

Ahmet Çolak

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ABOUT ME

I am an AI researcher, data scientist, and Ph.D. student in Information Technology at Ege University's International Computer Institute. My academic and professional research focuses on Geometric Deep Learning, Graph Neural Networks (GNNs), Spectral Graph Theory, and structural bioinformatics (specifically protein dynamics). I am passionate about engineering mathematically grounded, deterministic, and scalable AI solutions for optimizing complex systems.

WORK EXPERIENCE

Andromedy Digital Solutions

Data Scientist

2025

İzmir, Turkey

Worked on agricultural field boundary detection from satellite imagery (.tif) and GeoJSON using Random Forest (RF) and CNN models (F1-Score: 0.83).

PROJECTS & ACADEMIC RESEARCH

- **RDD-Based Topological Masking in GNNs:** Proposed a deterministic Restrained Disjunctive Domination (RDD) topological masking algorithm to mitigate the oversmoothing problem in Graph Neural Networks. The RDD-GIN architecture preserved discontinuous decision boundaries on heterophilic graphs (WebKB Texas), achieving 68% accuracy. Proved that the method guarantees 2-hop connectivity and prevents isolated nodes, unlike stochastic edge-dropping (DropEdge) baselines.
- **Hybrid Fusion of Algebraic Graph Invariants and GNN Embeddings:** Conducted a critical analysis of fusing 2-layer GNN node embeddings with the smallest k eigenvalues of the normalized Laplacian. Mathematically demonstrated that broadcasting a single global spectral vector to node-level heterophilic tasks causes a majority-class collapse artifact and GDA covariance singularity, rendering the algebraic contribution mathematically null in this regime.
- **RAG Search Engine:** Built a CLI-based search system for a movie corpus that combines keyword retrieval (BM25/TF-IDF), semantic search (embeddings + cosine similarity), and multimodal retrieval (CLIP image-to-text). Implemented hybrid ranking (Weighted + RRF) plus optional Gemini-powered query enhancement, reranking, and RAG outputs.
- **DomiPlan: Multi-Tenant Timetabling Expert System:** Developed a rule-based backend API for an automated school timetabling expert system using Python, FastAPI, and SQLAlchemy. Formulated the NP-Hard educational scheduling problem utilizing the Google OR-Tools CP-SAT solver to optimize complex bipartite matching constraints.

EDUCATION

Ege University

Ph.D. in Information Technology, International Computer Institute

02.02.2026 – In Progress

İzmir, Turkey

Ege University

M.Sc. in Computer Science (Math Dept.)

GPA: 4.00

10.09.2024 – 16.01.2026

İzmir, Turkey

Izmir Institute of Technology

B.Sc. in Mathematics

GPA: 2.96 — 2 Honor Certificates

03.09.2018 – 23.02.2024

İzmir, Turkey

CERTIFICATIONS, SKILLS & INTERESTS

Technologies: Python, Docker, PyG, R, MATLAB, SQL, LaTeX, Windows Subsystem for Linux (WSL2)

Skills: Geometric Deep Learning, Algorithm Analysis, High-Performance Computing

Languages: English (Professional), Turkish (Native)

Certifications:

- Google Project Management Professional Certificate
- Artificial Intelligence and Machine Learning Module Success Certificate (YÖK Data Analysis School, 2025-2026)
- Information Technology Internship Participation Certificate
- Web Application Development Training Completion Certificate