BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Karim G. Oweiss

eRA COMMONS USER NAME (credential, e.g., agency login): KOWEISS

POSITION TITLE: Professor of Electrical and Computer Engineering, Biomedical Engineering & Neuroscience

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Alexandria, Alexandria, Egypt	BSc	1993	Electrical Engineering
University of Alexandria, Alexandria, Egypt	MSc	1996	Electrical Engineering
University of Michigan, Ann Arbor, MI	PhD	2002	Electrical Engineering & Computer Science
University of Michigan, Ann Arbor, MI	Postdoctoral Fellow	2002	Biomedical Engineering

A. Personal Statement

I serve as Professor of Electrical and Computer, Bioengineering, Neuroscience and Neurology at University of Florida where I teach Bioelectrical Systems (at the undergraduate level) and Neural Signals, Systems and AI (at the graduate level); I mentor undergraduates, graduate students, postdoctoral fellows, and faculty at all levels. As a signals and systems engineer and electrophysiologist by training, I have focused on studying the neuroplasticity mechanisms associated with learning and memory, and the engineering of bi-directional neural interfaces for interrogating and potentially augmenting, assisting or repairing dysfunctional neural circuits in clinical applications.

My group has developed numerous analytical and experimental tools for basic neuroscience investigations; some are widely used by the neurophysiology community. Some of our most seminal contributions are the development of techniques for mapping functional and effective connectivity between neurons in awake behaving animals. More recently, we pioneered the development of compressed sensing for synaptic connectivity mapping using two photon optogenetics and helped validate its use in experimental studies *in vivo*. I use these tools to address longstanding questions related to pathophysiology of movement and cognitive disorders and how they continue to progress and degrade the quality of life with no cure. The goal is to interrogate fundamental mechanisms of neuroplasticity, namely intrinsic and synaptic plasticity that could lead to neurodegeneration and synaptic dysfunction during disease progression. These tools could be transformative in a) diagnosing onset of disease much earlier than current practice and b) devising interventions that could reverse the course of the disease and eventually cure it. This work has led to diverse progress towards translational neuroscience where we pioneered the development of novel neural decoding approaches for brain computer interfaces (BCIs), and encoding models for adaptive Deep Brain Stimulation (DBS) to patients with severe Essential Tremor, the most common movement disorder in humans.

Selected ongoing and recently completed projects:

UH3NS109845 (NINDS) Oweiss (PI)
09/30/2019-03/31/2026
Dual Lead Thalamic DBR-DBS Interface for Closed Loop Control of Severe Essential Tremor

R01NS093909-05 (NINDS) Oweiss (PI)
07/01/2015-06/30/2021
Optimizing microstimulation to restore lost somatosensation

HR0011-16-2-0027 (DARPA – Targeted Neuroplasticity Training) Oweiss (PI)
01/01/2017-12/31/2020
Optimized Learning via Peripheral Nerve Stimulation

B. Positions, Scientific Appointments, and Honors

Positions

2021	Visiting Professor (Sabbatical), Institute of Vision (Lab of Valentina Emiliani), Sorbonne University/INSERM, Paris, France
2016 - Present	Professor, Department of Neurology (by Courtesy), University of Florida, Gainesville, FL
2014 - Present	Professor, Department of Electrical & Comp. Eng., University of Florida, Gainesville, FL
2014 - Present	Professor, Department of Biomedical Eng.(affiliate), University of Florida, Gainesville, FL
2014 - Present	Professor, Department of Neuroscience (affiliate), University of Florida, Gainesville, FL
2014	Visiting Professor (Sabbatical), Department of Clinical Neurosciences, Division of Neurosurgery, Spectrum Health System, Grand Rapids, MI
2009 - 2014	Associate Professor (tenured), Dept. of Elec and Comp Eng, Michigan State Univ., MI
2009 - 2014	Associate Professor, Neuroscience Program, Michigan State Univ., East Lansing, MI
2009 - 2014	Associate Professor, Cognitive Science Program, Michigan State Univ., East Lansing, MI
2006 - 2009	Assistant Professor, Neuroscience Program, Michigan State Univ., East Lansing, MI
2003 - 2009	Assistant Professor, Dept. of Elec and Comp Eng, Michigan State Univ., East Lansing, M

Scientific Appointments & Honors

2024	Fellow, University of Florida's Advanced Leadership for Academics and Professionals.
2024 – Present	Fellow, American Academy for the Advancement of Sciences
2014 – Present	Preeminent Professor (University of Florida)
2011 – Present	Senior Member, IEEE
2012 - Present	Consulting Editor, Academic Press, Elsevier, Biomedical Engineering book Series
2012 - Present	Associate Editor, IEEE Trans Neural & Rehabilitation Eng
2010 - 2014	Standing Member of the NIH Neurotechnology Study Section
2010 - 2012	Associate Editor, IEEE Engineering in Med & Bio Editorial Board: Neural & Rehab Eng.
2009 - 2011	Associate Editor, IEEE Signal Processing Letters
2009 - 2011	Review Editor, Journal of Frontiers in Neural Engineering
2006 - Present	Associate Editor, Journal of Computational Intelligence and Neuroscience
2006	Member of IEEE Signal Processing Society Board of Directors
2005 - Present	Member, Society for Neuroscience
2005 - Present	Member, IEEE Technical Committees on: Biomedical Circuits and Systems, Life-Science Systems and Applications, Neural Systems and Applications
2001	Excellence in Neural Engineering Award (NSF)

C. Contributions to Science

1. **Neuroplasticity Mechanisms and Artificial Intelligence**: I have contributed to the development of cellular and ensemble level understanding of mechanisms of sensorimotor integration in somatosensory and motor areas of the rodent and rhesus macaque brains. We used these discoveries to devise novel machine learning techniques for decoding brain activity at exceedingly high temporal and spatial resolutions. Sample publications:
   a. S. Eldawlatly, K. Oweiss (2011) "Millisecond-Timescale Local Network Coding in the Rat Primary Somatosensory Cortex," ***PLoS ONE*** 6(6): e21649. PMCID: PMC3126857
   b. S Eldawlatly, K Oweiss (2014) "Temporal precision in population-but not individual neuron-dynamics reveals rapid experience-dependent plasticity in the rat barrel cortex", ***Front Comput Neurosci***. 2014 Nov 25;8:155. doi: 10.3389/fncom.2014.00155. eCollection 2014. PMCID: 25505407
   c. S. Eldawlatly, Y. Zhou, R. Jin and K. Oweiss, (2010) "On The Use of Dynamic Bayesian Networks in Reconstructing Functional Neuronal Networks from Spike Train Ensembles", ***Journal of Neural Computation***, MIT Press, 22:1, pp. 158-189. PMCID: 2794930

d. M. Aghagolzadeh, S. Eldawlatly and K. Oweiss, (2010) "Synergistic Coding by Cortical Neural Ensembles" ***IEEE Transactions on Information Theory: Special issue on Molecular Biology and Neuroscience***, 56:2, 875-899. PMCID: 2849156

2. **NeuroTechnology: Provision of tools for measurement and characterization of neural circuit function**. My group's most significant contribution is the development of all optical technology (using two photon microscopy and optogenetics) to quantify intrinsic and synaptic connectivity with cellular resolution *in silico* and *in vivo*. Sample publications:

    a. I-Wen Chen, Chung, Y Chan, P Navarro, V de Sars, E Ronzitti, D Tanese, K Oweiss & V Emiliani (2025) "High-throughput synaptic connectivity mapping using in vivo two-photon holographic optogenetics and compressive sensing", ***Nature Neuroscience****, in press*
    b. Shuo-Yen Chueh, et. Al. (2025) "Metaplasticity and Continual Learning: Mechanisms subserving Brain Computer Interface Proficiency and skill consolidation," ***J. Neural Engineering***; PMCID: 40315903
    c. P. Navarro, K. Oweiss (2023), "Compressive sensing of neuronal connectivity maps from subsampled, cell-targeted optogenetic stimulation," ***Patterns, Cell Press****,* volume 4, issue 10, PMCID: 37876895
    d. M. Vaidya, et al. (2017) "Emergent Coordination Underlying Learning to Reach-to-Grasp with a Brain-Machine Interface", ***Journal of Neurophysiology***. PMCID: PMC5966743

3. **Translational Neuroscience: Clinically Viable Brain Computer Interfaces**
    I am a recognized expert in the field of BCIs, and in the development of tools (both hardware and software) for the analysis of large-scale neural data acquired through both invasive and noninvasive neural interface technology. My seminal contributions are in the development of real time neural decoding approaches based on Reinforcement Learning. Sample publications:

    a. Balasubramanian K, et al. (2017) Changes in cortical network connectivity with long-term brain-machine interface exposure after chronic amputation. ***Nature Communication***; Nov 27;8(1):1796. doi: 10.1038/s41467-017-01909-2. PMCID: 5703974.
    b. Aghagolzadeh M. and Oweiss K., (2009) "Compressed and Distributed Sensing of Neuronal Activity for Real Time Spike Train Decoding", ***IEEE Transactions on Neural Systems & Rehabilitation Engineering***, 17:2, pp. 416-427. PMCID: 2782557
    c. Eleryan, M et al. (2014) "Tracking Single Units in Chronic Recordings in the Macaque Motor Cortex for Brain Machine Interface Applications", ***Frontiers in Neural Engineering*** 7:23, PMCID: 25071546
    d. M. Grosse-Wentrup, D. Mattia, K. Oweiss (2011), "Using Brain-Computer Interfaces to Induce Neural Plasticity and Restore Function," ***Journal of Neural Engineering***, 8: 025004. PMCID: 4515347

4. **Mechanisms of Deep Brain Stimulation in Movement Disorders**
    My seminal contributions are towards novel approaches to Deep Brain Stimulation (DBS) to treat movement disorders. Based on mechanisms underlying focal and distributed DBS in humans with severe Essential Tremor, the most common movement disorder, a major finding is that healthy movement and pathological tremor-related biomarkers are spatially organized in cerebellar-receiving and pallidal-receiving thalamic nuclei. These findings are used to design adaptive DBS that can be highly personalized using patient-specific protocols to minimize side effects and reduce DBS tolerance. Additionally, I have contributed to the development of computational models of basal ganglia circuits to elucidate mechanisms of DBS stimulation efficacy and optimization of DBS parameters for Parkinson's disease. Sample publications:

    a. J. Liu, H. Khalil, K. Oweiss (2011), "Neural Feedback for Instantaneous Spatiotemporal Modulation of Afferent Pathways in Bi-directional Brain Machine Interfaces," ***IEEE Transactions on Neural Systems & Rehabilitation Engineering***, 19:5, pp 521-533. PMID: 21859634
    a. J. Liu, H. Khalil, K. Oweiss (2011) "Model-based analysis and control of a network of Basal Ganglia spiking neurons in the normal and Parkinsonian states," ***Journal of Neural Engineering***, 8: 045002 (16pp). PMCID: 3219042
    b. J. Daly, J. Liu, M. Aghagolzadeh, K. Oweiss (2012), "Optimal Space Time Precoding of Artificial Sensory Feedback through Mutichannel Microstimulation in Bi-directional Brain Machine Interfaces " ***J. of Neural Engineering***, 9, 065004, doi:10.1088/1741-2560/9/6/065004

c. M. Bender, et al. (2025) “Evaluating Thalamic Biomarkers for Closed-Loop Deep Brain Stimulation in Essential Tremor” 37th International IEEE/EMBS Conference, Copenhagen, Denmark

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/karim.oweiss.1/bibliography/40871117/public/?sort=date&direction=ascending