GÜN KAYNAR

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RESEARCH INTERESTS

- Machine Learning
- Deep Learning
- AI for Science
- Computational Biology
- Reinforcement Learning
- Sequence Modeling

EDUCATION

Carnegie Mellon University — Pittsburgh, PA
Ph.D., School of Computer Science – Computational Biology — Aug 2024 – Jun 2028 (expected)
Advisor: Carl Kingsford

Bilkent University — Ankara, Turkey
M.Sc., Computer Science — 2021 – 2024

Bogazici University — Istanbul, Turkey
B.Sc., Molecular Biology and Genetics – Computer Science — 2016 – 2021
Exchange, University of Barcelona — 2020
Turkey National University Entrance Exam ranked top 0.000012%

EXPERIENCE

Research Assistant, Carnegie Mellon University — Aug 2024 - Present

- Currently building a structure-aware RNA foundation model trained with multiple metrics (structure stability, translation efficiency, manufacturability) for future use in sequence generation and optimization.
- Developed an uncertainty-guided data augmentation method for imbalanced text classification, improving F1 score 47% over the baseline. (in preparation for ICML 2026)
- Developed a multi-objective reinforcement learning framework for RNA sequence optimization in vaccine design (patent pending).
- Engineered a hybrid state-space model and simulation method to learn ribosome dynamics, enabling translation rate prediction and synthetic Ribo-Seq data generation (in preparation for *Nature Machine Intelligence*).
- Designed and implemented data augmentation techniques for electronic health records, leading to a 70% improvement in rare event detection. (in preparation for *JAMIA*)

Teaching Assistant, Carnegie Mellon University — Aug 2025 – Present
Algorithms and Advanced Data Structures
Support undergraduate and graduate students through labs, recitations, and office hours; contribute to designing and grading exams, quizzes, and programming assignments.

Research Assistant, Bilkent University — Sep 2021 - Aug 2024

- Developed PiDeeL that detected high-risk glioma tumors in 384 patients using biologically-informed neural networks (*Bioinformatics*).
- Identified critical metabolites and pathways associated with brain cancer survival using explainable deep learning (*RECOMB 2023*).
- Led a team of 3 researchers in designing a transformer-based variant detection tool, achieving state-of-the-art performance on low-coverage ancient genomes (down to 0.05X) (*ISMB 2025*).
- Trained ECOLE, a model that detects copy number variants in patients' whole exome sequencing data in hospitals (*Nature Communications*).

Teaching Assistant, Bilkent University — Sep 2021 – Aug 2024
Algorithms and Data Structures; Introduction to Python
Guided undergraduate and graduate students, taught labs and recitations, and contributed to authoring and grading exams, quizzes, and assignments.

Research Intern, Case Western Reserve University — Jun 2018 - Sep 2018

- Engineered and implemented a phosphorylation site comparison tool that identifies conserved and non-conserved sites between protein pairs.
- Developed a high-performance gene name conversion tool supporting multiple naming conventions and pseudogenes.

PUBLICATIONS (see Google Scholar)

Selected Papers

- **G. Kaynar** *et al.* "Uncertainty-Guided Iterative Greedy Data Augmentation for Imbalanced Text Classification", in preparation for *ICML 2026*.
- **G. Kaynar** and C. Kingsford "seq2ribo: Structure-aware integration of machine learning and simulation to predict ribosome location profiles from RNA sequences", in preparation for *Nature Machine Intelligence*.
- **G. Kaynar** *et al.* "Augmenting Electronic Health Records for Adverse Event Detection", in preparation for *JAMIA*.
- S Du, J Li, **G. Kaynar** *et al.* "Multi-Objective Codon Sequence Optimization Using Reinforcement Learning with Demonstrations and Dual-Oracle Folding", in preparation for *Nature Communications*.
- **G. Kaynar** *et al.* "PiDeeL: Metabolic Pathway-Informed Deep Learning Model for Survival Analysis and Pathological Classification of Gliomas", *Bioinformatics*, presented at RECOMB 2023.
- **D. Cakmakci*, G. Kaynar*** *et al.* "Targeted metabolomics analyses for brain tumor margin assessment during surgery", *Bioinformatics* (*equal lead)
- **MA. Yilmaz*, AA Ceylan*, G. Kaynar*** *et al.* "LYCEUM: Learning to call copy number variants on low coverage ancient genomes", in *Bioinformatics*, presented at ISMB 2025 (*equal lead)
- B Mandiracioglu, F. Ozden, G. Kaynar *et al.* "ECOLE: Learning to call copy number variants on whole exome sequencing data", *Nature Communications*, presented at RECOMB 2024.

Patent

- S Du, J Li, **G. Kaynar**, S. Tang, C. Kingsford "Methods and software for multi-objective codon optimization of mRNA sequences using reinforcement learning" (patent pending).

OPEN SOURCE SOFTWARE SYSTEMS (see GitHub)

- ECOLE (25+ ★)
- PiDeeL
- LYCEUM

SYNERGISTIC ACTIVITIES

- **Reviewer:** *IEEE/ACM TCBB 2025*, ISMB/ECCB 2025, RECOMB 2025, ISMB 2024, *IEEE/ACM TCBB 2024*, RECOMB 2024, RECOMB 2023, *IEEE/ACM TCBB 2023*, ISBRA 2022, *IEEE/ACM TCBB 2022*.
- **Volunteer:** RECOMB 2023, RECOMB-SEQ 2023, RECOMB-CCB, RECOMB-CG, RECOMB-Genetics 2023, BIO-Arch.

HONORS & AWARDS (selected)

- **Featured Article in Nature Editors' Highlights** – *Nature Communications* 2024.
- **Carnegie Mellon University SCS Ph.D. Fellowship** – full tuition and stipend, 2024–present.
- **Tri-Institutional PhD Fellowship** – 2024.
- **Cornell PhD Fellowship** – 2024.
- **UCLA PhD Fellowship** – 2024.
- **International Scientific Publication Incentive Program** – TÜBİTAK, 2021–2024.
- **TÜBİTAK Scientist Support Scholarship** – M.Sc.
- **Bilkent Comprehensive Scholarship** – 2021–2024.
- **Erasmus Mobility Grant** – European Commission, 2020.