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Announces the Ph.D. Dissertation Defense of

Hadi Esfandi

for the degree of Doctor of Philosophy (Ph.D.)

A Computational Framework for Multi-Scale Analysis of Mouse Cerebral Blood Flow Regulation

August 28 2025, 4 p.m.
[online]
https://fau-edu.zoom.us/j/85126089863?pwd=BXAfhZN7waGvawdqaSuy2abCTtRCQk.1

DEPARTMENT: Electrical Engineering and Computer Science

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ABSTRACT OF DISSERTATION
Recent advances in imaging technologies have enabled whole-brain measurements of hemodynamics with high spatiotemporal resolution. Yet a biophysical model that fully explains how active brain cells regulate cerebral hemodynamics to meet continuous metabolic demands has not previously been developed. This dissertation introduces a computational framework that simulates cellular-level interactions shaping cerebral hemodynamics in small rodents. The proposed model improves the predictive power of hemodynamic imaging, enabling more accurate inference of brain activity and advancing our ability to diagnose cerebrovascular pathologies.

BIOGRAPHICAL SKETCH
Born in Tehran, Iran.`
B.S., University of Isfahan, Isfahan, Iran 2015
M.S., University of Tehran, Tehran, Iran 2018
Ph.D., Florida Atlantic University, Florida, USA 2025

CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

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Published Papers:

Esfandi, H., Javidan, M., Anderson, R. M., & Pashaie, R. (2025). Depth-dependent contributions of various vascular zones to cerebral autoregulation and functional hyperemia: An in-silico analysis. PloS ONE, 20(5), e0321053.

Esfandi, H., Javidan, M., McGregor, E. R., Anderson, R. M., & Pashaie, R. (2025). Systems biology analysis of vasodynamics in mouse cerebral arterioles during resting state and functional hyperemia. Preprint available on bioRxiv; *Under revision in PLOS Computational Biology*.

Esfandi, H., Javidan, M., & Pashaie, R. "Optimization of data acquisition operation in optical tomography based on estimation theory." Biomedical Optics Express, 12(9), 5670–5690 (2021).

Javidan, M., **Esfandi, H.**, Anderson, R., & Pashaie, R. "Optimal data acquisition in tomography." JOSA A, 40(12), 2259–2276 (2023).

Javidan, M., **Esfandi, H.**, & Pashaie, R. (2023, March). Optimal tomography of dynamically evolving objects using machine learning algorithms. In Optical Tomography and Spectroscopy of Tissue XV (Vol. 12376, pp. 83-87). SPIE.

Javidan, M., **Esfandi, H.**, & Pashaie, R. (2021, November). Optimal Scanning Protocol for Optical Tomography. In 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) (pp. 3986-3989). IEEE.

In preparation:

Esfandi, H., et al. "Caloric restriction partially restores impaired nitric oxide-mediated neurovascular coupling in PS19 tauopathy mice."