

# MERT KOSAN

STAFF MACHINE LEARNING SCIENTIST AT VISA INC.

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## Education

### Computer Science Department, University of California, Santa Barbara (UCSB)

[Santa Barbara, USA](#)

Doctor of Philosophy and Master of Science in Computer Science

*Sept 2018 - June 2023*

- Advisor: Prof. Ambuj K. Singh | Dissertation: **Transparent Representation Learning for Graphs and Human-AI Collaboration**
- Research Interests: **Graph Machine Learning, Explainability, Anomaly Detection, Human-AI Collaboration** | GPA: 4.00/4.00

### Computer Science and Engineering Department, Sabanci University

[Istanbul, Turkey](#)

Bachelor of Science in Computer Science

*Sept 2013 - June 2018*

- Ranked 1st | GPA: 3.99/4.00

## Work Experience

### Visa Inc.

[Austin, USA](#)

Staff Machine Learning Scientist

*June 2023 - Present*

- Working on building novel and state-of-the-art architectures for Real-Time Payments (RTP).
- Working on and researching fraud detection, active learning, generative AI, and explainability.

### Visa Research

[Austin, USA](#)

PhD Intern | Topic: Improving AI Decisions with Feedback Loop Active Learner | **Paper and Patent.**

*June 2022 - Sept 2022*

- Proposed a human-in-the-loop recommender system improving AI decisions using active learning for anomaly detection applications, but applicable to different application scenarios such as credit card approval systems. The framework helps increase precision and recall.

### Visa Research

[Austin, USA](#)

PhD Intern | Topic: Peer Group Analysis | **Patent.**

*June 2021 - Sept 2021*

- Proposed a scalable and parallelizable dynamic peer grouping algorithm working with any existing anomaly detection algorithm to reduce false alarms and detect anomalies in their early stages. The framework reduces the false positives substantially and detects multiple events earlier.

### Visa Research

[Austin, USA](#)

PhD Intern | Topic: Fraud Detection and Profiling | **Patent.**

*June 2020 - Aug 2020*

- Developed a framework that generates profiling and optimized strategies for near-real-time unsupervised fraud detection on graphs. The framework profiles the fraud automatically and accurately in less than a second with a small number of transactions.

## Patents

**Method, system, and computer program product for improving machine learning models** 2024

**System, method, and computer program product for dynamic peer group analysis of systematic changes in large scale data** 2023

**Method, system, and computer program product for auto-profiling anomalies** 2022

## Publications

[KDD 2024] Danqing Wang, Antonis Antoniadis, Kha-Dinh Luong, Edwin Zhang, **Mert Kosan**, Jiachen Li, Ambuj Singh, William Y. Wang, Lei Li **Global Human-guided Counterfactual Explanations for Molecular Properties via Reinforcement Learning.**

[ICLR 2024] **Mert Kosan\***, Samidha Verma\*, Burouj Armgaan, Khushbu Pahwa, Ambuj Singh, Sourav Medya, Sayan Ranu **GNNX-BENCH: Unravelling the Utility of Perturbation-based GNN Explainers through In-depth Benchmarking.**

[AAAI 2024] Aritra Bhowmick, **Mert Kosan**, Zexi Huang, Ambuj Singh, Sourav Medya **DGCLUSTER: A Neural Framework for Attributed Graph Clustering via Modularity Maximization.**

[Preprint] **Mert Kosan**, Arlei Silva, Ambuj Singh. **Robust Ante-hoc Graph Explainer with Bilevel Optimization.**

[Preprint] Zexi Huang, **Mert Kosan**, Arlei Silva, Ambuj Singh. **Link Prediction without Graph Neural Networks.**

[WSDM 2023, MLog-WSDM 2023] **Mert Kosan\***, Zexi Huang\*, Sourav Medya, Sayan Ranu, Ambuj Singh. **Global Counterfactual Explainer for Graph Neural Networks.** ACM International Conference on Web Search and Data Mining. (Selected among **Top 10** in WSDM 2023, **Best Paper Award** in MLog-WSDM 2023)

[WSDM 2023 Crowd Science] **Mert Kosan**, Linyun He, Shubham Agrawal, Hongyi Liu, Chiranjeev Chetia. **AI Decision Systems with Feedback Loop Active Learner.** WSDM 2023 Crowd Science Workshop on Collaboration of Humans and Learning Algorithms for Data Labeling.

[DLG-AAAI 2023] **Mert Kosan**, Arlei Silva, Sourav Medya, Brian Uzzi, Ambuj Singh. **Event Detection on Dynamic Graphs.** Deep Learning on Graphs: Method and Applications, Association for the Advancement of Artificial Intelligence

## Research Experience

### GNNX-BENCH: Unravelling the Utility of Perturbation-based GNN Explainers through In-depth Benchmarking.

*Santa Barbara, USA*

University of California, Santa Barbara

*March 2023 - June 2023*

- Prepared an extensive benchmarking study encompassing seven factual and four counterfactual explainers.
- Provided novel insights that unveil stability against attacks and reproducibility of GNN predictions by explanations.
- Published a codebase to help the research community reproduce results or conduct further research.

### Robust Ante-hoc Graph Explainer with Bilevel Optimization

*Santa Barbara, USA*

University of California, Santa Barbara

*Aug 2021 - Feb 2022*

- Addressed limitations of available post-hoc and ante-hoc graph explainers in meaningful explanations, reproducibility, and robustness.
- Proposed a novel robust ante-hoc graph explainer that utilizes graph neural networks (GNN) and bilevel optimization.
- Outperformed state-of-the-art methods on graph classification tasks in accuracy, meaningful explanations, reproducibility, and robustness.

### Link Prediction without Graph Neural Networks

*Santa Barbara, USA*

University of California, Santa Barbara

*Aug 2021 - Feb 2022*

- Addressed limitation of available link prediction methods using graph neural networks in handling imbalanced classification.
- Proposed a novel topology-centric method consisting of graph learning, topological heuristics, and training with N-pair loss for link prediction.

### AI Decision Systems with Feedback Loop Active Learner

*Austin, USA*

Visa Research

*June 2022 - Sep 2022*

- Addressed the limitation of the collaboration of AI decision systems and human labelers in human-in-the-loop systems
- Proposed FLAL, for better ground-truth labeling by learning the interests/expertise of humans using active learning through recommendations.

### Global Counterfactual Explanation for Graph Neural Networks

*Santa Barbara, USA*

University of California, Santa Barbara

*Oct 2021 - Aug 2022*

- Formulated a novel problem of global counterfactual reasoning/explanations for graph neural networks applied on graph classification tasks.
- Proposed GCFExplainer, the first global explainer generating global counterfactual summary by vertex-reinforced-random-walks on an edit map.

### Group Prospect Theory - Decision Making with White and Black-box Models

*Santa Barbara, USA*

University of California, Santa Barbara

*Oct 2019 - Dec 2021*

- Analyzed how the risky behavior of individuals alters in the group setting from the individual setting using Prospect Theory.

### Event Detection on Dynamic Graphs

*Santa Barbara, USA*

University of California, Santa Barbara

*Jan 2019 - Aug 2021*

- Proposed an event detection framework using dynamic graph neural networks further enhanced by structural and temporal self-attention. DyGED learns correlations between the graph macro dynamics (a sequence of graph-level representations) and labeled events.

## Teaching Experience

### Co-designer/Instructor - Machine Learning Workshops with Python

*Santa Barbara, USA*

University of California, Santa Barbara

*May 2019 - June 2019*

- Helped the students, from A Self-Organized PhD Students Exchange Program by Junior Nanotech Network, for their projects.

### Teaching Assistant - Data Structures & Algorithms

*Santa Barbara, USA*

University of California, Santa Barbara

*Sep 2018 - April 2019, Sep 2021 - Dec 2021*

- Led discussion and problem-solving teaching sessions. Discussed class assignments and projects with students.

## Academic Services

**Registration Chair** KDD'23

**Reviewer**

29 Reviews: ICLR'22, ICLR'25 (3), NeurIPS'22, NeurIPS-AI4D3'23 (3), KDD'22 (2), WebConf'20, WebConf'23, ICDE'21, AAMAS'24 (2), TNNLS (5), TIST (5), TKDD (2), TPAMI, TAI.

## Skills

**Programming** Python (PyTorch, Keras, Scikit-Learn, NetworkX), C++, Java, SQL

**Miscellaneous** Linux, Git,  $\text{\LaTeX}$ (Overleaf/R Markdown), Microsoft Office.

**Soft Skills** Result-oriented, Responsible, Hardworking, Fast-learner.

**Languages** Turkish (native), English (fluent), Spanish (beginner), Korean (beginner).

**Hobbies** Chess, Strategy Games, Football, Snooker, Science Fiction, Instrumental Music.