Moein Khajehnejad

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Education and Occupation

Monash University — **Melbourne**
Postdoctoral Research fellow, Advisor: Prof. Adeel Razi — *2023 - current*
Monash Data Futures Institute, Turner Institute for Brain and Mental Health, Monash University

Cortical Labs — **Melbourne**
Part-time Data Scientist — *2022 - current*

Monash University — **Melbourne**
Ph.D., Department of Data Science and AI — *2019 - 2023*

Sharif University of Technology — **Tehran**
B.Sc., Computer Sciences & Electrical Engineering — *2011 - 2016*

Research Interests

- *Graph Neural Networks*
- *Deep Reinforcement Learning*
- *Lifelong Learning*
- *Large Language Models*
- *Computational Neuroscience*
- *Neuro-AI*

Publications (Google Scholar)

Conferences

1. ***M. Khajehnejad*** *et al. "Temporal Attention-enhanced Variational Graph Recurrent Neural Network Captures Dynamics of Live Neurons and Their Behavior in a Game Environment".* In review at the 38th Conference on Neural Information Processing Systems **(NeurIPS 2024**).
2. ***M. Khajehnejad*** *et al. "On Complex Network Dynamics of an In-Vitro Neuronal System during Rest and Gameplay".* In Proceedings of the 37th Conference on Neural Information Processing Systems **(NeurIPS 2023: InfoCog, GenBio, RealML, and NeurReps (oral presentation)**).
3. ***M. Khajehnejad*** *et al. "Neural Network Poisson Models for Behavioural and Neural Spike Train Data".* **Spotlight paper** at the 39th International Conference on Machine Learning **(ICML 2022)**.
4. ***M. Khajehnejad*** *et al. "Biological Neurons vs Deep Reinforcement Learning: Sample efficiency in a simulated game-world".* In Proceedings of the 36th Conference on Neural Information Processing Systems **(NeurIPS 2022: DeepRL, MemARI, and LMRL)**.
5. *A. Khajehnejad et al. "CrossWalk: Fairness-enhanced Node Representation Learning".* In Proceedings of the AAAI Conference on Artificial Intelligence, **(AAAI-22)**.
6. ***M. Khajehnejad*** *and Forough Habibollahi "Hunting for Dual-target Set on a Class of Hierarchical Networks.* In Proceedings of the **International Conference on Network Science**, Springer LNCS Vol. 13197.
7. ***M. Khajehnejad*** *et al. "Adversarial Graph Embeddings for Fair Influence Maximization over Social Networks".* In Proceedings of the 29th International Joint Conference on Artificial Intelligence **(IJCAI'20)**.
8. ***M. Khajehnejad*** *et al. "Optimal Decision Making Under Strategic Behavior".* In Proceedings of the 33rd Conference on Neural Information Processing Systems **(NeurIPS 2019: Human-Centric Machine Learning)**.

Journals

9. ***M. Khajehnejad*** *et al. "Biological Neurons Compete with Deep Reinforcement Learning in Sample Efficiency in a Simulated Gameworld".* Under review at **PNAS**.
10. ***M. Khajehnejad*** *et al. "Explaining workers' inactivity in social colonies from first principles".* Published in the **Journal of the Royal Society Interface**.
11. ***M. Khajehnejad*** *et al. "Social Learning versus Individual Learning in the Division of Labour".* Published in the

Journal of Biology.

12. *B. J. Kagan et al. "Scientific communication and the semantics of sentience"*. Published in **Neuron**.
13. *B. J. Kagan et al. "In vitro Neurons Learn and Exhibit Sentience When Embodied In a Simulated Game-world"*. Published in **Neuron**.
14. ***M. Khajehnejad***, *"SimNet: Similarity-based Network Embeddings with Mean Commute Time"*. Published in Journal of **PLoS One**.
15. ***M. Khajehnejad***, *"Efficiency of Long-Range Navigation on Treelike Fractals"*. Published in the journal of **Chaos, Solitons & Fractals.**
16. ***M. Khajehnejad** et al. "Alzheimer's Disease Early Diagnosis using Manifold-based Semi-Supervised learning"*. Published in journal of **Brain Sciences**.
17. *T. Weng et al. "Navigation by anomalous random walks on complex networks"*. Published in the journal of **Nature Scientific Reports**.

Work Experience

Cortical Labs pty ltd **Australia**
Data Scientist - Part Time *Jan 2022 – Current*

- **Achievement:** Developed deep reinforcement learning algorithms and compared sample efficiency during learning with live biological neurons. Studied the neural correlates of consciousness and intelligence in vitro.
- **Research Areas:** Deep reinforcement learning, Computational Neuroscience, Cognition, Consciousness.

Max Planck Institute for Software Systems (MPI-SWS) **Germany**
Machine Learning Researcher *Jan 2019 – May 2019*

- **Achievement:** Mathematically solved problem of optimal decision-making under strategic behaviour using synthetic/real credit card data.
- **Research Areas:** Fairness, Optimal Decision-Making, Machine Teaching

statNLP @ SUTD-MIT **Singapore**
Machine Learning Intern *Jul 2016 – Oct 2016*

- **Achievement:** Developed a novel approach for low-dimensional network embedding.
- **Research Areas:** Network Embedding, Graph Representation Learning

LSIR @ EPFL **Switzerland**
Information Systems Research Intern *Jan 2016 – May 2016*

- **Achievement:** Significantly modified the accuracy of several state-of-the-art deep learning algorithms in word embedding.
- **Research Areas:** Convex Optimization, Natural Language Processing, Word Embedding

SyMLab @ HKUST **Hong Kong**
Machine Learning Intern *Jul 2015 – Oct 2015*

- **Achievement:** Introduced a novel measure for mean first traverse distance on complex networks.
- **Research Areas:** Network Science, Graph Representation Learning

Computer skills

Programming Languages: Python, R, Matlab

Data Analysis & Visualization: Pandas, NumPy, Matplotlib, Seaborn, Plotly

Machine Learning & Deep Learning: Scikit-learn, PyTorch, TensorFlow, Keras

Large Language Models (LLMs): Transformer architectures (BERT, GPT, T5), Hugging Face, LangChain, BERT-based models (RoBERTa), CLIP, Sequence-to-sequence models

Version Control: Git, GitHub

Data Science Skills: Statistical analysis, Predictive modeling, Feature engineering, Model evaluation and validation, Time series analysis, Data-driven decision making

Typesetting Envs.: LaTeX, Xepersian **Network Visualization Envs.**: Gephi, MuxViz

Honors and Awards

- Travel award, **CNS* 2024**, Natal, Brazil.
- Best reviewer award, **Learning on Graphs (LoG) Conference 2022**.
- Travel award, **39th International Conference on Machine Learning (ICML 2022)**, Baltimore, United States.
- Among 17 fully-funded electees globally to **NETHIKE 2022** Summer School by ***ETH*** Zürich, Switzerland.
- Among 30 fully-funded electees globally to **2022 Complex networks: theory, methods, and apps** Spring School, Italy.
- Travel award, **NetSci-X 2022**, Porto, Portugal.
- Accepted to **Machine Learning Summer School (MLSS 2020)**, Tübingen, Germany: acceptance rate of 13.8%.
- Travel award, **33rd Conference on Neural Information Processing Systems (NeurIPS 2019)**, Vancouver, Canada.
- Fully-funded fellowship, **Max Planck Institute for Software Systems**, Saarbrücken, Germany, 2019.
- Awarded full fellowship for internship, **Singapore University of Technology and Design (SUTD-MIT)**, Singapore, 2016.
- Awarded full fellowship for internship, **Swiss Federal Institute of Technology Lausanne (EPFL)**, Switzerland, 2016.
- Full attendance scholarship, **National Uni. of Singapore (NUS) Workshop** on Contemporary Research in Computer Science and Information Systems, Singapore, 2016.
- Awarded full fellowship for internship, **Hong Kong University of Science and Technology (HKUST)**, Hong Kong, 2015.
- Ranked among top **0.05%** in the Iranian nation-wide university entrance exam of Maths and Physics, 2011.
- Awarded Essential Advance diploma for research on pointed graphs from the 21^{st} International Summer **Conference of Tournament of Towns**, Moscow, Russia., 2009

Invited Talks

Live GuestStream at Active Inference Institute — **Online Podcast, Aug 2024**
Oral contribution to Computational Neuroscience Meeting (CNS*2024) — **Natal, Brazil, Jul 2024**
Maths in the Brain Workshop — **Melbourne, Australia, Oct 2023**
Telluride Neuromorphic Cognition Engineering Workshop (OSN23) — **Telluride, USA, July 2023**
Pharmacology Department, Oxford University — **Oxford, UK, Oct 2022**
Wellcome Trust Centre for Neuroimaging, University College London (UCL) — **London, UK, Oct 2022**
Spotlight at International Conference on Machine Learning (ICML) — **Baltimore, USA, July 2022**
Complex networks: Theory, Methods, and Applications — **Como, Italy, May 2022**
Workshop on Socially Responsible Machine Learning - ICML — **Virtual, July 2021**
International Joint Conference on Artificial Intelligence (IJCAI) — **Virtual, Jan 2021**
Machine Learning Summer School (MLSS) — **Virtual, July 2020**
Human-Centric Machine Learning (HCML) Workshop - NeurIPS — **Vancouver, Canada, Dec 2019**

Professional Experience

Program Organizer/Area Chair:

- The first Workshop on "NeuroAI @ NeurIPS 2024: Fusing Neuroscience and AI for Intelligent Solutions" **(NeurIPS*2024)**
- ECR committee member at Organization for Human Brain Mapping-Australian chapter & Maths in the Brain Workshop 2024 **(OHBM-OZ & Maths in the brain 2024)**
- Tutorial on "Unraveling Dynamics and Connectivity from Spiking Time Series" **(CNS*2024)**
- Workshop on Responsible AI at the International Conference on Learning Representations **(ICLR-21)**

Journal/Conference Reviewer:

- 38th Conference on Neural Information Processing Systems **(NeurIPS 2024)**
- IEEE Transactions on Neural Networks and Learning Systems 2023 **(IEEE TNNLS)**

- Learning on Graphs Conference **(LoG)** 2022, 2023
- 39th International Conference on Machine Learning **(ICML 2022)**
- 5th annual ACM FAccT conference **(ACM FAccT 2022)**
- 29th International Joint Conference on Artificial Intelligence 2020 **(IJCAI 2020)**
- Journal of Future Generation Computer Systems 2020 **(FGCS)**

Graduate Teaching Assistant

Monash University

Head TA *for Multi agent systems and collective behaviour* *Semester 2 – 2022*

TA *for Computational Modelling and Simulation* *Semester 1 – 2020 & 2021*

University of Melborune

TA *for Real and Artificial Neural Networks* *Semester 2 – 2020*