Arefeh Sherafati

Research Scientist | Physics, Neuroscience & Artificial Intelligence
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Arefeh Sherafati is a research scientist and science communicator working at the intersection of physics, neuroscience, and artificial intelligence. She develops optical neuroimaging methods at St. Jude Children's Research Hospital, advises early-stage neurotechnology and digital-health startups, and mentors the next generation of computational scientists. Her work spans clinical brain imaging, large-scale open neuroscience datasets, and award-winning applied AI, including a 2023 Grand Prize Runner-Up finish in the Vesuvius Challenge for using deep learning to read 2,000-year-old Herculaneum scrolls.

Education

Ph.D. & M.Sc., Physics, Washington University in St. Louis — 2014 – 2020
Thesis: Separating Signal from Noise in High-Density Diffuse Optical Tomography

M.Sc., Physics, Shahid Beheshti University — 2011 – 2013
Thesis: Cosmological Tests in Non-Linear Massive Gravity

B.Sc., Physics, Sharif University of Technology — 2007 – 2011

Experience

Research Scientist, St. Jude Children's Research Hospital — 2025 – Present
- Develop optical neuroimaging methods to study brain function in children with serious and complex conditions.
- Design novel data-acquisition and analysis pipelines to improve signal quality and clinical relevance.
- Collaborate across multidisciplinary teams to integrate optical neuroimaging into clinical studies.

Scientific & AI Consultant, Startup Advisory — 2025 – Present
- Advise early-stage digital-health and neurotechnology startups on scientific strategy, AI product development, and data-driven validation.
- Help founders turn complex research into fundable roadmaps, NIH SBIR/STTR proposals, and fundraising narratives.

Research Mentor, Lumiere Education, Mehta+, Superprof — 2023 – Present
- Mentor college and high-school students one-on-one in neuroscience, physics, and computer-science research, guiding several to their first publications.

Independent Researcher, Vesuvius Challenge — 2023 – 2025
- Contributed to deep-learning ink detection for Herculaneum papyri; awarded 2023 Grand Prize Runner-Up ($50k) and a 2024 Progress Prize.
- Designed experiments for model understanding and error analysis; refined patch-sampling and aggregation strategies.

Postdoctoral Scholar, UCSF Weill Institute for Neurosciences — 2023 – 2024
- Led a project with the Allen Institute to release the largest mouse V1 calcium-imaging dataset to date.
- Built a Python toolbox for statistical analysis of neural responses; characterized spatial and motion selectivity with ML.

Postdoctoral Research Associate, Washington University School of Medicine — 2020 – 2023
- Developed data-processing tools and machine-learning pipelines for HD-DOT clinical and cognitive neuroimaging.
- Led teams handling HD-DOT/fMRI data and mentored a postdoc, three graduate students, and several research assistants.

Graduate Research Assistant, Washington University in St. Louis — 2014 – 2020
- Published the first comprehensive motion-artifact analysis for HD-DOT and developed a novel motion-detection metric.

- Led clinical protocol development for cochlear-implant and deep-brain-stimulation patients; contributed to NIH R01 grants and projects funded by the Gates Foundation and Meta.

Selected Publications

Dorsolateral prefrontal cortex supports speech perception in listeners with cochlear implants. *eLife.* link

fNIRS reproducibility varies with data quality, analysis pipelines, and researcher experience. *Communications Biology.* link

Global motion detection and censoring in high-density diffuse optical tomography. *Human Brain Mapping.* link

Mapping cortical activations underlying covert and overt language production. *NeuroImage.* link

Mapping brain function in adults and young children during naturalistic viewing. *Human Brain Mapping.* link

Mapping neural correlates of biological motion perception in autistic children. *Molecular Autism.* link

A high-density diffuse optical tomography dataset of naturalistic viewing. *Scientific Data.* link

Decoding visual information from high-density diffuse optical tomography. *NeuroImage.* link

Portable, field-based neuroimaging. *NeuroImage.* link

Full publication list available on Google Scholar.

Awards & Honors

- Vesuvius Challenge 2023 Grand Prize Runner-Up ($50,000) and 2024 Progress Prize
- 1st Place, SPIE Optics Outreach Games, Optics + Photonics (2016)
- 1st Place, Annual Graduate Research Symposium in Sciences (2016)
- SPIE Travel Grant for Leadership Workshop
- Hughes Summer Fellowship; Graduate Teaching Fellowship; University Fellow, WashU Physics

Leadership, Teaching & Service

- Peer reviewer for NeuroImage, Nature Scientific Reports, Neurophotonics, Psychophysiology, and OpenReview.
- Founded and led a weekly HD-DOT data-quality workshop and an ML-in-brain-signal-processing journal club (30+ members).
- Contributed to the Deep Learning course (CIS-522) at the University of Pennsylvania.
- Vice President, SPECTRA (OSA/SPIE student chapter); taught undergraduate physics, quantum mechanics, and astrophysics.
- Active in Women in Physics and graduate peer mentoring.

Selected Invited Talks

- Separating signal from noise in high-density diffuse optical tomography. Computational Imaging Group, WashU (2022).
- Mapping the impact of deep brain stimulation on brain function in Parkinson disease. Psychiatry Grand Rounds, WashU School of Medicine (2020).
- Developing diffuse optical tomography for patients with implants. fNIRS Seminar Series, Ohio State University (2019).

A complete list of invited talks and 50+ conference presentations is available on request and on Google Scholar.