Tuesday, July 2nd, 2019 (morning) + Tuesday, July 9, 2019 (full day):
Location: HS 00.006 in Albertstr. 23, ground floor
Talk duration: 25min + 10min discussion and feedback

Legend:

Topic advisors from group of Wolfram Burgard
Topic advisors from group of Tonio Ball
Topic advisors from group of Michael Tangermann

Basic Topics for BSc students

- "Foundations of Brain Signals and Brain-Computer Interfaces"

Topic Number, Topic Name, Literature	**Math level**	**Supervisor**	**Student**
B1 Spectrum Estimation of Discrete Time Series • KAY, Steven M.; MARPLE, Stanley L. Spectrum analysis—a modern perspective. *Proceedings of the IEEE*, 1981, 69. Jg., Nr. 11, S. 1380-1419. • HARRIS, Fredric J. On the use of windows for harmonic analysis with the discrete Fourier transform. *Proceedings of the IEEE*, 1978, 66. Jg., Nr. 1, S. 51-83.	mid-high	Martin Glasstetter	
B2 Preprocessing and classification of ERD / ERS signals • BCI book by Wolpaw and Wolpaw. Brain-Computer Interfaces: principles and practice. Oxford Univ. Press, 2011. • Blankertz B, Tomioka R, Lemm S, Kawanabe M, Müller KR, Optimizing Spatial Filters for Robust EEG Single-Trial Analysis. IEEE Signal Process Mag, 25(1):41-56, 2008 [pdf] [url] • Blankertz B, Tomioka R, Lemm S, Kawanabe M, Müller KR, Optimizing Spatial Filters for Robust EEG Single-Trial Analysis. IEEE Signal Process Mag, 25(1):41-56, 2008 [pdf] [url]	mid-high	Sebastian Castaño	
B3 Preprocessing and classification of event-related potentials • Blankertz B, Lemm S, Treder MS, Haufe S, Müller KR, Single-trial analysis and classification of ERP components - a tutorial. NeuroImage, 56:814-825, 2011 [pdf] [url]	mid	Jan Sosulski	
B4 Text spelling with an auditory BCI • Schreuder et al., AMUSE paradigm	low-mid	Michael Tangermann	

Advanced Decoding Methods for MSc students

- “Algorithms for the Real-Time Decoding of Brain Signals”

Topic + Literature	Math level	Supervisor	Student
M1 Functional connectivity estimation • André M. Bastos and Jan-Mathijs Schoffelen, A Tutorial Review of Functional Connectivity Analysis Methods and Their Interpretational Pitfalls, Front. Syst. Neurosci., 08 January 2016, https://doi.org/10.3389/fnsys.2015.00175, • Consistency of EEG source localization and connectivity estimates, Keyvan Mahjoory, Vadim V. Nikulin, Loïc Botrel, Klaus Linkenkaer-Hansen, Marco M. Fato, Stefan Haufe, https://doi.org/10.1016/j.neuroimage.2017.02.076	high	Sebastian Castano	
M2 Riemannian methods for classification in BCI • Kalunga, Emmanuel K., et al. "Online SSVEP-based BCI using Riemannian geometry." *Neurocomputing* 191 (2016): 55-68. • Barachant, Alexandre, et al. "Classification of covariance matrices using a Riemannian-based kernel for BCI applications." *Neurocomputing* 112 (2013): 172-178.	high	Dan Wilson	
M3 Review on source reconstruction methods • Castaño-Candamil, Sebastián, Johannes Höhne, Juan-David Martínez-Vargas, Xing-Wei An, German Castellanos-Domínguez, and Stefan Haufe. "Solving the EEG inverse problem based on space–time–frequency structured sparsity constraints." NeuroImage 118 (2015): 598-612. • Gramfort, Alexandre, Daniel Strohmeier, Jens Haueisen, Matti S. Hämäläinen, and Matthieu Kowalski. "Time-frequency mixed-norm estimates: Sparse M/EEG imaging with non-stationary source activations." NeuroImage 70 (2013): 410-422.	high	Sebastian Castano	
M4 Enhancement of evoked potentials • Rivet, Bertrand, et al. "xDAWN algorithm to enhance evoked potentials: application to brain–computer interface." *IEEE Transactions on Biomedical Engineering* 56.8 (2009): 2035-2043.	mid-high	Jan Sosulski	
M5 Deep learning on EEG for movement decoding • Schirrmeister, R. T., Springenberg, J. T., Fiederer, L. D. J., Glasstetter, M., Eggensperger, K., Tangermann, M., Hutter, F., Burgard, W., & Ball, T. (2017). Deep learning with convolutional neural networks for EEG decoding and visualization. *Human brain mapping*, *38*(11), 5391-5420.	mid	Robin Schirrmeister	
M6 Deep learning on EEG for diagnosis • Schirrmeister, R. T., Gemein, L., Eggensperger, K., Hutter, F., & Ball, T. (2017). Deep learning with convolutional neural networks for decoding and visualization of EEG pathology. *arXiv preprint arXiv:1708.08012*. • Roy, S., Kiral-Kornek, I., & Harrer, S. (2018). ChronoNet: A Deep Recurrent Neural Network for Abnormal EEG Identification. *arXiv preprint arXiv:1802.00308*.	mid	Lukas Gemein	
M7 Transfer Learning in BCI • P. L. C. Rodrigues, C. Jutten, and M. Congedo, “Riemannian Procrustes Analysis: Transfer Learning for Brain-Computer Interfaces,” IEEE Transactions on Biomedical Engineering, 2018.	high	Henrich Kolkhorst	
M8 Identifying Brain Activity during Sleep using Deep Learning • S. Chambon, V. Thorey, P. J. Arnal, E. Mignot, and A. Gramfort, “DOSED: a deep learning approach to detect multiple sleep micro-events in EEG signal,” *Journal of Neuroscience Methods*, Apr. 2019.	mid	Johannes Meyer	

Advanced Applications / Neuroscience for MSc. Students:

- “Advanced Neurotechnological Applications”

Topic + Literature	Math level	Supervisor	Student
M11 Adaptive control of deep brain stimulation in Parkinson’s disease • Little, Simon, and Peter Brown. "What brain signals are suitable for feedback control of deep brain stimulation in Parkinson's disease?." Annals of the New York Academy of Sciences 1265, no. 1 (2012): 9-24.	low	Sebastian Castano	
M12 Expectation minimization for unsupervised learning • Kindermans, Pieter-Jan, David Verstraeten, and Benjamin Schrauwen. "A bayesian model for exploiting application constraints to enable unsupervised training of a P300-based BCI." *PloS one* 7.4 (2012): e33758.	high	Jan Sosulski	
M13 Learning from label proportions for unsupervised classification • Hübner et al. 2017**:** Learning from label proportions in brain-computer interfaces: Online unsupervised learning with guarantees. PLOS One	mid	Michael Tangermann	
M14 Coded Stimulation Patterns for Visually Evoked Potentials • S. Nagel and M. Spüler, “Modelling the brain response to arbitrary visual stimulation patterns for a flexible high-speed Brain-Computer Interface,” *PLOS ONE*, vol. 13, no. 10, p. e0206107, Oct. 2018.	mid	Henrich Kolkhorst	
M15 Motor Imagery in the Context of a Hand Exoskeleton • L. Randazzo, I. Iturrate, S. Perdikis, and J. d R. Millán, “mano: A Wearable Hand Exoskeleton for Activities of Daily Living and Neurorehabilitation,” *IEEE Robotics and Automation Letters*, vol. 3, no. 1, pp. 500–507, Jan. 2018.	mid	Marina Kollmitz	