

Mürsel Karadas

Independent Researcher
Department of Neurology, First Affiliated Hospital
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I am an engineer and physicist investigating how sensory information is transformed by neural circuits across brain states and turning into perception. I choose the olfactory bulb as a model to study this problem, using integrated all-optical and electrophysiological techniques. By extending this framework to cortical and hippocampal circuits, I aim to uncover systems-level principles that govern perception, cognition, and behavior.

Expertise: Microscopy, all-optical imaging and stimulation, electrophysiology, signal processing, inverse problems, neural interfaces, computational/theoretical electromagnetics.

Work Experience	First Affiliated Hospital, Chongqing Medical University Chongqing, China	2026.05 - Present
	• Department of Neurology — Independent Researcher.	
	NYU Grossman School of Medicine New York, NY, USA	2019.08 - 2026.03
	Technical University of Denmark (DTU) Lyngby, Denmark	2016.02 - 2019.08
	• Center for Magnetic Resonance, Department of Electrical Engineering.	
	Middle East Technical University (METU) Ankara, Turkey	2012.09 - 2016.02
	• Department of Electrical and Electronics Engineering.	
	Copenhagen University Copenhagen, Denmark	2018.05 - 2018.10
	• Department of Neuroscience.	

Education	Department of Health Technology	Lyngby, Denmark
	<i>Ph.D. in Electrical Engineering (Neurotechnology)</i>	Completed 2019.08
	• Thesis: Highly Sensitive Magnetic Sensing of Neural Activity	
	• Advisors: Assoc. Prof. Dr. Axel Thielscher, Prof. Dr. Ulrik Lund Andersen	
	• Focus: Electromagnetic sensing, neuron modeling, extracellular recording, inverse problems.	
	Dept. of Electrical and Electronics Engineering	Ankara, Turkey
	<i>Ph.D. Student (Coursework Completed)</i>	2014.09 - 2016.01
	• Focus: Electrical/Mechanical property imaging, electromagnetic wave theory.	
	Dept. of Electrical and Electronics Engineering	Ankara, Turkey
	<i>M.Sc. in Electrical Engineering</i>	2011.09 - 2014.08
	• Thesis: 2D Simulations Based on General Time Dependent Reciprocal Relation for LFEIT.	
	Dept. of Electrical and Electronics Engineering	Ankara, Turkey
	<i>B.Sc. in Electrical Engineering</i>	2007.09 - 2011.06
	• Graduated with High Honors.	

Preprints/ Unpublished Manuscripts	1. Gill, JV, Karadas, M , Shoham S, Rinberg, D, Temporal sequence geometry enables odor recognition and generalization. <i>bioRxiv</i> (2026). 10.64898/2026.01.20.700611
	2. Zheng, Z (Sam), Zutshi, I, Huszár, R, Zhang, Y, Karadas, M , Buzsáki, G, Williams, AH. From labels to latents: revealing state-dependent hippocampal computations with Jump Latent Variable Model. <i>bioRxiv</i> (2025). 10.64898/2025.12.14.694183
	3. Zhang, Y.*, Karadas* , M, Zheng, S., Buzsaki, G, State regulation and homeostatic control of acetylcholine neuromodulation in the hippocampus. Under revision (<i>Neuron</i>).(*co-first author)
	4. Karadas, M* , Gill*, JV, Theagen, D, Shoham S, Rinberg, D, A Multiscale All-Optical Approach for Investigating Neural Connectivity. (In preparation).

Journal Publications	1. Gonzalez, J, Vöröslakos, M, Aykan, D, Soto, N, Nitzan, N, Swanson, R, Karadas, M , Chen, ZS, Buzsáki, G. Subspace communication in the hippocampal-retrosplenial axis. <i>Nature</i> (2026). 10.1038/s41586-026-10481-z
	2. Karadas, M , Gill, JV, Ceballo, S, Shoham, S, Rinberg, D. Rapid temporal processing in the olfactory bulb underlies concentration-invariant odor identification and signal decorrelation. <i>Nature Neuroscience</i> , 29(5):1109–1121 (2026). 10.1038/s41593-026-02250-y
	3. Zhang, Y.*, Karadas* , M, Liu, J., Gu, X., Vöröslakos, M., Li, Y., Tsien, RW, Buzsáki, G, Interaction of acetylcholine and oxytocin neuromodulation in the hippocampus. <i>Neuron</i> , 112(11):1862–1875.e5 (2024). 10.1016/j.neuron.2024.02.021 . Cover Paper. (*co-first author)
	4. Lambert G.G., et al., Karadas M. , et al., CaBLAM! A high-contrast bioluminescent Ca ²⁺ indicator derived from an engineered <i>Oplophorus gracilirostris</i> luciferase. <i>Nature Methods</i> (2025). 10.1038/s41592-025-02972-0
	5. Karadas, M. , Olsson, C., Hansen, N. W., Perrier, J. P., Webb, J. L., Huck, A., Andersen, U. L., Thielscher, A. In-vitro recordings of neural magnetic activity from the auditory brainstem using color centers in diamond: A simulation study. <i>Frontiers in Neuroscience</i> . 10.3389/fnins.2021.643614

6. Zhang, Y., Cao, L., Varga, V., Jing M., **Karadas, M.** Yulong Li, Y., Buzsaki, G, Cholinergic suppression of hippocampal sharp wave ripples impairs working memory. **PNAS**. [10.1073/pnas.2016432118](https://doi.org/10.1073/pnas.2016432118)
7. **Karadas, M.**, Wojciechowski, AM, Huck, A, Dalby, NO, Andersen, UL Thielscher, A Feasibility and resolution limits of opto-magnetic imaging of neural network activity in brain slices using color centers in diamond **Scientific Reports**, vol 8, no. 1, 4503 (2018). [10.1038/s41598-018-22793-w](https://doi.org/10.1038/s41598-018-22793-w)
8. Wojciechowski, AM, **Karadas, M.**, Osterkamp, C, Jankuhn, S, Meijer, J, Jelezko, F, Huck, A, Andersen, UL Precision temperature sensing in the presence of magnetic field noise and vice-versa using nitrogen-vacancy centers in diamond **Applied Physics Letters**, vol 113, no. 1, 013502 (2018). [10.1063/1.5026678](https://doi.org/10.1063/1.5026678)
9. Wojciechowski, AM, **Karadas, M.**, Huck, A, Osterkamp, C, Jankuhn, S, Meijer, J, Jelezko, F, Andersen, UL Contributed review: camera-limits for wide-field magnetic resonance imaging with a nitrogen-vacancy spin sensor **Review of Scientific Instruments**, vol 89, no. 3, 031501 (2018). [10.1063/1.5010282](https://doi.org/10.1063/1.5010282)

Conference Proceedings

1. **Karadas, M.**, Gill, JV, Ceballo, S, Shoham S, Rinberg, D, Olfactory bulb network computations underlie concentration invariant odor identification, Cosyne 2023.
2. Gill, JV, **Karadas, M.**, Shoham S, Rinberg, D, The geometry and role of sequential activity in olfactory processing, Cosyne 2023.
3. Gill, JV, **Karadas, M.**, Shoham S, Rinberg, D, The geometry and role of sequential activity in olfactory processing, SfN 52nd annual meeting, 2022.
4. Ceballo, S, Karimimehr, S, **Karadas, M.**, Rinberg, D, A behavioral paradigm for measuring perceptual distances between pairs of natural and artificial odors, SfN 52nd annual meeting, 2022.
5. **Karadas, M.**, Gill, JV, Shoham S, Rinberg, D, Olfactory bulb network computations underlie concentration invariant odor identification, SfN 52nd annual meeting, Neuroscience 2022.
6. **Karadas, M.**, Gill, JV, Shoham S, Rinberg, D, Multiscale probing of the olfactory bulb reveals a crucial early response window in odor coding, 8th Annual Brain Initiative Meeting (2022).
7. Wojciechowski, AM, **Karadas, M.**, et al. Towards wide-field imaging of brain slices using a quantum diamond microscope. **SPIE Photonics West**, 2018. [10.1117/12.2325262](https://doi.org/10.1117/12.2325262)
8. **Karadas, M.**, Gencer, NG. 2D simulations based on general time-dependent reciprocal relation for LFEIT. **IEEE EMBC** 2015. [10.1109/EMBC.2015.7318669](https://doi.org/10.1109/EMBC.2015.7318669)
9. Tafreshi, AK, **Karadas, M.**, Top, CB, Gencer, NG. Data acquisition system for harmonic motion microwave Doppler imaging. **IEEE EMBC** 2014. [10.1109/EMBC.2014.6944223](https://doi.org/10.1109/EMBC.2014.6944223)

Awards & Honors

- Scholarship for M.Sc. Degree 2011 - 2014
- Rank 1, Acceleration Program (Project: Blood vessel imaging) 2011
- Scholarship for B.Sc. Degree 2007 - 2011
- Silver Medalist 2005
- Bronze Medalist 2004

Teaching & Mentoring

Teaching Assistantships

- **DTU (2017-2018)**: Applied Signal Processing.
- **METU (2012-2016)**: Introduction to Medical Imaging, Fundamentals of Biomedical Engineering, Computational Methods, Analog/Digital Electronic Design, Signal Processing.