: 10.1523/JNEUROSCI.3694-14.2015

Zander TO, Shetty K, **Lorenz R**, Leff DR, Krol LR, Darzi AW, Gramann K, Yang G-Z (2016). Automated Task Load Detection with Electroencephalography: Towards Passive Brain-Computer Interfacing in Robotic Surgery, *Journal of Medical Robotics Research*, 2(1): 1750003, doi: 10.1142/S2424905X17500039

Violante IR, Li LM, Carmichael DW, **Lorenz R**, Leech R, Hampshire A, Rothwell JC, Sharp, DJ (2017). Externally induced frontoparietal synchronization modulates network dynamics and enhances working memory performance. *Elife*, 6:e2200, doi: 10.7554/eLife.22001

Kaelen M, Barrett FS, Roseman L, **Lorenz R**, Family N, Bolstridge M, Curran HV, Feilding A, Nutt DJ, Carhart-Harris RL (2015). LSD enhances the emotional response to music. *Psychopharmacology*, 232(19): 3607-3614. doi: 10.1007/s00213-015-4014-y

Vidaurre C, Pascual J, Ramos-Murguialday A, **Lorenz R**, Blankertz B, Birbaumer N, Mueller K-R (2013). Neuromuscular electrical stimulation induced brain patterns to decode motor imagery. *Clinical Neurophysiology*, 124(9): 1824-1834, doi: 10.1016/j.clinph.2013.03.009

Kaelen M, Roseman L, Kahan J, Ribeiros AS, Orban C, **Lorenz R** et al. (2016). LSD enhances music-induced imagery via changes in parahippocampal connectivity, *European Neuropsychopharmacology*, 26(7):1099-109, doi: 10.1016/j.euroneuro.2016.03.018

Journal papers – in progress

Lorenz R, Simmons L, Monti RP, Arthur J, Limal S, Leech R, Violante IR. Assessing tACS-induced phosphene perception using adaptive Bayesian optimization. *Under review at NeuroImage,* preprint available bioRxiv: doi.org/10.1101/150086

Lorenz R*, Kaelen M*, Barrett F, Roseman L, Santos-Ribeiro A, Evans L, Feildling A, Nutt D, Carhart-Harris R, Leech. Effects of LSD on music-evoked brain activity. *Under review at NeuroImage,* preprint available bioRxiv: doi.org/10.1101/153031

Lorenz R, Monti RP, Koush Y, Sharp D, Montana G, Hampshire A, Leech R, Violante IR. Towards tailoring non-invasive stimulation using neuroadaptive Bayesian optimization. *In preparation*

Conference papers

Lorenz R*, Monti RP*, Hampshire A, Koush Y, Anagnostopoulos C, Faisal A, Sharp D, Montana G, Leech R, Violante IR (2016). Towards tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization, In *6th International Workshop on Pattern Recognition in Neuroimaging (PRNI)*, doi: 10.1109/PRNI.2016.7552338

Lorenz R*, Monti RP*, Violante IR, Faisal A, Anagnostopoulos C, Leech R, Montana G (2015). Stopping criteria for boosting automatic experimental design using real-time fMRI with Bayesian optimization. In *5th NIPS Workshop on Machine Learning and Interpretation in Neuroimaging: Beyond the Scanner*, arXiv:1605.04435v1, MLINI/2015/15

Monti RP, **Lorenz R**, Leech R, Anagnostopoulos C, Montana G (2016). Text-mining the NeuroSynth corpus using Deep Boltzmann Machines, In *6th International Workshop on Pattern Recognition in Neuroimaging (PRNI)*, doi: 10.1109/PRNI.2016.7552329

Monti RP, **Lorenz R**, Hellyer P, Leech R, Anagnostopoulos C, Montana G (2015). Graph Embeddings of Dynamic Functional Connectivity Reveal Discriminative Patterns of Task Engagement in HCP Data. In *5th International Workshop on Pattern Recognition in Neuroimaging (PRNI)*, doi: 10.1109/PRNI.2015.21

Pascual J, **Lorenz R**, Blankertz B, Vidaurre C (2013). Hybrid EEG-Based BCI User Interface for Action Selection. In Pons JL, Torricelli D, Pajaro M (eds.) *Converging Clinical & Engineering Research on Neurorehabilitation*, BIOSYSROB 1 (pp. 1171-1176). Springer, Berlin, Heidelberg, doi: 10.1007/978-3-642-34546-3_194

Book chapters

Zander TO, Brönstrup J, **Lorenz R**, Krol LR (2014). Towards BCI-based Implicit Control in Human-Computer Interaction.In S Fairclough and K Gilleade (eds), *Advances in Physiological Computing*, Human Computer Interaction Series (pp.67-90). Springer, London, doi: 10.1007/978-1-4471-6392-3_4

Conference talks

Lorenz R, Violante IR, Monti R, Montana G, Hamshire A, Leech R (2017). Fractioning frontoparietal brain networks using neuroadaptive Bayesian optimization. *Organization for Human Brain Mapping Annual Meeting* 2017, 30.6.2017, Vancouver, Canada. Slides: https://figshare.com/articles/RomyLorenz_OHBM2017_pdf/5160877

Lorenz R, Monti RP, Hampshire A, Koush Y, Anagnostopoulos C, Faisal A, Sharp D, Montana G, Leech R, Violante IR (2016). Towards tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization. *6th International Workshop on Pattern Recognition in Neuroimaging (PRNI)*, 23.06.2016, Trento, Italy.

Lorenz R, Monti RP, Leech R, Anagnostopoulos C, Montana G (2016). Text-mining the Neurosynth corpus using Deep Boltmann Machines. *6th International Workshop on Pattern Recognition in Neuroimaging (PRNI)*, 22.06.2016, Trento, Italy.

Lorenz R, Monti RP, Violante IR, Anagnostopoulos C, Faisal AA, Montana G, Leech R (2015). Stopping criteria for boosting automatic experimental design using real-time fMRI with Bayesian optimization. *5th NIPS Workshop on Machine Learning and Interpretation in Neuroimaging: Beyond the Scanner*, 11.12.2015, Montreal, Canada.

Lorenz R, Monti RP, Violante IR, Anagnostopoulos C, Faisal AA, Montana G, Leech R (2015). The Automatic Neuroscientist: towards optimising patient-tailored cognitive rehabilitation therapy. *International Conference on Brain Informatics & Health*, 30.08.2015, London, UK.

Lorenz R, Pascual J, Blankertz B, Vidaurre C (2013). Assessing the User Experience with Hybrid BCIs. *4th TOBI Workshop – Practical Brain-Computer Interfaces for End-Users: Progress and Challenges*, 23.01.2013, Sion, Switzerland.

Conference posters (first-authored ones listed only)

Lorenz R, Simmons L, Monti RP, Arthur J, Limal S, Leech R, Violante IR. Assessing tACS-induced phosphene perception using adaptive Bayesian optimization. *Organization for Human Brain Mapping Annual Meeting 2017*, Vancouver, Canada.

Lorenz R, Monti RP, Koush Y, Anagnostopoulos C, Faisal A, Sharp D, Hampshire A, Montana G, Leech R, Violante IR (2016). The Automatic Neuroscientist: Tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization, *6th International Conference on Transcranial Brain Stimulation*, Göttingen, Germany.

Lorenz R, Monti RP, Koush Y, Anagnostopoulos C, Faisal A, Sharp D, Hampshire A, Montana G, Leech R, Violante IR (2016). Tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization, *Organization for Human Brain Mapping Annual Meeting 2016*, Geneva, Switzerland.

Lorenz R, Monti RP, Koush Y, Anagnostopoulos C, Faisal A, Sharp D, Hampshire A, Montana G, Leech R, Violante IR (2016). Tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization, *Brain Stimulation and Imaging Meeting*, Geneva, Switzerland.

Lorenz R, Monti RP, Braga R, Anagnostopoulos C, Faisal A, Montana G, Leech R (2015). Turning fMRI experiments on its head using rt-fMRI: opening new avenues in cognitive neuroscience. *Organization for Human Brain Mapping Annual Meeting 2015*, Honolulu, US.

Lorenz R, Monti RP, Cole J, Faisal A, Anagnostopoulos C, Montana G, Leech R (2015). Towards steering the chronnectome - on the potential of dynamic functional connectivity-based neurofeedback of large scale brain networks. *Real-time Functional Imaging and Neurofeedback Conference 2015*, Gainesville, US.

Lorenz R, Faisal AA, Dinov M, Violante IR, Leech R (2014). Neurofeedback training of large-scale brain networks. *Annual Meeting of Society of Neuroscience 2014*, Washington DC, US.

Lorenz R, Pascual J, Blankertz B, Vidaurre C (2013). Towards a broad-scale Usability Evaluation of Hybrid BCIs. *5th International Brain-Computer Interface Meeting 2013*, Pacific Grove, US.

Open peer-reviews

Leech R & **Lorenz R** (2017) Review for: J Westfall, TE Nichols, T Yarkoni. Fixing the stimulus-as-fixed-effect fallacy in task fMRI, *Wellcome Open Research*, doi: 10.21956/wellcomeopenres.11977.r21481