Shahriar Noroozizadeh

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EDUCATION

Carnegie Mellon University, **School of Computer Science and Heinz College** *Pittsburgh, PA*
Doctor of Philosophy in Machine Learning (CS) and Public Policy Management (Heinz) **Expected: Dec 2026**
Advisors: Profs. George Chen, Jeremy Weiss (NIH), Zachary Lipton (ML)
GPA: 4.1/4.3

Master of Science in Machine Learning (Computer Science) **May 2022**
GPA: 4.1/4.3

Master of Science in Biomedical Engineering (Computational Neuroscience) **Dec 2020**
Advisor: Prof. Bin He
GPA: 4.0/4.0

University of British Columbia *Vancouver, Canada*
Bachelor of Applied Science – Engineering Physics (EE+CS Specialization) **May 2018**
Advisor: Prof. Septimiu Salcudean

PHD RESEARCH

Carnegie Mellon University, **Machine Learning Department and Heinz College** *Pittsburgh, PA*
Representation Learning for Unstructured Time Series/Longitudinal Data **Sep 2021 – Present**

Temporal-Supervised Contrastive Learning:
- Advanced supervised contrastive learning into the temporal domain through introducing a self-supervised framework learning hyperspherical embeddings centered on prototypical examples for enhanced intrinsic interpretability.
- Achieved state-of-the-art performance in clinical time series outcome prediction by underpinning predictive clustering.
- Devised novel representation learning techniques to adapt deep learning models for complexities of irregularly sampled and variable-length temporal data, crucial for deploying ML in high-stakes settings like clinical decision support in healthcare.

Introducing an Alternative to Data Augmentation:
- Proposed a nearest neighbor pairing mechanism and validated it as an effective alternative for data augmentation in time series data to ensure realistic and meaningful contrastive learning when standard augmentations are not feasible.

Causal Inference for Survival Analysis:
- Developed a longitudinal survival analysis framework that adapts meta-learner strategies to estimate treatment effects under right-censoring and time-varying exposures, enabling robust causal inference in dynamic settings.

Multimodal Temporal Modeling of Structured and Textual Time Series Data with LLMs:
- Developed a framework leveraging large language models (LLMs) to extract, align, and structure time-localized events from unstructured text, improving temporal resolution in predictive modeling.
- Investigating multimodal time series representation learning by integrating structured temporal data with unstructured text to enhance forecasting and causal reasoning in sequential decision-making.

Generative Models for Event Trajectory Forecasting:
- Exploring the development of interpretable generative models to predict future event trajectories from historical data, enabling personalized event sequence analysis and time interval estimation.

SELECTED PROFESSIONAL EXPERIENCE

Google Research *New York, NY*
PhD Student Researcher, BigML Team **May 2025 – Present**
- Discovered Transformers and Mamba exhibit **implicit in-weights reasoning**, demonstrating reasoning over stored parameters rather than contextual tokens through a large-scale *path-star* graph task adversarial to next-token learning.
- Revealed that deep sequence models form an emergent **geometric memory** encoding global relationships between non-co-occurring entities, challenging the traditional associative-memory abstraction.
- Established and analyzed a theoretical and empirical framework framing large language model memory as **associative vs. geometric**, highlighting implications for reasoning, retrieval, and knowledge organization. *[Paper under review]*

Sanofi *Cambridge, MA*
AI Research Scientist Intern, Unstructured Data Search Team **May 2024 – Aug 2024**
- Developed a novel mRNA-Language Model (mRNA-LM) using three specialized encoder-only transformer models for different mRNA regions pretrained on over 10 million mRNA Sequences, achieving a 15% improvement over SOTA models on regression and classification tasks for mRNA properties. *[Resulted in Publication]*
- Proposed a Contrastive Language-Image Pre-training (CLIP) module for multimodal alignment of mRNA sequence segments, enabling unified representations for full-length mRNA sequences and improving downstream task performance.

Microsoft *Vancouver, Canada*
Software Engineering Intern **Jan 2015 – May 2015**
- Developed Windows 10 applications and automation tools to enhance software development efficiency.

SELECTED PUBLICATIONS

Shahriar Noroozizadeh, Pim Welle, Jeremy C. Weiss, George H. Chen, Dec 2023, The Impact of Medication Non-adherence on Adverse Outcomes: Evidence from Schizophrenia Patients via Survival Analysis. *Proceedings of the sixth Conference on Health, Inference, and Learning*, PMLR 287:573-609.

Sizhen Li**, Shahriar Noroozizadeh**, Saeed Moayedpour, [et al, including Ziv Bar-Joseph, Sven Jager], 2025, mRNA-LM: Full length integrated SLM for mRNA vaccine design. *Nucleic Acids Research Journal,* 53.3. [at **Sanofi**]

Shahriar Noroozizadeh, Jeremy C. Weiss, George H. Chen, Dec 2023, Temporal Supervised Contrastive Learning for Modeling Patient Risk Progression. *Proceedings of the 3rd Machine Learning for Health.* PMLR 225: 403–427.

Alexander D. Kyriazis*, **Shahriar Noroozizadeh***, Amir Refaee*, Woongcheol Choi*, Lap-Tak Chu*, [et al, including Septimiu E. Salcudean], 2019. An end-to-end system for automatic characterization of iba1 immunopositive microglia in whole slide imaging. *Neuroinformatics, 17,* pp.373-389.

WORKSHOP PRESENTATIONS

Shahriar Noroozizadeh, Vaishnavh Nagarajan, Elan Rosenfeld, Sanjiv Kumar, "Transformers can memorize geometrically, we do not understand why.", NeurIPS – Foundations of Reasoning in Language Models workshop, San Diego USA, 7 Dec 2025. [at **Google**]

Shahriar Noroozizadeh, Jeremy C. Weiss**,** "Reconstructing Sepsis Trajectories from Clinical Case Reports using LLMs: the Textual Time Series Corpus for Sepsis", Machine Learning for Health Findings, San Diego, USA, 1 Dec 2025. [Poster]

Spandan Das*, Vinay Samuel**, Shahriar Noroozizadeh***, "TLDR at SemEval-2024 Task 2: T5-generated clinical-Language summaries for DeBERTa Report Analysis", NAACL – Proceedings of the 18th International Workshop on Semantic Evaluation, Mexico City, Mexico, June 2024. [Poster]

Shahriar Noroozizadeh, Jeremy C. Weiss, George H. Chen, "Temporal Supervised Contrastive Learning with Applications to Tabular Time Series Data", AAAI – Representation Learning for Responsible Human-Centric AI workshop, Washington DC, USA, 13 Feb 2023. [**Oral Presentation**]

Ye Won Byun*, Cathy Jiao**, Shahriar Noroozizadeh***, Jimin Sun*, Rosa Vitiello*, "ET tu, CLIP? Addressing Common Object Errors for Unseen Environments", CVPR – Embodied AI workshop, New Orleans, USA, 19 June 2022. [Poster]

PREPRINTS AND WORKING PAPERS

Shahriar Noroozizadeh, Vaishnavh Nagarajan, Elan Rosenfeld, Sanjiv Kumar, "Deep sequence models tend to memorize geometrically; it is unclear why.", arXiv:2510.26745 [Fall 2025] *Under Review* [at **Google**]

Saeed Moayedpour, Alejandro Corrochano-Navarro, Faryad Sahneh, **Shahriar Noroozizadeh** [et al, including Ziv Bar-Joseph, Sven Jager], "Many-Shot In-Context Learning for Molecular Inverse Design", arXiv:2407.19089 [at **Sanofi**]

Shahriar Noroozizadeh, Sayantan Kumar, George H. Chen, Jeremy C. Weiss, "PMOA-TTS: Introducing the PubMed Open Access Textual Times Series Corpus", arXiv:2505.20323 [Fall 2025] *Under Review*

Shahriar Noroozizadeh, Sayantan Kumar, Jeremy C. Weiss, "Forecasting Clinical Risk from Textual Time Series: Structuring Narratives for Temporal AI in Healthcare", arXiv:2504.10340 [Fall 2025] *Under Review*

Shahriar Noroozizadeh, Xiaobin Shen, Jeremy C. Weiss, George H. Chen, "SurvHTE-Bench: A Benchmark for Heterogeneous Treatment Effect Estimation in Survival Analysis", [Fall 2025] *Under Review*

SKILLS

Programming Languages: Python, C/C++, Java, MATLAB, Git, Bash
Deep Learning Libraries: PyTorch, TensorFlow, Transformers, HugginFace, OpenAI Gym
Python Libraries: Numpy, Matplotlib, Pandas, SciPy, Scikit-Learn
AI/ML and Deep Learning Techniques: Representation Learning, Contrastive Learning, Temporal ML, Multimodal ML, Regression, Survival Analysis, Reinforcement Learning, Transformers and LLMs, BERT, GPT, Llama, LSTM, CNN, VAE, GAN

AWARDS & HONOURS

Natural Sciences and Engineering Research Council of Canada (NSERC) 3-year Doctoral Fellowship	**Sep 2023–Sep 2026**
Tata Consultancy Services (TCS) Presidential Fellowship	**Sep 2024–Aug 2025**
Suresh Konda Memorial Best First Research Paper Award, Carnegie Mellon University	**May 2023**
Center for Machine Learning and Health Digital Health Innovation Fellowship	**Sep 2022–Aug 2023**
Carnegie Mellon University Presidential Fellowship	**Sep 2018**
UBC Self-Directed Research Abroad Award (Computational Gene Sequencing Research at USC)	**May 2017–Aug 2017**
Award for Excellence in Medical Engineering Student Design and Innovation as Finalist	**Apr 2017**
Coordinated International Experience Award (ETH Zürich)	**Sep 2016–Dec 2016**
The Google Games at UBC: 3rd Place / 1st Place in Coding Challenge, Google	**May 2016**
IEEEXtreme 9.0 Programming Contest: 1st Place at UBC, 4th in Canada, IEEE	**Oct 2015**

PROFESSIONAL SERVICES AND TEACHING EXPERIENCE

Reviewer: NeurIPS 2025–2023; ICLR 2026–2024; ML4H 2025–2024, CHIL 2025-2024; MLHC 2025, AAAI 2023
Teaching Assistant: Probabilistic Graphical Models (2024), ML for Problem Solving (2023), Unstructured Data Analytics (2023,2022), PhD Microeconomics(2024–2022), Neural Signal Processing (2020), Algorithms and Data Structures (2017, 2018)

PATENTS

Sven Jager, Ziv Bar-Joseph, Sizhen Li, **Shahriar Noroozizadeh**, Saeed Moayedpour. *Predicting mRNA properties using large language transformer models.* [WO 2025/026948 A1](). Published Feb 6, 2025. Filed Jul 26, 2024. Assignee: Sanofi SA.

SELECTED ACADEMIC PROJECTS

Clinical Trial NLI Enhancement – SemEval 2024 Task 2 – Advanced NLP (CMU)　　　Nov 2023 – Mar 2024
- Designed a model for SemEval 2024's Safe Biomedical NLI task, focusing on enhancing LLMs for reliable inference in clinical trials' data analysis.
- Utilized GPT for generating coherent premises and finetuning DeBERTa on entailment and contradiction classification.
- Implemented noisy channel model prompting enhancing few-shot learning performance for sparse and unbalanced data.

"Jarvis, Follow my Lead" – Multi-Modal Machine Learning (CMU)　　　Jan 2022 – Jun 2022
- Spearheaded a team project to align natural language instructions with egocentric visual cues for household task execution using ALFRED benchmarks.
- Improved model robustness by incorporating pre-trained CLIP encoders with Episodic Transformer architecture.
- Showcased the project's advancements at the CVPR Embodied AI Workshop, highlighting improvements in object recognition and directive interpretation.

"BERT, do you still love me?" – Probabilistic Graphical Models (CMU)　　　Jan 2021 – May 2021
- Conducted a comprehensive study on enhancing BERT and RNNs with graphical models (CRF) for POS tagging and NER tasks, demonstrating improved encoding capabilities.
- Awarded Best Project and Poster in the PGM course for innovative approach to NLP task performance enhancement.

Model-Based RL with PETS – Deep Reinforcement Learning (CMU)　　　Nov 2019 – Dec 2019
- Implemented the Probabilistic Ensemble and Trajectory Sampling (PETS) algorithm in the OpenAI-Gym Pusher environment, enabling a robotic arm to push objects to target locations using a probabilistic neural network ensemble.
- Employed model predictive control with the cross-entropy method for effective planning and trajectory sampling.