

# 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

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

01/2022 – 05/2026

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

- **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

01/2022 – present

*Imaging Science Student Council, Washington University in St. Louis*

- **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)

01/2024 – 05/2024

*McKelvey School of Engineering, Washington University in St. Louis*

- 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

09/2021 – 01/2022

*Department of Neurology, Washington University in St. Louis*

- 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

10/2019 – 05/2021

*University of Turku, Faculty of Medicine*

- 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

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

AWARDS & HONORS (SELECTED)

1 <sup>st</sup> 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)

<b>President, Association of Graduate Engineering Students (AGES)</b> <i>Washington University in St. Louis</i> – Responsible for leading the executive board, driving strategic initiatives, and collaborating with the engineering school administration to improve student resources and opportunities.	05/2022 – 05/2023
<b>Graduate Ambassador, McKelvey School of Engineering</b> <i>Washington University in St. Louis</i> – 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.	05/2022 – present

SKILLS

<b>Languages:</b> German (native), English (fluent); <b>Programming Languages:</b> MATLAB, Python (including TensorFlow, PyTorch), R, Shell Scripts;	<b>Leadership &amp; Team Management:</b> Proven ability to lead and manage diverse teams in academic and community settings;
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CONFERENCE PROCEEDINGS (SELECTED)

I have presented research accomplishments at over 15 local and international conferences, including OHBM, fNIRS, and SPIE. See <a href="#">here</a> for a full list of conference proceedings.	
1. <b>Fehner, W.</b> , 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. <b>Fehner, W.</b> , 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. <b>Fehner, W.</b> , 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. <b>Fehner, W.</b> , 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. <b>W. Fehner</b> , 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).	