

# Athar Mahmoudi

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## Summary

I am a Machine Learning Scientist specializing in **physiological time-series** modeling. Currently, I lead research on non-invasive glucose estimation at Advanced Sensor Research Inc. (ASR), developing **Transformer-based architectures** and representation learning pipelines for noisy, real-world data. I hold a Ph.D. in Computing Science from the University of Alberta, where I focused on **Reinforcement Learning** and **Human-Centered AI**.

My work bridges theoretical novelty and deployment: I build **robust, interpretable models** that generalize across domains (people and sensors) and perform reliably under uncertainty. My technical core lies in **sequence modeling, domain generalization**, and rigorous experimental evaluation to support data-driven decision-making.

## Technical Skills

**Deep Learning & Time-Series:** Transformers, TCNs, LSTM/GRU, Representation Learning (AE/VAE/VQ-VAE), Domain Generalization, Sequence-to-Sequence Modeling.

**Reinforcement Learning:** Deep RL (DQN, PPO, SAC), Q-Learning, reward modeling (RLHF-style from physiological feedback), personalized reward models (user embeddings), reward shaping, OpenAI Gym.

**Optimization & AutoML:** Bayesian optimization, hyperparameter optimization (HPO), AutoML pipelines.

**Research Methods:** Explainable AI (SHAP), Experimental Design (A/B Testing, Ablations), Statistical Analysis, Signal Processing (Filtering, De-noising), Uncertainty Estimation.

**Engineering & Tools:** Python, PyTorch, TensorFlow, Hugging Face, Stable Baselines3, Scikit-learn, SQL, Docker, AWS/GCP, Git, Linux/Bash.

## Industry Experience

### Machine Learning Scientist, Advanced Sensor Research Inc. (ASR)

Jan 2025–Present

- Built end-to-end **time-series machine learning** pipelines for non-invasive glucose estimation. [*PyTorch, TensorFlow, Hugging Face*]
- Developed and benchmarked **Transformer-based sequence models** alongside baselines (**LSTM, TCN**), including **representation learning** (autoencoder-style pretraining). [*PyTorch*]
- Ran structured **architecture** and **hyperparameter** experiments; compared training protocols for stability across sensor noise and session variability. [*PyTorch, scikit-learn*]
- Designed evaluation splits to test **generalization** across subjects/sessions/sensor units; investigated **domain generalization** and **domain adaptation** strategies. [*PyTorch, Pandas*]
- Implemented **explainability** and **error analysis** workflows (slice-based analysis, failure mode analysis, calibration/uncertainty checks). [*PyTorch*]
- Performed **exploratory data analysis** and signal-quality investigations to identify data issues and guide data-cleaning and collection improvements. [*SciPy*]

### Intern Research Scientist, Samsung Research Montreal

Jun 2022–Apr 2023

- Designed and evaluated **deep reinforcement learning** methods for network load balancing in simulated environments. [*PyTorch, OpenAI Gym, Stable Baselines3*]
- Implemented **curriculum learning** to improve training robustness and generalization to harder scenarios. [*PyTorch, Stable Baselines3*]
- Implemented a **Vector-Quantized Variational Autoencoder (VQ-VAE)** for **representation learning** within RL pipelines. [*PyTorch*]
- Adapted and integrated an **Online Decision Transformer** into an existing RL framework to enhance network load balancing and energy efficiency. [*PyTorch, Hugging Face*]

### Software Engineer, Pars Cognition

Sept 2017–Aug 2018

- Developed mini serious-games to support cognitive science studies and data collection. [*Unity, GameMaker*]

## Research Experience

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### Ph.D. Researcher, University of Alberta

Sept 2018–Jan 2025

- Designed an adaptive framework using **Experience-Driven Procedural Content Generation via Reinforcement Learning (EDPCRL)** for personalization in exposure therapy tasks. [*Python, OpenAI Gym*]
- Proposed an **RLHF**-inspired approach that learns **reward models** from physiological feedback and user embeddings, then **pretrains/fine-tunes** agents for faster personalization. [*PyTorch*]
- Built adaptive VR environments with personalized parameters to support controlled experiments and reproducible personalization. [*Unity*]
- Built a player experience model from gameplay videos to support integration of experience models into procedural content generation pipelines. [*PyTorch*]
- Applied **machine learning** methods to estimate real-time stress from physiological signals; developed baselines, evaluation protocols, and performed **ablation studies**. [*scikit-learn*]
- Conducted human-subject studies ( $n = 30+$ ): study design, ethics, data collection, statistical analysis, and reporting.

### M.Sc. Researcher, Shahid Beheshti University

Sept 2014–Aug 2017

- Developed a serious game to investigate behavioral differences between typical and autistic children; instrumented gameplay for feature extraction and analysis. [*Unity*]
- Applied **machine learning** techniques to analyze gameplay data and identify behavioral patterns. [*MATLAB*]
- Conducted human-subject studies for data collection and analysis.

## Education

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### Doctor of Philosophy, Computing Science

Sept 2018 – Jan 2025

*University of Alberta, Edmonton, Canada*

*Thesis:* Automated Personalized Exposure Therapy Based on Physiological Measures Using Experience-driven Procedural Content Generation via Reinforcement Learning

### Master of Science, Computer Engineering / Artificial Intelligence

Sept 2014 – Aug 2017

*Shahid Beheshti University, Tehran, Iran*

*Thesis:* Pattern Extraction and Analysis of the Behavior of Children with Autism Spectrum Disorders Using a Designed Video Game

### Bachelor of Science, Computer Engineering / Software Engineering

Sept 2009 – Aug 2014

*University of Tehran, Tehran, Iran*

*Final Project:* Designed and developed a game for children with autism to improve receptive language skills

## Selected Publications

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- **Athar Mahmoudi-Nejad**, Matthew Guzdial, and Pierre Boulanger. “Spiders Based on Anxiety: How Reinforcement Learning Can Deliver Desired User Experience in Virtual Reality Personalized Arachnophobia Treatment.” *ACM Transactions on Interactive Intelligent Systems*. 2026.
- Dave Goel, **Athar Mahmoudi-Nejad**, and Matthew Guzdial. “Label-Free Subjective Player Experience Modelling via Let’s Play Videos.” *AIIDE*. 2024.
- **Athar Mahmoudi-Nejad**, Matthew Guzdial, and Pierre Boulanger. “Arachnophobia Exposure Therapy using Experience-driven Procedural Content Generation via Reinforcement Learning.” *AIIDE*. 2021.
- Shadan Golestan, **Athar Mahmoudi-Nejad**, and Hadi Moradi. “A framework for easier designs: Augmented intelligence in serious games for cognitive development.” *IEEE Consumer Electronics Magazine*. 2018.

## Service & Teaching

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### Program Committee / Reviewer

Sept 2023–Present

- AIIDE 2025, EXAG 2024; Reviews for CHI 2024, PeerJ, IEEE Transactions on Affective Computing.

### Teaching Assistant

Sept 2018–Dec 2024

- Courses: File and Database Management, AI in Games, VR/AR & Telepresence, HCI, GPU Programming.
- Led labs, graded assignments/exams, held office hours, and supported course delivery.

### Treasurer, CSGSA (UAlberta)

Sept 2019–Sept 2020

- Managed finances for the Computing Science Graduate Students’ Association.