Born 11.12.1991
rahmani.b91@gmail.com
Github Linkedin
Personal page
See my full CV

Languages

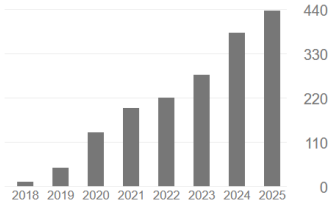
English ★★★
Persian ★★★
French ★☆☆

Expertise

Machine Learning
Large Language Models
Diffusion Models
System Identification for Physics/Biology

Publications

List on Google Scholar



Community Service

- Program chair assistant NeurIPS 2024
- NeurIPS 2023 & 2024 workshop co-organizer MLNCP

Grants & Award

- EPFL eSeed 2020, 100K CHF
- Marie Curie Fellowship 2023, 174K EU, BiTFormer

Tools

Pytorch Tensorflow Git
Python C C++
AzureML Docker
Large-Models-Training
API Prompting
Matlab Windows Linux

Babak Rahmani

About me

I hold a PhD in Electrical Engineering with a multidisciplinary background spanning machine learning, physics, and biological systems. My research focuses on **efficient and agentic AI**, particularly reasoning, memory, and compositional generalization in large language models. I have extensive experience in large-scale training (up to 7B parameters), post-training, alignment, and reinforcement learning.

Education

2018 – 2022 **PhD Electrical Engineering (EE)** EPFL, Lausanne, Switzerland
Thesis: Learning of physical systems: from inference to control
Supervisors: Christopher Moser & Demetri Psaltis

2014 – 2016 **Masters EE** Sharif University of Technology, Tehran, Iran
GPA: 17.77/20.00 (3.79/4)

2010 – 2014 **Bachelors EE** Tehran University, Tehran, Iran
Ranked top 10/120. GPA: 18.03/20.00 (3.88/4)

Experience

2025 – now **Visiting Researcher (Sabbatical), Tübingen ELLIS and AI center**
Marie Skłodowska-Curie Fellow (BiTFormer). Research on **agentic systems, world models, and open-ended reasoning**.

2022 – now **Researcher, Microsoft Research UK**
Efficient AI: I have been working on efficient ways to improve the performance of large language models, focusing on reasoning and recall capabilities. These efforts involve augmenting their memory in recall scenarios or using extra flops to improve their compositional reasoning. I demonstrated that we can elevate the complexity class of these models by turning them into implicit reasoners. **ICML2025 (Spotlight)**: Implicit Language Models are RNNs: Balancing Parallelization and Expressivity.

AOC: Collaborative effort of a team of 15+ on the development of the Analog Optical Computer using analog electronics and 3D optics to enable efficient machine learning inference and combinatorial optimization. My key contributions included developing theory, designing, and conducting ML generalization and robustness experiments (see **technical report** and **main paper in Nature**). Additionally, I contributed to transforming the abstraction of the AOC hardware into diffusion models for generative AI.

Learning Locally in Neural Networks: Developed a local learning rule training algorithm that matches the performance of backpropagation for physical neural networks (PNNs) **Science**.

Training of PNNs: Authored a position paper on efficient training mechanisms for PNNs, in **Nature**.

2018 – 2022 **PhD Student, EPFL, Switzerland**

Neural Networks for Biology: Developed probabilistic models of the Retina Ganglion Cells (RGCs) in mice to control the RGCs' spikings via a learned controller **NeurIPS**. The model was successfully validated in mice Retina samples **Nature Communication**.

Neural Networks for Physics: Developed neural network-based approaches for system identification and controlling the response of nonlinear, time-varying optical systems. **Nature Machine Intelligence**.