Mohsen Nayebi Kerdabadi

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Education

Doctor of Philosophy, Computer Science ***Jan. 2022 - Present***

University of Kansas, Lawrence, KS, USA; GPA: 3.89/4
Focus: Knowledge Graphs, LLMs, Time Series Analysis, Health Informatics

Master of Science, Computer Science ***Jan. 2022 - May 2024***

University of Kansas, Lawrence, KS, USA; GPA: 4/4
Focus: Contrastive Learning, Survival Analysis, Adversarial/Counterfactual Explanation

Bachelor of Science, Mechanical Engineering ***Sep. 2016 - Mar. 2021***

Isfahan University of Technology, Isfahan, Iran; GPA: 3.82

Technical Skills and Interests

Research Interests: Data Mining, Knowledge Graphs, Large Language Models (LLMs), Time Series Analysis, Recommendation Systems, Natural Language Processing (NLP), Health Informatics
Programming Languages: Python, SQL, Matlab
Libraries & Online tools: PyTorch, TensorFlow/Keras, PyTorch Geometric, Python Visualization & Data Analysis Libraries, Azure Databricks
AI/ML Skills: Deep Learning (RNNS, CNNs, Transformers), Graph Neural Networks (GNN, GCN, GAT, Hypergraph Convolution, Hypergraph Attention, Hypergraph Transformer), Generative AI (GANs, Autoencoders), Large Language Models (Prompt Engineering, Embedding Retrieval Augmentation), Recommendation Systems, Adversarial Attacks/-Counterfactual Explanations, Contrastive Learning, Transfer Learning, Meta Learning.

Selected Publications

- Arya Hadizadeh Moghaddam, **Mohsen Nayebi Kerdabadi**, Bin Liu, Mei Liu, Zijun Yao, Contrastive Learning on Medical Intents for Sequential Prescription Recommendation," CIKM'24 | *Paper*
- Arya Hadizadeh Moghaddam, **Mohsen Nayebi Kerdabadi**, Bin Liu, Mei Liu, Zijun Yao, Discovering Time-Aware Dependency in Electronic Health Records through Personalized Hidden Graph Inference," TKDD'24 | *Paper*
- Arya Hadizadeh Moghaddam, **Mohsen Nayebi Kerdabadi**, Zijun Yao, Meta-Learning on Augmented Gene Expression Profiles for Enhanced Lung Cancer Detection," AMIA'24 | *Paper*
- **Mohsen Nayebi Kerdabadi**, Arya Hadizadeh Moghaddam, Bin Liu, Mei Liu, Zijun Yao, Contrastive Learning of Temporal Distinctiveness for Survival Analysis in Electronic Health Records," CIKM'23 | *Paper*
- **Mohsen Nayebi Kerdabadi**, Zijun Yao, OntoFAR: Hierarchical Multi-Ontology Fusion Better Augments EHR Representation," ICLR'25 | *Under Review*
- Jinxiang Hu, **Mohsen Nayebi Kerdabadi**, Joseph Cappeller, Richard Barohn, Zijun Yao, Recurrent Neural Networks and Attention Score for Personalized Prediction and Interpretation of Patient-Reported Outcomes," The Journal of Biopharmaceutical Statistics | *Accepted*
- **Mohsen Nayebi Kerdabadi**, Arya Hadizadeh Moghaddam, Zijun Yao, Forecasting Subjectively Observed Patient Reported Outcomes via Transformer-guided Soft Clustering-based Multi-task Learning," | *Under Review*
- **Mohsen Nayebi Kerdabadi**, Bin Liu, Mei Liu, Zijun Yao, SurvAttack: Black-Box Attack On Survival Models through Ontology-Informed EHR Perturbation," Arxive | *Paper*

Experience

∗ **Graduate Research Assistant, The University of Kansas** ***Sep 2022 - Present***

OntoFAR: Hierarchical Ontology Fusion for Augmenting Health Representation Learning

An LLM-dense-retrieval multi-ontology fusion encoder that augments health representation learning. OntoFAR constructs a heterogeneous knowledge graph supporting multi-level (hyper)graph attention message passing, integrating into healthcare models to enhance medical concept representation (Boosted PRAUC by 2% over the best baseline in sequential diagnosis prediction) | *Paper under review*

OTCSurv: Ontology-aware Temporality-based Contrastive Survival Analysis

A knowledge graph-augmented temporal contrastive survival analysis framework which integrates contrastive learning with interpretable attention modules. Developed a supervised weighted contrastive loss leveraging survival time for temporal distinctiveness with adjustable temperature (improves C-index by 1% and MAE by 1.1% over the best baseline.) | *Paper*

SurvAttack: Black-box Adversarial Attack Framework for Survival Models

A black-box adversarial attack framework designed to compromise the robustness of survival ranking models and provide counterfactual explanations for model prediction. SurvAttack employs adversarial actions guided by a composite score of semantic similarity and survival output change, diminishing both ranking ability (92% reduction in c-index) and time prediction (increasing MAE by 122%). | *Paper*

ARCI: Attentive Recommendation with Contrasted Intents

A sequential prescription recommendation framework using adaptive attention-based models and Intent-Aware recommendation with Contrastive Learning for medical intent representation (achieves a 2.3% improvement in PRAUC over the best baseline.) | *Paper*

TC-MTL: Transformer-guided Soft Clustering-based Multi-Task Learning framework

A multitask learning framework which improves the prediction of subjective patient-reported outcomes (PROs) by addressing patient heterogeneity. A transformer-based soft clustering module dynamically assigns patients to homogeneous clusters via attention mechanisms (achieved 1.68% increase in AUROC) . | *Paper under review*

MetaGene: Meta-Learning for Cancer Prediction

A Meta-Learning approach for gene expression data, optimizing across datasets to address data insufficiency (improves Transformer performance by 5.5% on a cancer prediction task.) | *Paper*

Time Series Self-Supervised Contrastive Learning

Conducted research on self-supervised representation learning of Time Series, focused on Electrocardiography Contrastive Learning leveraging temporal, spatial, and spectral augmentation techniques. | *Ongoing project*

Data Management and Preprocessing

Hands-on experience in handling and manipulating large-scale datasets, including real-world Electronic Health Records (EHRs), Electrocardiography (ECG/EKG), and Echocardiogram (Echo) datasets.

∗ **Graduate Teaching Assistant, The University of Kansas** ***Jan 2022 - May 2023 / Aug 2024 - Jan 2025***

Advanced Data Science (EECS 835), fall 2024,
System Dynamics and Control Systems (ME 682), fall 2022, *video of class lecture*
Mechanical Engineering Measurements and Experimentation (ME 455), Spring 2022, *video of class lecture*

Related Projects

LLM Dense Retrieval Augmentation for Sequential Diagnosis Prediction ***2024***

A multilevel LLM dense retrieval pipeline that integrates LLM embeddings across code, visit, and patient learning stages using prompt engineering at code, visit, and patient levels (achieves a 1.9% PRAUC boost over a transformer model without LLM augmentation.

Contrastive Learning Augment Health Representation using Medical Knowledge Graph. ***2024***

A supervised contrastive method to integrate domain knowledge in health representation learning. Patient visit sequences are augmented by replacing discrete medical codes with the most co-occurred sibling in the knowledge graph, creating positive pairs for contrastive training (4% AUROC increase in acute kidney injury prediction.)

Echocardiogram Abnormality Prediction based on Electrocardiography Encoding ***2024***

A study to investigate the prediction of ECHO abnormalities from 12-lead ECG signals, using architectures like CNN, RNN, CNN-RNN, CNN-Attention RNN, and CNN-Transformer (best AUROC=0.7668 with CNN-Transformer)

Neural Program Synthesis-TransFill ***2024***

A neural program synthesis model for regular expressions. It uses dual Transformer encoders to separately process input and output sequences, merging their outputs into a unified encoding. A Transformer decoder iteratively predicts program segments, synthesizing the complete program from I/O examples, achieving 72.8% accuracy.

Image Captioning ***2022***

A model for generating descriptive captions for images, using an encoder-decoder architecture with a CNN-based encoder (ResNet50) and an attention LSTM decoder. Trained on the Flickr8k dataset (8,000 images), the model's performance is evaluated using the BLEU score.

Write Shakespeare! ***2021***

A bidirectional LSTM-based autoregressive model trained on over 2,000 lines from the Shakespeare Sonnets Dataset to generate Shakespearean-style text.

Professional Services

Reviewer for: ICLR 2025, SDM 2025, KDD 2024, CIKM 2024

Honors and Awards

David D. and Mildred H. Robb Award for support in attending conference, The University of Kansas, 2024.
College of Engineering Research Scholarship Award, The University of Kansas, 2022.
Summer Research Scholarship Award, ME Department, The University of Kansas, 2022.
Ranked 1st in the Graduating Class, Isfahan University of Technology, 2021.
Earned National Undergraduate Full Scholarship, Isfahan University of Technology, 2016.

Certifications & Courses

- **AI courses @ KU**: Data Science (4/4), Machine Learning (4/4), Bioinformatics (4/4), Inference and Learning (4/4), Computer Vision (4/4), Program Synthesis (4/4), Deep Reinforcement Learning (4/4), Optimization (4/4)
- **AI Courses @ Coursera**: *Generative Adversarial Networks Specialization*, *Deep Learning Specialization*, *TensorFlow Developer Professional Certificate*, *AI for Medicine Specialization*