Mohsen Rakhshan

Johns Hopkins BME Distinguished Fellow, Ph.D.

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Education

2022 – now **Postdoctoral fellowship, Johns Hopkins Medicine, MD, USA** in Biomedical Engineering department.
Improving bi-directional neural prostheses by understanding the neural basis of multi-sensory integration

2017 – 2022 **Ph.D., Dartmouth College, NH, USA** in Computational and Cognitive Neuroscience.
Thesis title: *Beyond homogeneous decision-making models: role of brain areas interaction and heterogeneity*

2015 – 2017 **M.Sc., The University of Notre Dame, IN, USA** in Electrical Engineering (Signals, Systems, and Control).
Research title: *Noise effects on learning of spiking neural networks.*

2013 – 2015 **M.Sc., Shiraz University of Technology, Shiraz, Iran** in Electrical Engineering (Control).
Thesis title: *Sum of Squares-Based Quadratic and Nonquadratic Stabilization Conditions for Nonlinear PDE and ODE Systems in the Polynomial Fuzzy Form.*

2009 – 2013 **B.Sc., Shiraz University (Pahlavi University), Shiraz, Iran** in Electrical Engineering (Control)
Research title: *ANFIS Approach for Tracking Control of MEMS Triaxial Gyroscope.*

Research Publications

Journal Articles (∗ shows equal contribution)

1. **Rakhshan, M.**, Camp, E., Izquierdo, A., & Soltani, A. (n.d.). Learning under uncertainty is modulated by difference in volatility associated with similar actions. *(To be submitted soon).*
2. **Rakhshan, M.**, Schafer, R., Moore, T., & Soltani, A. (n.d.). Neural mechanisms underlying robust target selection in the oculomotor system. *(To be submitted soon).*
3. **Rakhshan, M.**, & Soltani, A. (n.d.). Facilitation of distributed decision making via heterogenous circuits with selective inhibition. *(To be submitted soon).*
4. Soltani, A., **Rakhshan, M.***, Schafer, R*, Burrows, B., & Moore, T. (2021). Separable influences of reward on visual processing and choice. *Journal of Cognitive Neuroscience*, *33*(2), 248–262. https://doi.org/10.1162/jocn_a_01647
5. **Rakhshan, M.***, Lee, V.*, Chu, E.*, Harris, L., Laiks, L., Khorsand, P., & Soltani, A. (2020). Influence of expected reward on temporal order judgment. *Journal of Cognitive Neuroscience*, *32*(4), 674–690. https://doi.org/10.1162/jocn_a_01516

6. Ardeshiri, R. R., Khooban, M. H., Noshadi, A., Vafamand, N., & **Rakhshan, M.** (2019). Robotic manipulator control based on an optimal fractional-order fuzzy pid approach: Sil real-time simulation. *Soft Computing*, 1–12. https://doi.org/10.1007/s00500-019-04152-7

7. Stolyarova, A.*, **Rakhshan, M.***, Hart, E., O'Dell, T., Peters, M., Lau, H., Soltani, A., & Izquierdo, A. (2019). Contributions of anterior cingulate cortex and basolateral amygdala to decision confidence and learning under uncertainty. *Nature Communications*, *10*(1), 1–14. https://doi.org/10.1038/s41467-019-12725-1

8. **Rakhshan, M.**, Gupta, V., & Goodwine, B. (2019). On passivity of fractional order systems. *SIAM Journal on Control and Optimization*, *57*(2), 1378–1389. https://doi.org/10.1137/17M1126230

9. **Rakhshan, M.**, Vafamand, N., Mardani, M. M., Khooban, M.-H., & Dragičević, T. (2019). Polynomial control design for polynomial systems: A non-iterative sum of squares approach. *Transactions of the Institute of Measurement and Control*, *41*(7), 1993–2004. https://doi.org/10.1177/0142331218793476

10. Pitarch, J. L., **Rakhshan, M.**, Mardani, M. M., & Shasadeghi, M. (2017). Distributed saturated control for a class of semilinear pde systems: An sos approach. *IEEE Transactions on Fuzzy Systems*, *26*(2), 749–760. https://doi.org/10.1109/TFUZZ.2017.2688379

11. **Rakhshan, M.**, Vafamand, N., Khooban, M. H., & Blaajberg, F. (2017). Maximum power point tracking control of photovoltaic systems: A polynomial fuzzy model-based approach. *IEEE Journal of Emerging and Selected Topics in Power Electronics*. https://doi.org/10.1109/JESTPE.2017.2708815

12. Vafamand, N., & **Rakhshan, M.** (2017). Dynamic model-based fuzzy controller for maximum power point tracking of photovoltaic systems: A linear matrix inequality approach. *Journal of Dynamic Systems, Measurement, and Control*, *139*(5). https://doi.org/10.1115/1.4035240

13. Pitarch, J., **Rakhshan, M.**, Mardani, M., Sadeghi, M., & de Prada, C. (2016). Distributed nonlinear control of a plug-flow reactor under saturation. *IFAC-PapersOnLine*, *49*(24), 87–92. https://doi.org/10.1016/j.ifacol.2016.10.760

14. **Rakhshan, M.**, Moula, E., Shabani-nia, F., Safarinejadian, B., & Khorshidi, S. (2016). Active noise control using wavelet function and network approach. *Journal of Low Frequency Noise, Vibration and Active Control*, *35*(1), 4–16. https://doi.org/10.1177/0263092316628260

15. **Rakhshan, M.**, Vafamand, N., Shasadeghi, M., Dabbaghjamanesh, M., & Moeini, A. (2016). Design of networked polynomial control systems with random delays: Sum of squares approach. *International Journal of Automation and Control*, *10*(1), 73–86. https://doi.org/10.1504/IJAAC.2016.075146

16. Jarrahi, M. A., Samet, H., Raayatpisheh, H., Jafari, A., & **Rakhshan, M.** (2015). An anfis-based fault classification approach in double-circuit transmission line using current samples. *International Work-Conference on Artificial Neural Networks*, 225–236. https://doi.org/10.1007/978-3-319-19222-2_19

17. Tajeddini, M. A., Safarinejadian, B., & **Rakhshan, M.** (2015). An unknown input observer for fault detection based on sliding mode observer in electrical steering assist systems. *AUT Journal of Modeling and Simulation*, *47*(2), 31–43. https://doi.org/10.22060/MISCJ.2015.568

18. **Rakhshan, M.**, Shabani-nia, F., & ShaSadeghi, M. (2015). Anfis approach for tracking control of mems triaxial gyroscope. *Modeling and Simulation in Electrical and Electronics Engineering*, *1*(1), 35–40. https://doi.org/10.22075/mseee.2015.240

19. Safarinejadian, B., Gharibzadeh, M., & **Rakhshan, M.** (2014). An optimized model of electricity price forecasting in the electricity market based on fuzzy timeseries. *Systems Science & Control Engineering: An Open Access Journal*, *2*(1), 677–683. https://doi.org/10.1080/21642583.2014.970733

20. **Rakhshan, M.**, Barzegar, H., Safarinejadian, B., & Ostovar, F. (2014). An automotive cruise control using fuzzy control optimized via extended kalman filter. *Majlesi Journal of Mechatronic Systems*, *3*(4).

21 **Rakhshan, M.**, Khorshidi, S., & Safarinejadian, B. (2014). Active noise control in presence of disturbance using adaptive neuro fuzzy inference system. *Journal of Computational Intelligence and Electronic Systems*, *3*(2), 99–105. https://doi.org/10.1166/jcies.2014.1082

22 **Rakhshan, M.**, Vafamand, N., & Shasadeghi, M. (2014). Nonlinear static state feedback control design for polynomial systems: A sum of squares approach. *1st National Conference on Development of Civil Engineering, Architecure,Electricity and Mechanical in Iran*.

23 **Rakhshan, M.**, Mardani, M. M., ShaSadeghi, M., & Mardaneh, M. (2012). Relaxed stabilization conditions via sum of squares approach for the nonlinear polynomial model. *The Modares Journal of Electrical Engineering*, *12*(1), 24–30.

Grants and Fellowships

Grants

2021 **Assisting in writing grant (modeling, simulations, visualization, and hypothesizing the outcome of the research)**, Dartmouth College, NH, USA.

2018 **Assisting in writing NIH grant (visualization)**, Dartmouth College, NH, USA.

2016 **Assisting in writing NSF grant (literature review)**, University of Notre Dame, IN, USA.

Fellowships

2022 **BME Distinguished Postdoctoral Fellowship**, Johns Hopkins Medicine, MD, USA.

2021 **Nominated by Dartmouth College for Schmidt Science Fellowship**, Dartmouth College, NH, USA.

E.E. Just Graduate Fellowship, Dartmouth College, NH, USA.

Awards

2020 **Granted permanent residency of the United States through "Professional holding an advanced degree or of exceptional ability" category**.

2018 **The Neukom Institute for Computational Science**, Travel award for SfN conference, Dartmouth College, NH, USA.

2019 **The Neukom Institute for Computational Science**, Travel award for SfN conference, Dartmouth College, NH, USA.

Mentoring Experiences

2021 – 2022 **Dartmouth College, NH, USA**: Co-mentoring E.E. Just First-Year Graduate Fellows and Undergraduate Fellows

Dartmouth College, NH, USA: Mentoring undergraduate students through Undergraduate Advising and Research program

2018 – 2022 **Dartmouth College, NH, USA**: Peer advising two graduate students in the Psychological and Brain Sciences department

2017 – 2022 **Dartmouth College, NH, USA**: Mentoring undergraduate students through Women in Science Project

Research Experiences

2022 – now	**Johns Hopkins Medicine, MD, USA**: Improving bi-directional neural prostheses by understanding the neural basis of multi-sensory integration
2017 – 2022	**Dartmouth College, NH, USA**: Modulations of sensorimotor processing during value-based decision making
2018 – 2019	**Dartmouth College, NH, USA**: Simultaneous decoding of attentional and reward modulations in human EEG
2016 – 2017	**University of Notre Dame, IN, USA**: Noise effects on neural networks
2015 – 2016	**University of Notre Dame, IN, USA**: Intelligent Transportation Network Control
2013 – 2015	**Shiraz University of Technology, Shiraz, Iran**: Intelligent control systems
2011 – 2013	**Shiraz University, Shiraz, Iran**: Remotely operated underwater vehicle design and build
2012 – 2012	**Shiraz University, Shiraz, Iran**: PCB Rogowski coil design and build
	Shiraz University, Shiraz, Iran: Low frequency sonic flow meter design and build
2011 – 2011	**Shiraz University, Shiraz, Iran**: Bone age assessment using AI
	Shiraz University, Shiraz, Iran: Sound array and object tracking design and build
	Cornell University, NY, USA: Solar desalination systems prototyping

Teaching Experiences

Winter 2020	**Dartmouth College, NH, USA**: Principles of Human Brain Mapping with fMRI (TA/Instructor), Lecturer: Prof. Wager
Fall 2019	**Dartmouth College, NH, USA**: Laboratory in Psychological Science (TA), Lecturer: Prof. Brown
Spring 2019	**Dartmouth College, NH, USA**: Statistics (TA), Lecturer: Prof. Soltani
Spring 2018	**Dartmouth College, NH, USA**: Laboratory in Psychological Science (TA), Lecturer: Prof. Gobbini
Spring 2017	**University of Notre Dame, IN, USA**: Electronics I (Lab Instructor), Lecturer: Prof. Chisum
Spring 2016	**University of Notre Dame, IN, USA**: Power Systems Analysis and Electrical Machines (TA), Lecturer: Prof. Lemmon

Teaching Experiences (continued)

Fall 2015 — **University of Notre Dame, IN, USA**: Signal and Systems (TA), Lecturer: Prof. Hochwald

Fall 2013a — **Shiraz University, Shiraz, Iran**: Operations Research (TA), Lecturer: Prof. Dehghani

Fall 2013b — **Shiraz University, Shiraz, Iran**: Digital Control Systems (TA), Lecturer: Prof. KarimAghaei

Spring 2013 — **Shiraz (Students' Research and Entrepreneurship Center), Shiraz, Iran**: Applied Electronics and Digital Circuits, Lecturer: Mohsen Rakhshan

Fall 2012 — **Shiraz (Students' Research and Entrepreneurship Center), Shiraz, Iran**: Applied Electronics and Digital Circuits, Lecturer: Mohsen Rakhshan

Shiraz Payam Noor (Students' Research and Entrepreneurship Center), Shiraz, Iran: Applied Electronics and Digital Circuits, Lecturer: Mohsen Rakhshan

Working Experiences

2014 — **Co-founder**: ARTIN Sanaat Kusha Company co-founder (smart irrigation systems), Shiraz, Iran

2013 — **Intern**: Electrical Engineering intern in Shiraz Refinery, Shiraz, Iran

Skills

Languages — Persian (native), English (professional), French (intermediate), Arabic (intermediate), German (beginner), Spanish (beginner).

Coding — MATLAB/Octave (professional), Python (intermediate), C/C++ (beginner), R (beginner), ROS (beginner), Julia (beginner).

Software — MNE EEG Toolbox, Codevision AVR, Altium, Pspice, Proteus, multisim, Labview, Comsol, LaTeX

Misc. — Advanced academic knowledge in AI and data science. Basic academic knowledge in object tracking, MEMS and NANO technology.

Miscellaneous Experience

Achievements

2015 — **Valero Ph.D. Scholarship**, University of Texas at San Antonio, TX, USA.

First rank, among all the students of the Engineering school with GPA 4/4, Shiraz University of Techonology, Shiraz, Iran.

Peer Review Services

- PLOS Computational Biology
- IEEE Transactions on Neural Networks and Learning Systems
- IEEE transaction on Cybernetics

Miscellaneous Experience (continued)

- IEEE Transactions on Cognitive and Developmental Systems
- IEEE Transactions on Systems, Man, and Cybernetics
- IEEE Conference on Decision and Control
- Neurocomputing
- Nonlinear Dynamics
- International Journal of Systems Science
- Journal of Dynamic Systems, Measurement, and Control

Memberships

- Student member of IEEE
- Member of The New York Academy of Sciences
- Member of American Association for the Advancement of Science
- Member of Society for Neuroscience (SfN)
- Member of Society for Neuroeconomics (SNE)

Certification

2020 **BCI** & **Neurotechnology Spring School**, By g.tec medical engineering GmbH, Austria.

2019 **Medical Neuroscience**, By Coursera (Duke University), USA.

Interests

- **Hiking**
- **Running**
- **Traveling**

References

Available on Request