

CURRICULUM VITAE

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POSITION

Senior Scientist, Institute of Electrical and Biomedical Engineering, UMIT TIROL, Hall in Tirol, Austria

SCIENTIFIC DEGREES

- 2016 PhD in Mathematics, „Summa cum Laude“, Mathematisch-Naturwissenschaftliche Fakultät, Westfälische Wilhelms-Universität Münster, Germany
- 2011 Diploma (Master's equivalent) in Mathematics with minor in Physics, „with greatest distinction“, Westfälische Wilhelms-Universität Münster, Germany

PROFESSIONAL APPOINTMENTS

since 2018	Senior Scientist, Institute of Electrical and Biomedical Engineering, UMIT TIROL, Hall in Tirol, Austria
2016-2018	Postdoctoral Fellow, Scientific Computing & Imaging (SCI) Institute, University of Utah, USA
2011-2016	Research assistant, Institute for Biomagnetism and Biosignalanalysis (IBB), Westfälische Wilhelms-Universität Münster, Germany
2008-2010	Student assistant, Institute of Mathematical Statistics, Westfälische Wilhelms-Universität Münster, Germany
2009	Student assistant, Mathematical Institute, Westfälische Wilhelms-Universität Münster, Germany
2007-2008	Student assistant, Institute of Theoretical Physics, Westfälische Wilhelms-Universität Münster, Germany

PROFESSIONAL ACTIVITIES

- Associate Editor “Frontiers in Human Neuroscience”
- Reviewer for scientific journals (selection): Applied Sciences, Biomedical Engineering/Biomedizinische Technik, BioMedical Engineering OnLine, BMC Neuroscience, Brain Topography, Entropy, Frontiers in Computational Neuroscience, IEEE Journal of Biomedical and Health Informatics, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Medical Imaging, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Journal of Neural Engineering, Mathematical and Computational Applications, NeuroImage, Physics in Medicine and Biology, Physiological Measurement, PLOS ONE, Sensors, Transactions on Neural Systems & Rehabilitation Engineering

- Co-Head of Scientific Program Committee, Member of Local Organizing Committee “BMT 2022 – Joint Annual Conference of the Austrian, German and Swiss Societies for Biomedical Engineering”, September 28-30, 2022, Innsbruck Austria
- Session Organizer “Patient-Specific Bioelectric Field Modeling and Simulation in Brain Research”, “BMT 2022 – Joint Annual Conference of the Austrian, German and Swiss Societies for Biomedical Engineering”, September 28-30, 2022, Innsbruck Austria (together with Prof. Carsten Wolters)
- Symposium organizer „New methods for reconstructing and manipulating neuronal networks in the human brain“, Workshop Biosignale – Innovative Verarbeitung bioelektrischer und biomagnetischer Signale, March 2020, Kiel, Germany (together with Prof. Carsten Wolters)

MEMBERSHIP IN SCIENTIFIC SOCIETIES

- German Society for Biomedical Engineering (DGBMT)
- Austrian Society for Biomedical Engineering (ÖGBMT)

RESEARCH INTERESTS

- Multimodal brain imaging, particularly EEG/MEG source analysis
- Electric/magnetic brain stimulation, particularly optimization of transcranial electrical/magnetic stimulation (TES/TMS) and deep brain stimulation (DBS)
- Finite element methods (FEM) and bioelectric field simulations
- Sensitivity analysis and uncertainty quantification

IMPORTANT RESULTS

- Development of novel accurate and robust FEM approaches to solve the EEG/MEG forward problem
- Derivation of guidelines for EEG/MEG head modelling based on detailed sensitivity studies
- Detailed study of influence of tissue conductivity uncertainties on EEG source analysis
- Development and (retrospective) evaluation of an algorithm for DBS optimization

10 SELECTED PUBLICATIONS

- **Vorwerk, J.**, Cho, J. H., Rampp, S., Hamer, H., Knösche, T. R., & Wolters, C. H. (2014). A guideline for head volume conductor modeling in EEG and MEG. *NeuroImage*, 100, 590-607. DOI: [10.1016/j.neuroimage.2014.06.040](https://doi.org/10.1016/j.neuroimage.2014.06.040)
- **Vorwerk, J.**, Aydin, Ü., Wolters, C. H., & Butson, C. R. (2019). Influence of head tissue conductivity uncertainties on EEG dipole reconstruction. *Frontiers in neuroscience*, 13, 531. DOI: [10.3389/fnins.2019.00531](https://doi.org/10.3389/fnins.2019.00531)
- **Vorwerk, J.**, Engwer, C., Pursiainen, S., & Wolters, C. H. (2016). A mixed finite element method to solve the EEG forward problem. *IEEE transactions on medical imaging*, 36(4), 930-941. DOI: [10.1109/TMI.2016.2624634](https://doi.org/10.1109/TMI.2016.2624634)
- Engwer, C., **Vorwerk, J.***, Ludewig, J., & Wolters, C. H. (2017). A discontinuous Galerkin method to solve the EEG forward problem using the subtraction approach. *SIAM Journal on Scientific Computing*, 39(1), B138-B164. DOI: [10.1137/15M1048392](https://doi.org/10.1137/15M1048392)
- **Vorwerk, J.**, Oostenveld, R., Piastra, M. C., Magyari, L., & Wolters, C. H. (2018). The FieldTrip-SimBio pipeline for EEG forward solutions. *Biomedical engineering online*, 17(1), 1-17. DOI: [10.1186/s12938-018-0463-y](https://doi.org/10.1186/s12938-018-0463-y)

- **Vorwerk, J.**, Brock, A. A., Anderson, D. N., Rolston, J. D., & Butson, C. R. (2019). A retrospective evaluation of automated optimization of deep brain stimulation parameters. *Journal of neural engineering*, 16(6), 064002. DOI: [10.1088/1741-2552/ab35b1](https://doi.org/10.1088/1741-2552/ab35b1)
- **Vorwerk, J.**, Hanrath, A., Wolters, C. H., & Grasedyck, L. (2019). The multipole approach for EEG forward modeling using the finite element method. *NeuroImage*, 201, 116039. DOI: [10.1016/j.neuroimage.2019.116039](https://doi.org/10.1016/j.neuroimage.2019.116039)
- Aydin, Ü., **Vorwerk, J.**, Dümpelmann, M., Küpper, P., Kugel, H., Heers, M., Wellmer, J., Kellinghaus, C., Haueisen, J., Rampp, S., Stefan, H. & Wolters, C. H. (2015). Combined EEG/MEG can outperform single modality EEG or MEG source reconstruction in presurgical epilepsy diagnosis. *PLoS one*, 10(3), e0118753. DOI: [10.1371/journal.pone.0118753](https://doi.org/10.1371/journal.pone.0118753)
- Horn, A., Reich, M., **Vorwerk, J.**, Li, N., Wenzel, G., Fang, Q., Schmitz-Hübsch, T., Nickl, R., Kupsch, A., Volkmann, J., Kühn, A.A. & Fox, M. D. (2017). Connectivity predicts deep brain stimulation outcome in Parkinson disease. *Annals of neurology*, 82(1), 67-78. DOI: [10.1002/ana.24974](https://doi.org/10.1002/ana.24974)
- **Vorwerk, J.**, McCann, D., Krüger, J., & Butson, C. R. (2020). Interactive computation and visualization of deep brain stimulation effects using Duality. *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization*, 8(1), 3-14. DOI: [10.1080/21681163.2018.1484817](https://doi.org/10.1080/21681163.2018.1484817)

* The first two authors contributed equally to this work.

SELECTED PROJECTS

- FWF Grant P 35949-B, 2022-2026, “Uncertainty Quantification for EEG/MEG Source Analysis”
- TWF Grant GZL F.45065, 2023-2024, “Machine Learning for Real-Time EEG Classification”

SELECTED INVITED TALKS

- Summer School SFB 1261, “Influence of accurate volume conductor modeling on the MEG and EEG forward Problem”, August 19, 2020, University of Kiel, Kiel, Germany
- Scientific Computing Seminar, “New methods in EEG/MEG source analysis”, January 26, 2018, Emory University, Atlanta (GA), USA
- Workgroup Movement Disorders, “Modeling in Bioelectromagnetism”, July 21, 2017, Charité University Medicine, Berlin, Germany

SELECTED CONFERENCE TALKS

- 4th International Conference on Basic and Clinical multimodal Imaging (BaCI), “Influence of volume conductor accuracy on DBS optimization”, September 12, 2019, Chengdu, China
- 21st International Conference on Biomagnetism (Biomag), “Influence of head tissue conductivity uncertainties on EEG source localization”, August 27, 2018, Philadelphia (PA), USA
- SC16 – The International Conference on High Performance Computing, Networking, Storage and Analysis, “Mobile computational steering for interactive prediction and visualization of deep brain stimulation therapy”, Workshop “Taking Supercomputing to the Clinic”, November 14, 2016, Salt Lake City (UT), USA
- 20th International Conference on Biomagnetism (Biomag), “Avoiding skull leakages using Mixed-FEM approaches”, October 5, 2016, Seoul, Korea

AWARDS

- Postdoc Travel Assistance Award, 2018, Office of Postdoctoral Affairs, University of Utah, USA

SOFTWARE DEVELOPMENT

- FieldTrip-SimBio, Computation of EEG forward solutions using FEM in the open-source toolbox FieldTrip, fieldtriptoolbox.org
- DUNEuro, Open-source toolbox for forward modeling in neuroscience using state-of-the-art FEM approaches, duneuro.org