

Ehsan Mobaraki

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EDUCATION

Ph.D. candidate in Computer Science, Aalborg University

October 2022 – Present

Thesis topic: *Post-hoc Explainability and Neural-Symbolic Reasoning in Complex and Knowledge Graphs*

Supervisor: Prof. Christian S. Jensen, **Co-supervisor:** Prof. Sean Bin Yang

Visiting Ph.D. Student, Scuola Normale Superiore (SNS), Pisa, Italy Dec 2024 – May 2025

Supervisor: Prof. Fosca Giannotti – Research on interpretable link prediction and neural-symbolic

reasoning for knowledge graphs, collaborating with the Knowledge Discovery and Data Mining Laboratory.

I began my Ph.D. research focusing on post-hoc explainability methods for Graph Neural Networks

(GNNs). As part of this, I developed a comprehensive benchmarking framework covering multiple down-

stream tasks — including graph classification, node classification, link prediction, entity resolution, and

knowledge graph embeddings — across top-tier GNN architectures and explainability techniques. Building

on this work, I designed a meta-explanation framework for GNNs, extending the benchmarking toolkit to

enable broader and more adaptive explainability analysis. My research further investigates interpretability

in the context of knowledge graphs and knowledge graph embeddings, seeking to bridge post-hoc tech-

niques with embedding-based models. Additionally, my Ph.D. explores explainability in complex graphs,

with an emphasis on hypergraphs, hypergraph neural networks, and uncertain graphs, addressing diverse

application scenarios.

Courses Taken in Aalborg University: Advanced Topics in Machine Learning: Trustworthy AI,

Automated Planning Tools for Intelligent Decision Making, Data Quality Management, Introduction to

Probabilistic Machine Learning, Recent Advances within Specialized Data Management Systems, Knowl-

edge Graphs and Semantic Web Technologies, Big Data Integration, Applications of AI to Modern Data

Management Systems, Quantum Computing, Distributed Data Processing with Dataflow Systems, Urban

Data Management Representation and Mining, Academic Information Searching: Methods, Sources, and

Documentation, Academic Writing in English, Applying the Danish Code of Conduct for Research In-

tegrity to your Research, Introduction to PhD study, Professional Communication, Research Transparency

in Quantitative and Qualitative Science, and Shaping your Research Career in Industry and Academia.

Master of Science in Computer Science and Engineering, Sabanci University, Istanbul, Turkey

January 2018 - September 2020

Thesis topic: *Cyclic Adversarial Framework with Implicit Autoencoder and Wasserstein Loss (CAFIWL)*

Supervisor: Prof. Kemal Kilic

Proposed a model to enhance the quality and distribution matching of generative models, drawing inspira-

tion from DeepMind's 'Distribution Matching in Variational Inference' project. The research incorporates

Boosting techniques (Ensemble Learning), Wasserstein Distance, and Regret Analysis on discriminators

to mitigate mode collapse and improve overall performance.

Bachelor of Science, University of Tabriz, Tabriz, Iran

September 2012 - January 2015

Major: Information Technology Engineering, **GPA:** 16.16/20.0

Research Interests: *Explainability of Graph Neural Networks, Explainability for Neural Networks, Graph Neural Networks, Knowledge Graphs, Knowledge Graph Embeddings, Explainability for Knowledge Graph Embeddings, Uncertain Graphs, Generative Adversarial Networks, Variational Generative Models, Machine Learning, Data Analysis.*

PUBLICATIONS

- Mobaraki, E., Yang, S. B., Jensen, C. S. (May 2025). Meta-Explaining Graph Neural Networks via Cross-Category Adaptation and Evaluation. Manuscript submitted for review at the Conference on *Neural Information Processing Systems (NeurIPS)*, 2025.
- Mobaraki, E., Giannini, F., and Diligenti, M. Graph-Enhanced Relational Concept Bottleneck Models: Integrating GNNs and HGNNs for Knowledge Graphs. In preparation.
- Ontiveros, R. C., Mobaraki, E., Giannini, F., Barbiero, P., Gori, M., and Diligenti, M (July 2025). [Interpretable Link Prediction via Neural-Symbolic Reasoning](#). Presented at the *XAI World Conference 2025* – Organisation Private Roundtable, July 2025.
- Arafat, N. A., Mobaraki, E. B., Khan, A., Velaj, Y., & Bonchi, F. (October 2024). Estimate and Reduce Uncertainty in Uncertain Graphs. *Proceedings of the IEEE International Conference on Data Science and Advanced Analytics (DSAA)*, 2024, San Diego, CA, USA.
- Mobaraki, E. B., & Khan, A. (April 2023). Interpretability Methods for Graph Neural Networks (Demonstration). In *6th Joint Workshop on Graph Data Management Experiences & Systems (GRADES) and Network Data Analytics (NDA): Co-located with SIGMOD 2023*, Seattle, WA, USA.
- Khan, A., & Mobaraki, E. B. (May 2023). Interpretability Methods for Graph Neural Networks (Tutorial). In *10th IEEE International Conference on Data Science and Advanced Analytics (DSAA)*, Thessaloniki, Greece.
- Mobaraki, E. (2017). A Model for Improving the Business Intelligence of Companies Envisaging Knowledge Management Approach: A Case Study of Knowledge-Based Organizations of East Azarbaijan Science and Technology Park. *Journal of Engineering and Applied Sciences*, 12(19), 5024-5034.
- Mobaraki, E. (2017). An Elaboration on the Status of E-commerce in Iran Considering Its Growth and Challenges. *International Journal of Applied Business and Economic Research*, 15(5), 433-442.

CONFERENCE PRESENTATIONS

- Presented a Tutorial on Explainability Methods for Graph Neural Networks at October 2023.
- 10th IEEE International Conference on Data Science and Advanced Analytics (DSAA).

WORK EXPERIENCE

- Project Supervisor, Aalborg University.** Brain Age Estimation by MRI Jan 2023 - Present
Samples, Heart Stroke Prediction, Fall Detection, Energy-Efficient Optimal
- Paths Finding, Addressing Class Imbalance with Loss Function Variations, End-To-End GNN Explanation Framework, In Search of Hyperparameters, Sentiment analysis, and Database System for Specific Applications.
- Researcher, Sabanci University.** Conducted research on advanced algo- Sep 2019 - Sep 2021
rithms and programming languages. Key projects included region-based face
- detection, gender detection, generating realistic photos, and adversarial face attacks.
- Researcher, Sabanci University.** Web Sorting Project and Student Grad- Jun 2018 - Dec 2018
uation Analysis.

- **Researcher, University of Tabriz.** Researched AI projects and E-business, contributing to publications in BI-Business Intelligence. Sep 2015 - Sep 2017
- **Teaching Assistant, Sabanci University.** Courses: Advanced Programming, Software Engineering, Computational Biology. Duties: preparing assignments, reviewing exams, and lecturing. Jan 2018 - Sep 2019
- **Teaching Assistant, University of Tabriz.** Course: Information Systems Management. Duties: preparing assignments, reviewing exams, and lecturing to over sixty students. Sep 2015 - Jan 2016
- **Exam Invigilator, Sabanci University, Istanbul, Turkey.** Invigilating more than 50 exams, Faculty of Engineering and Natural Sciences. Jan 2018 - Sep 2020
- **Exam Invigilator, Aalborg University, Aalborg, Denmark.** Invigilating exams, Department of Computer Science. Jan 2023 - Present

SCHOLARSHIPS/HONORS & AWARDS

- Full PhD Scholarship, Aalborg University, Oct 2022 - Oct 2025.
- External Reviewer for SIGMOD 2024, PVLDB 2023.
- Registration fee waiver for the 10th IEEE International Conference on Data Science and Advanced Analytics (DSAA), October 2023.
- Full tuition waiver, accommodation, and stipend, Sabanci University, Jan 2018 - Sep 2020.
- Web-Sorting Project Scholarships, Sabanci University, Jun 2018 - Oct 2018 & Jun 2019 - Oct 2019.
- Graduation Eligibility Project Scholarship, Sabanci University, Jun 2020 - Sep 2020.

CODING SKILLS

Languages Visual Basics, C, C++, Java, C#, PHP, HTML4&5, ASP, SPSS, CSS, JavaScript, Google App Script, Python, Swift, RStudio, SQL, MATLAB, VHDL, Circuit Design through Quartus, Verilog, Network Design Script, SAT tools Mini-Sat.

REFERENCES

- **Prof. Christian S. Jensen**, Aalborg University, Denmark. csj@cs.aau.dk
- **Prof. Sean Bin Yang**, Aalborg University, Denmark. seanbinyang@cs.aau.dk
- **Prof. Kemal Kilic**, Sabanci University, Turkey. kkilic@sabanciuniv.edu
- **Prof. Yucel Saygin**, Sabanci University, Turkey. yucel.saygin@sabanciuniv.edu
- **Prof. Berrin A. Yanikoglu**, Sabanci University, Turkey. berrin@sabanciuniv.edu