

Wiete Fehner

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I am a PhD candidate in Imaging Science at Washington University in St. Louis. I specialize in high-resolution optical imaging techniques for decoding brain activity and mapping human cognition in naturalistic settings, providing a practical alternative to fMRI. My research aims to create neuroimaging technologies that integrate seamlessly into daily life, enabling real-time brain insights through wearable systems. Driven by a vision of accessible neuroimaging, I apply advanced signal processing, statistical modeling, and machine learning to achieve accurate neuro-decoding in real-world environments. With expertise in MATLAB and Python, I design experimental paradigms, develop robust image-processing pipelines, and use data science to address complex neuroimaging challenges.

EXPERIENCE

PhD Research | NeuroPhoto Lab | PI: Dr. Joseph P. Culver

Biophotonics Research Center, MIR, Washington University in St. Louis

01/2022 – 05/2026

- **Developing Advanced Neuroimaging Techniques:** Pioneering visual semantic encoding and decoding methods using fiber-based and wearable High-Density Diffuse Optical Tomography (HD-DOT) to enable high-resolution semantic human brain mapping as a surrogate for fMRI in naturalistic settings. This work addresses complex signal processing challenges, extending neuroimaging applications into practical, real-world, and clinical contexts.
- **Refining Functional Connectivity Mapping:** Advancing human brain functional connectivity mapping in task-free environments through multivariate analytical techniques within HD-DOT. Improvement of task-free brain mapping approaches is critical for clinical applications.
- **Leading Data Analysis and Method Development:** Designing naturalistic experimental paradigms and directing data collection, novel method development, and validation processes. Optimizing analysis pipelines in MATLAB and Python to incorporate advanced signal processing, artifact correction, and post-processing techniques.
- **Data Acquisition:** Collection of neuroimaging data with fiber-based and wearable HD-DOT systems. As a level II trained MRI personnel, I collect fMRI data for HD-DOT validation purposes.

Founder & Lead Curriculum Developer, Summer Math Crash Course

Imaging Science Student Council, Washington University in St. Louis

01/2022 – present

- **Founded and led the annual Summer Math Crash Course to address the diverse mathematical needs of graduate students transitioning from various academic backgrounds or re-entering academia.** Team leader of 14 student curriculum developers and course instructors.
- Lead developer of a 9-week curriculum covering linear algebra, calculus, and signals and systems including programming projects in Google Collab.
- Secured an initial \$10k funding, managed the course expansion to a \$15k budget, and collaborated closely with faculty to tailor the curriculum, resulting in 120+ student registrations.

Graduate Teaching Assistant | Practicum in Computational Imaging (ESE 5934)

McKelvey School of Engineering, Washington University in St. Louis

01/2024 – 05/2024

- Mentored engineering graduate students in developing their semester-long computational research projects, focusing on deep learning and machine learning applications in imaging science. Facilitated discussions that guided project formulation and execution. One student published their project at CVPR.

Graduate Research Assistant | Ances Bioimaging Laboratory | PI: Dr. Beau Ances

Department of Neurology, Washington University in St. Louis

09/2021 – 01/2022

- Conducted comparative analysis of white matter microstructure in Alzheimer's disease versus Down syndrome cohorts using diffusion tensor imaging (DTI).
- Implemented advanced MRI data preprocessing using FSL, bash scripts, and statistical analysis with R.

Graduate Research Assistant | TBMC Optical Imaging Lab | PI: Dr. Teemu Rinne

University of Turku, Faculty of Medicine

10/2019 – 05/2021

- Developed a novel auditory paradigm utilizing fNIRS to investigate the functional changes in the auditory cortex induced by cochlear implantation. Collected data, processed, and analyzed it in Python.
- Played a pivotal role in establishing the optical imaging lab, which enhanced the university's research infrastructure and experimental capabilities.

EDUCATION

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| Washington University in St. Louis St. Louis, MO, USA <i>PhD Candidate in Imaging Science, Advisor: Dr. Joseph P. Culver</i> | 08/2021 – 05/2026 |
| – Thesis title: Advancing High-Density Diffuse Optical Tomography for Visual Semantic Decoding in Naturalistic Settings | |
| Washington University in St. Louis St. Louis, MO, USA <i>MS in Electrical Engineering (30 USCS, CGPA: 3.83, graded as A)</i> | 08/2021 – 12/2023 |
| University of Turku Turku, Finland <i>MS in Human Neuroscience (120 ECTS, CGPA: 5, graded as 'excellent')</i> | 08/2019 - 05/2021 |
| University of Bremen Bremen, Germany <i>Selected Bachelor of Science Courses in Psychology (90 ECTS, CGPA: 1.83, graded as 'good')</i> | 10/2017 – 07/2019 |
| Carl von Ossietzky University of Oldenburg Oldenburg (Oldb), Germany <i>BA in Philosophy and Gender Studies (180 ECTS, CGPA: 1.27, graded as 'excellent')</i> | 10/2014 – 06/2017 |

AWARDS & HONORS (SELECTED)

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| 1 st Place Poster Award at Imaging Science Pathway Retreat 2024 St. Louis, USA | 04/2024 |
| Imaging Science Outstanding Leadership Award | 05/2024 |
| Imaging Science Pathway Fellowship (NIH T32) | 01/2023 – 10/2024 |
| Danforth Scholar Washington University in St. Louis | 09/2021 – present |
| McKelvey Engineering Professional Development Award Washington University in St. Louis | 03/2024 |

LEADERSHIP EXPERIENCE & COMMUNITY SERVICE (SELECTED ACTIVITIES)

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| President, Association of Graduate Engineering Students (AGES) <i>Washington University in St. Louis</i> | 05/2022 – 05/2023 |
| – Responsible for leading the executive board, driving strategic initiatives, and collaborating with the engineering school administration to improve student resources and opportunities. | |
| Graduate Ambassador, McKelvey School of Engineering <i>Washington University in St. Louis</i> | 05/2022 – present |
| – Support prospective and incoming graduate engineering students with their transition to graduate school and represent WashU McKelvey School of Engineering in recruitment and outreach events. | |

SKILLS

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| Languages: German (native), English (fluent); | Leadership & Team Management: Proven ability to lead and manage diverse teams in academic and community settings; |
| Programming Languages: MATLAB, Python (including TensorFlow, PyTorch), R, Shell Scripts; | |

CONFERENCE PROCEEDINGS (SELECTED)

I have presented research accomplishments at over 15 local and international conferences, including OHBM, fNIRS, and SPIE. See [here](#) for a full list of conference proceedings.

1. **Fehner, W.**, Fogarty, M., Bajracharya, A., Markow, Z.E., Wilhelm, W., Trobaugh, J., Huth, A. G., Culver, J. P. (2024). "Towards Semantic Encoding of Visual Content in Movies via High-Density Diffuse Optical Tomography." Poster at Society for fNIRS Conference 2024, Birmingham, GB (10 September 2024).
2. **Fehner, W.**, Markow, Z., Fogarty, M., Bajracharya, A., Wilhelm, D., Huth, A. G., Culver, J. P. (2024). "Towards Semantic Visual Decoding of Naturalistic Movies with High-Density Diffuse Optical Tomography." Poster presentation at the Organization for Human Brain Mapping (OHBM) 2024, Seoul, South Korea, June 2024.
3. **Fehner, W.**, Markow, Z., Fogarty, M., Bajracharya, A., Wilhelm, D., Huth, A. G., Culver, J. P. (2024). "Towards Semantic Visual Decoding of Naturalistic Movies with High-Density Diffuse Optical Tomography." Invited talk for the MIR Research Symposium 2024, St. Louis, USA, May 2024.
4. **Fehner, W.**, Fogarty, M., Anastasio, M. A., & Culver, J. P. (2023). "Evaluation of multivariate approaches to functional connectivity mapping with fNIRS." In Proceedings of SPIE PC12365, Neural Imaging and Sensing 2023, PC123650C (17 March 2023).
5. **W. Fehner**, M. Fogarty, M.A. Anastasio, J.P. Culver. (2023). "Comparison of Multivariate and Bivariate Functional Connectivity Approaches using High-Density Diffuse Optical Tomography for Human Brain Mapping." Invited talk presented at the Imaging Science Pathway Retreat 2023, St. Louis, USA (30 March 2023).