Mohsen Nayebi Kerdabadi

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Education

Doctor of Philosophy, Computer Science ***Jan. 2022 - Dec. 2026***

University of Kansas, USA; Focus: Knowledge Graphs, LLMs, Time Series Analysis, Health Informatics

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

University of Kansas, USA; Focus: Contrastive Learning, Survival Analysis, Explainable AI

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

Isfahan University of Technology, Iran

Technical Skills and Interests

Research Interests: Knowledge Graphs, Large Language Models, Time Series Analysis, Recommendation Systems, Natural Language Processing, Health Informatics, Self-Supervised Learning

Programming Languages: Python, SQL, Matlab

Libraries & Tools: PyTorch; TensorFlow/Keras; PyTorch Geometric; scikit-learn; NumPy; pandas; NetworkX; Ray; Optuna; Matplotlib/Seaborn/Plotly; SQL; Snowflake; Jupyter/EMP Notebooks; LangChain; Git.

AI/ML Skills: Deep Learning (RNNs, CNNs, Transformers), Graph Neural Networks (GCN, GAT, Hypergraph, Hypergraph Transformer, GraphSAG), GANs, Autoencoders, Large Language Models (Prompt Engineering, Retrieval Augmentation), Recommendation, Adversarial Attacks, Contrastive Learning, Transfer/Meta Learning.

Experience

Professional Experience: Principle Data Science Intern, AI Foundations, Capital One ***Jun 2025 - August 2025***

- Reframed fraud detection as spatio-temporal GNN node classification; built a directed temporal graph (100M+ nodes/1B edges) linking online sessions with time/recency constraints, enabling causal message passing.
- Custom-designed relational/time-aware/attention-based GraphSAGE architectures with inductive neighbor sampling; leveraged lag-aware label propagation; performed graph analytics (e.g., sparsity, degree analysis).
- Parallel HP Optimization with Ray+Optuna; applied GNNExplainer graph interpretable study (Impact: +6.38% AUC, -50% customer friction.)| *paper*

Academic Research Experience: Research Assistant, University of Kansas ***Jan 2023 - Present***

- **LINKO: LLM-Augmented INtegrative Knowledge Propagation over Ontology Graphs for Health Representation**
  - Designed a graph-augmented LLM node initialization for concept embeddings using prompt-engineered text dense retrieval enriched with ontology subgraph context to seed high-fidelity embeddings.
  - Developed a multi-ontology knowledge graph learning framework with dual-axis intra-ontology/inter-ontology propagation via multi-level (hyper)graph attention, (Result: +7.18% PRAUC in diagnosis prediction.) | *paper*
- **OTCSurv: Ontology-aware Temporality-based Contrastive Survival Analysis Framework**
  - A knowledge graph-augmented survival analysis framework which integrates contrastive learning with interpretable attention modules. Developed a supervised time-aware weighted contrastive loss with adjustable temperature (Result: +1.3% C-index and -37% MAE) | *paper*
- **SurvAttack: Ontology-Guided Adversarial Perturbations for Robust and Interpretable Survival Models**
  - A black-box adversarial attack on survival ranking models, optimizing a perturbation composite score of semantic similarity and survival change, significantly degrading performance (Result: -92% c-index).
  - Leveraged counterfactual insights for model interpretability and adversarial training for robustness. | *paper*
- **KG-LLM Co-Learning: LLM-Guided Reasoning-Enhanced Knowledge Graph Construction and Learning**
  - LLM-guided KG construction/refinement via LLM prompting & semantic clustering of nodes/edges; expand to a hierarchical KG. KG Pretraining: init node/rel with LLM reasoning embeddings; multi-objective fine-tuning with Contrastive constraints (cluster cohesion/separation), and link prediction.
  - Fuse the pretrained KG embeddings into multilevel LLM dense retrieval embeddings across visit/patient. Leverage a cluster-wise graph transformer for patient-level prediction task. | *current research*
- **ARCI: Attentive Drug Recommendation Framework with Contrasted Intents**
  - A sequential prescription recommendation framework using adaptive attention-based models and Intent-Aware recommendation with Contrastive Learning (Result: >+10% in PRAUC) | *paper*
- **Cardiac Time Series Self-Supervised Representation Learning**
  - Self-supervised representation learning for cardiac time series using reconstruction (AE/VAE/MAE) and contrastive methods with temporal, spatial, and spectral augmentations.| *current research*

Academic Teaching Experience: Teaching Assistant, University of Kansas ***Jan 2022 - Present***

- **Data Mining** (EECS 568) & **Advanced Data Science** (EECS 835), Fall 2025
- **Advanced Data Science** (EECS 835), Fall 2024
- System Dynamics and Control Systems (ME 682), Fall 2022, *video*
- Mechanical Engineering Experimentation (ME 455), Spring 2022, *video*

Selected Projects

Discovering Time-aware Hidden Dependencies with Personalized Graphical Structure *2025*
Contributed to developing the Time-aware Personalized Graph Transformer (TPGT), a temporal graph model with a dynamic adjacency matrix based on medical ontology, enhancing relationship extraction (Result: 3.8% AUCROC in acute kidney injury prediction). | *paper*

MetaGene: Meta-Learning for Cancer Prediction *2025*
Contributed to developing a Meta-Learning approach for gene expression data, optimizing across datasets to address data insufficiency (Result: +5.5% Accuracy on cancer prediction task.) | *paper*

Echocardiogram Abnormality Prediction based on Electrocardiography Encoding *2025*
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 (Result: AUC=0.7668 with CNN-Transformer)

Efficient Adaptable Contrastive Learning Under Resource Constraints *2025*
Resource-efficient contrastive learning using block-wise matrix multiplication to scale large batch sizes under memory/time constraints with an adaptive compute-memory trade-off. A transfer-learned neural resource estimator with binary-search optimization auto-tunes maximal batch size/block count, with validated experimental results.

TC-MTL: Transformer-guided Soft Clustering-based Multi-Task Learning framework. *2024*
Developed a multitask learning framework with a transformer-based soft clustering module that dynamically groups patients to address heterogeneity in health prediction (Result:+6.28% in AUC). | *preprint*

Contrastive Learning Augment Health Representation using Medical Knowledge Graph. *2024*
A supervised contrastive method via a new patient sequence augmentation replacing medical codes with the most co-occurred sibling in the knowledge graph (Result: +4% AUC in AKI prediction).

Neural Program Synthesis-TransFill *2024*
A neural program synthesis model for regular expressions. It uses dual Transformer encoders to process input and output sequences. A Transformer decoder auto-regressively predicts program segments. (Result: 72.8% accuracy)

Selected Research Publications

- **CIKM 2025 - Full Research Paper** | Multi-Ontology Integration with Dual-Axis Propagation for Medical Concept Representation, **1st author** | *paper*
- **NeurIPS 2025 - NPGML Paper** | Temporal Directed Graph Learning for Account Takeover Fraud Detection, **1st author** | *paper*
- **Cell Pattern 2025 - Journal Paper** | SurvAttack: Black-Box Attack On Survival Models through Ontology-Informed EHR Perturbation, **1st author** | *preprint*
- **WSDM 2025 - Full Research Paper** | MetaDrug: Multi-Level Meta-Learning on Cold-Start Patients for Prescription Recommendation, **2nd author** | *under Review*
- **Biopharmaceutical Statistics 2025 - Journal Paper** | Recurrent Neural Networks and Attention Score for Personalized Prediction and Interpretation of Patient-Reported Outcomes, **2nd author** | *paper*
- **CIKM 2024 - Full Research Paper** | Contrastive Learning on Medical Intents for Sequential Prescription Recommendation, **2st author** | *paper*
- **TKDD 2024 - Journal Paper** | Discovering Time-Aware Dependency in Electronic Health Records through Personalized Hidden Graph Inference, **2st author** | *paper*
- **AMIA 2024 - Full Research Paper** | Meta-Learning on Augmented Gene Expression Profiles for Enhanced Lung Cancer Detection, **2st author** | *paper*
- **CIKM 2023 - Full Research Paper** | Contrastive Learning of Temporal Distinctiveness for Survival Analysis in Electronic Health Records, **1st author** | *paper*

Professional Services

Reviewer for: ICLR, SDM, KDD, CIKM, TKDD, IJCAI, Journal of Biomedical Informatics

Honors and Awards

David D. and Mildred H. Robb Award, 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, Machine Learning, Bioinformatics, Inference and Learning, Computer Vision, Deep Reinforcement Learning, Optimization I & II, Embedded ML, Analysis of Algorithms
- **Online AI Courses @ Coursera:** LangChain for LLM Application Development, LangChain Chat with Your Data, AI Agents in LangGraph, *Generative Adversarial Networks Specialization*, *Deep Learning Specialization*, *TensorFlow Developer Professional Certificate*, *AI for Medicine Specialization*