ROOZBEH FARHOODI

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BIO

I've graduated in applied mathematics and am currently a postdoc at the University of Pennsylvania under the supervision of Dr. Konrad P. Kording. I am interested in neuro-anatomy, neural networks and system neuroscience.

EDUCATION

Postdoctoral
University of Pennsylvania, USA, 2019-present
Advisors: Konrad P. Kording

Ph.D. in Applied Mathematics,
Sharif University of Technology, Tehran, Iran, 2012 to 2019
Dissertation: "Sampling Neuron Morphology"
Advisors: Morteza Fotouhi

M.Sc. in Mathematics,
Sharif University of Technology, Tehran, Iran, 2008 to 2011
Concentration: "The Hammersley Model and the Longest Increasing Subsequence"
Advisor: Kasra Alishahi
GPA 18.50/20

B.Sc. in Mathematics,
Sharif University of Technology, Tehran, Iran, 2004 to 2008
GPA 18.2/20

AWARDS and HONORS

Postdoc fellowship, University of Pennsylvania, USA, 2017-present

Research Grant for Ph.D students, Cognitive Science and Technologies Council, Iran, 2015

Ranked 1st on the National Entrance Exam for Graduate Program, Iran, 2012

First Prize, International Mathematics Competition (IMC), Blagoevgrad, Bulgaria, 2007

Gold Medal, National Mathematics Olympiad, Iran, Summer 2003

Silver Medal, National Mathematics Olympiad, Iran, Summer 2002

PUBLICATIONS

Please find the latest publications on my Google scholar profile.

Akbarzadeh S.*, Farhoodi R., Lyu T., Awais M., Zhao X., Farooq Abbasi S., Chen W. (2020). Evaluation of Apgar Scores and Non-Nutritive Sucking Skills in Infants Using a Novel Sensitized Non-Nutritive Sucking System, Proceeding of *Engineering in Medicine and Biology Conference (EMBC)*.

(paper)

Filom*, K., Kording, K. P. Farhoodi, R. (2020). PDE constraints on smooth hierarchical functions computed by neural networks. *arXiv preprint*, arXiv:2005.08859 (paper)

Farhoodi*, R., Lansdell*, B. J., Kording, K. P. (2019). Quantifying how staining methods bias measurements of neuron morphologies. *Frontiers in Neuroinformatics*, 13, 36. (paper)

Farhoodi*, R., Filom*, K., Jones, I. S., Kording, K. P. (2019). On functions computed on trees. Neural Computation. (paper)

Glaser*, J. I., Benjamin*, A. S., Farhoodi*, R., Kording, K. P. (2019). The roles of supervised machine learning in systems neuroscience. *Progress in neurobiology*. (paper)

Farhoodi*, R., Kording, K. P. (2018). Sampling neuron morphologies. *BioRxiv*, 248385. (paper)

Kording*, K. P., Benjamin, A., Farhoodi, R., Glaser, J. I. (2017). The roles of machine learning in biomedical science. *In Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2017 Symposium*. National Academies Press. (paper)

CONFERENCE PRESENTATIONS

Akbarzadeh S., Farhood R., Lyu T., Awais M., Zhao X., Farooq Abbasi S. Chen* W., "Evaluation of Apgar Scores and Non-Nutritive Sucking Skills in Infants Using a Novel Sensitized Non-Nutritive Sucking System", 42nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'20), Montral Canada, July, 2020

Farhoodi* R., Filom* K., Kording, K. P., "A PDE description of tree functions with repeated inputs", Conference on Mathematical Theory of Deep Neural Networks (Deepmath), New York city USA, October 2019

Ing-Esteves* S., Farhoodi R., Kording K. P. Lefebvre J., "Dendrite self-avoidance is mediated by transient neurite bridges", Society for Neuroscience (SfN), Chicago USA, October 2019

Ing-Esteves* S., Farhoodi R. Lefebvre J., "Representing neural reconstructions as cyclic graphs allows investigation of contact-dependent models of dendrite self-avoidance", Canadian Association for Neuroscience (CAN), Toronto Canada, May 2019

Farhoodi* R., Filom* K., Jones I. S., Kording K. P., "On Functions Implemented in Trees", The Science of Deep Learning, Washington D.C., March 2019

Ing-Esteves* S., Farhoodi R. Lefebvre J., "4D analysis using cycling graph reconstructions to investigate dendrite self-recognition and self-avoidance", Computational and Systems Neuroscience (Cosyne), Cascais, Portugal, March 2019

Farhoodi* R., Lansdell* B. J., Kording K. P., "Quantifying the effect of staining methods on extracted neuron morphology, Neuro Informatics (INCF), Montral, Canada, August 2018

Farhoodi* R., Rolnick* D., Kording K. P., "Neuron dendrograms uncover asymmetrical motifs", Computational and Systems Neuroscience (Cosyne), Denver, USA, March 2018

Farhoodi* R., Ramkumar* P., Kording, K. P., "Deep learning approach towards generating neuronal morphology", Computational and Systems Neuroscience (Cosyne), Salt Lake City, USA, February 2017

SELECTED TALKS

The Dendrograms of Neuron Morphologies exhibit Asymmetrical Motifs, Neuromatch Conference 3.0, October 2020 (YouTube)

Reconstructing the morphology of neurons from sparse noisy observations, 36th Annual MINS Un-Retreat Symposium Year of Brain Science Technology, University of Pennsylvania, USA, April 2020 (link)

The architecture of neuron morphologies, Computational Neuroscience Intiative (CNI), University of Pennsylvania, USA, April 2018

Classification and generating of neuron morphologies, Janelia Research Campus, Ashburn, USA, June 2017

Electrical imaging from high-density neural recordings, Nanosymposium, Society for Neuroscience (SfN), San Diego, USA, November 2016

PUBLICATIONS – In Farsi

Farhoodi, R., Ten Simple Rules for Structuring Papers, *Sharif Math Magazine*. Translated from here, 2018 (PDF)

Farhoodi, R., A Geometrical Proof for a Limit Theorem in Probability, Sharif Math Magazine, No.7 (2015), pp 61-65 (PDF)

Farhoodi, R., Introduction to Neuroscience, Sharif Math Magazine, No.5 (2014), pp. 41-45, (PDF)

Farhoodi, R., Salavati, E., Interview with first female winner of fields medal; Maryam Mirzakhani, 2014 (PDF)

Farhoodi, R., Abbasian, A., Three Examples of Applying Mathematics in Biology, IPM Newsletter, No.69 (2013), pp. 3-6 (PDF)

Farhoodi, R., Mathematics of Sandpile Model, *journal of Iranian mathematics Olympiad (Pargar)* (2013), pp. 12-24 (PDF)

Farhoodi, R., Graduate Study in Iran, Discussion with Prof.Mehrdad Shahshahani, *Sharif Math Magazine*, No.4 (2012), pp. 43-54 (PDF)

Farhoodi, R., Hammersly Model and Largest Increasing Subsequence in a Random Permutation, Master thesis, Mathematics Department, Sharif University of technology (2010) (PDF)

PROFESSIONAL ACTIVITIES

Emcee(Show-runner) for +20 talks in Neuromatch Conference 3.0: A conference made for the whole neuroscience community, October 26 - 30, 2020:

Co-organizer of a workshop at Computational and Systems Neuroscience (Cosyne) 2020. Title: Neural networks that are neuronal networks: Considerations of neuron morphology in circuit computations.

Member of Society of Neuroscience (SfN)

Reviewer of:

- PNAS (Proceedings of the National Academy of Sciences of the United States of America)
- Nature Scientific Reports (open access journal publishing original research from across all areas of the natural and clinical sciences)
- Neural Computation (peer-reviewed scientific journal published by MIT Press)
- BioRob (International Conference on Biomedical Robotics and Biomechatronics)
- Neurmatch conference (1 2) (link)

DEVELOPED PACKAGES

BonsaiNet

A python package for understanding neuron morphology. The package has many modules for analysing data. **McNeuron**; to plot and edit neurons and generate new samples using Markov Chain Monte Carlo, **Tree-GAN**; that extends the generative adversarial networks (GANs) to tree-structure data, **Actual-Tree**; for comparing neurons with actual trees, **Staining-methods**; to check the reliability neuron morphologies extracted by different staining methods.

MENTORING / STUDENT SUPERVISION

Dewang Saluja: Master student (2018-2020), University of Pennsylvania Project: Tree functions to obtain insights into deep learning

Ilenna Jones: PhD Candidate (2017-), University of Pennsylvania Project: Computation in single neuron morphology

Anirudth Natarajn: summer internship (2018), University of Pennsylvania Project: Comparing neuron morphologies and actual tree

TEACHING EXPERIENCE

Lead TA for Neuromatch Academy 2020: An online school for Computational Neuroscience: A three-week online course to learn computational neuroscience . containing 7000+ participants around the word, 300+ TA and 15 Lead TA and 40 tutorial mentors.

Holding undergraduate courses at Sharif University for:

- "Differential Equations", Spring 2014
- "Probability and application", Spring 2011

Selected TAs:

- Stochastic Analysis, Fall 2011
- Real Analysis, 2010
- Random Process, 2009
- Calculus I and II, 2008

COMPUTER SKILLS

Programming in most of popular languages: Python, MATLAB, Java, C++, HTML, etc.

EXTRACURRICULAR ACTIVITIES

In my spare time, I play piano (what I'm practicing now), read books (what I'm reading now) and travel (where I'm now). I am getting my license to teach BodyPump (Les Mills) group exercise.