



# HAMIDREZA ABBASPOURAZAD

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Los Angeles, California

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## EDUCATION

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**PhD, Electrical Engineering**, University of Southern California, Los Angeles, USA *2015 - Present*  
Adviser: Professor Maryam M Shanechi (<http://nseip.usc.edu>)  
**MSc, Computer Science**, University of Southern California, Los Angeles, USA *2017 - Present*  
GPA: 3.97/4.00  
**BSc, Electrical Engineering**, Sharif University of Technology, Tehran, Iran *2010 - 2015*  
GPA: 18.92/20 (class of 2015 top 3 students)  
Minor in Economics  
**High School Diploma in Physics and Mathematics**, Energy High School, Tehran, Iran *2006 - 2010*  
GPA: 19.98/20 (class of 2010 top student)

## HONORS AND ACHIEVEMENTS

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Ranked **2<sup>nd</sup>** among more than 270,000 competitors in nationwide BSc exam (known as *Konkoor*), Iran *2010*  
Member of *Iran's National Elites Foundation (INEF)* *2010 - Present*  
Member of *Exceptional Talents Community of Sharif University of Technology* *2015 - Present*

## RESEARCH INTERESTS

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Statistical machine learning, Time-series dynamics, Representation learning, Computational neuroscience

## RESEARCH EXPERIENCE

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**Neural Systems Engineering and Information Precoessing Lab (NSEIP)** *2015 - Present*  
University of Southern California, Los Angeles, California  
Adviser: Professor Maryam M Shanechi (<https://nseip.usc.edu>)  
We develop statistical machine learning tools to study brain and improve neurotechnology

## PUBLICATIONS

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### Journal papers

**Hamidreza Abbaspourazad**, Mahdi Chadhuari, Yan Wong, Bijan Pesaran and Maryam Shanechi, "Multiscale, low-dimensional motor cortical state dynamics explain naturalistic movements", In submission, 2020

**Hamidreza Abbaspourazad**, Han Lin Hsieh and Maryam Shanechi, "A Multiscale dynamical modeling and identification framework for spike-field activity", *IEEE Trans. Neural Syst. Rehabil. Eng.*, 2019

### Conference papers

**Hamidreza Abbaspourazad**, Yan Wong, Bijan Pesaran, Maryam Shanechi, "Identifying multiscale hidden states to decode behavior", *IEEE Engineering in Medicine and Biology Society*, 2018 (selected for oral presentation)

**Hamidreza Abbaspourazad**, Han Lin Hsieh, Maryam Shanechi, "Multiscale modeling of dependencies between spikes and fields", *Asilomar Conference on Signals, Systems, and Computers*, 2017 (selected for oral presentation)

**Hamidreza Abbaspourazad** and Maryam Shanechi, "An unsupervised learning algorithm for multiscale neural activity", *IEEE Engineering in Medicine and Biology Society*, 2017 (selected for oral presentation)

### Conference abstracts

**Hamidreza Abbaspourazad**, Mahdi Chadhuari, Yan Wong, Bijan Pesaran, Maryam Shanechi, "Multiscale low-dimensional neural dynamics explain naturalistic 3D movements", in Computational and Systems Neuroscience (COSYNE), 2020

**Hamidreza Abbaspourazad**, Yan Wong, Bijan Pesaran, Maryam Shanechi, "Dynamical characteristics of simultaneously-recorded spike and LFP activities underlying movement", in Annual meeting, Society for Neuroscience (SfN), 2019

**Hamidreza Abbaspourazad**, Yan Wong, Bijan Pesaran, Maryam Shanechi, "Identifying multiscale hidden dynamics to decode movement", in Annual meeting, Society for Neuroscience (SfN), 2018

**Hamidreza Abbaspourazad** and Maryam Shanechi, "Learning the dependencies between spikes and fields in multiscale modeling", in Annual meeting, Society for Neuroscience (SfN), 2017

**Hamidreza Abbaspourazad** and Maryam Shanechi, "A new modeling framework for multiscale neural activity underlying behavior", in Annual meeting, Society for Neuroscience (SfN), 2016

## TEACHING EXPERIENCE

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|   |             |
|---|-------------|
| Head Teaching Assistant, <b>Probability and Statistics</b>                              | Fall 2014   |
| Teaching Assistant and Assignment Designer, <b>Principles of Electrical Engineering</b> | Fall 2014   |
| Teaching Assistant and Assignment Designer, <b>Principles of Economics</b>              | Spring 2013 |
| Head Teaching Assistant, <b>Signals and Systems</b>                                     | Spring 2012 |
| Laboratory Assistant, <b>Analog Circuits</b>  | Spring 2012 |
| Laboratory Assistant, <b>Logic Circuits and Digital Systems</b>                         | Spring 2012 |
| Head Teaching Assistant, <b>Electrical Circuit Theory</b>                               | Fall 2012   |

## TECHNICAL STRENGTHS

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|------------------------------|---|
| <b>Modeling and Analysis</b> | Statistical machine learning, Deep learning, Time-series dynamical modeling |
| <b>Software &amp; Tools</b>  | Python, Tensorflow, Matlab, C++, HTML                                       |

## PROJECTS

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### Research

**Developing deep auto encoding models to understand brain dynamics** 2019 - Present  
I am implementing deep variational auto encoders to better understand and predict brain recording time-series.

**Recapitulating neural manifolds with recurrent neural networks** 2019 - Present  
I implemented recurrent neural networks which uncover a similar low-dimensional manifold in their high-dimensional artificial neurons compared to real brain neurons during naturalistic movements in non-human primates.

**Discovering similarities and differences in the low-dimensional dynamics of spiking and local field potentials (LFP) activity during naturalistic movements** 2018 - 2019  
I implemented machine learning algorithms and applied on non-human primates brain recordings, in form of binary (spiking activity) and continuous (LFP activity) time-series. We discovered similarities in dynamics across both recordings, which reflected different biological process, indicating a multiscale control of movement in the brain.

**An Unsupervised learning algorithm to learn low-dimensional dynamical representations from mixed binary-continuous time-series** 2016 - 2018  
I implemented an Expectation-Maximization based algorithm to learn low-dimensional representation from high-dimensional and mixed continuous-binary time-series. We applied this algorithm on mixed spiking-LFP recordings from non-human primates and showed improvements over conventional methods.

### Others

**IPDB.page** 2019 - Present

A website for summarizing, listing and discussing academic publications

**Design and implementation of disentangled variational auto encoders** 2019

**Design and implementation of deep semantic segmentation for natural images** 2019

**Design and implementation of recurrent neural networks for past-to-future prediction** 2019

**Design and implementation of a *Lego NXT Mindstorm* for pursuing a defined object (both mechanical and control system), *Best team winner*** 2012

**Design and implementation of a colorful finger-touch display for photos and additional effects** 2012

**Design and implementation of a quiz show** 2011

## SELECTED COURSES

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Representation learning, Deep learning, Artificial intelligence, Analysis of Algorithms, Probabilistic machine learning, Estimation theory, Game theory, Natural Language Processing

## SERVICE

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Reviewed multiple papers for IEEE NER, IEEE Access and IEEE TII.

## INTERESTS

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Soccer (former USC Futsal team member), HIIT exercises, Sport events, Movies, Video games

## REFERENCES

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Professor Maryam M Shanechi (<http://nseip.usc.edu>, [shanechi@usc.edu](mailto:shanechi@usc.edu))