Barış Ekim — Curriculum Vitae

Contact Information

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References

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Yaron Orenstein
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Ben-Gurion University of the Negev (BGU)
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Education

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Doctor of Philosophy (Ph.D.) in Computer Science, expected in May 2025
GPA: 5.0/5.0
Advisor: Professor Bonnie Berger

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Master of Science (S.M.) in Computer Science, May 2022
GPA: 5.0/5.0
Advisor: Professor Bonnie Berger
Relevant Coursework:
Foundations of Program Analysis
Advanced Complexity Theory
Topics in Computational Molecular Biology
Advanced Natural Language Processing
Computational Systems Biology: Deep Learning in the Life Sciences

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Bachelor of Science (S.B.) in Computer Science and Molecular Biology and Mathematics (Double Major), May 2020
GPA: 4.8/5.0
Advisors: Professors Bonnie Berger and Ömer Yılmaz
Relevant Coursework (asterisks denote graduate-level courses):
*Advanced Algorithms**
*Advanced Topics in Theoretical Computer Science**
*Cancer Biology**
*Principles and Practice of Drug Discovery and Development**
*Theory of Computation**

Research Interests

Very broadly, my research revolves around

Applying techniques from theoretical computer science and applied mathematics to design **efficient** algorithms and data structures for biological problems;
Designing **scalable** algorithms for ubiquitous biological tasks, such as genome assembly, read mapping, and sequence indexing and search;
Developing **scalable** tools that allow researchers to work with very large datasets or large collections of datasets;
Gaining **biological insights** from advances in analysis of next-generation sequencing (NGS) data in order to answer fundamental **biological questions**.

Research Experience

Orenstein Group **February 2019 - September 2019**
Ben-Gurion University of the Negev

Developed a randomized algorithm for computing near-optimal universal hitting sets with Prof. Yaron Orenstein, and Prof. Bonnie Berger of MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). Developed the corresponding software package, `pasha`, for public use [2, 7, 8, 9, 13, 14, 15].

Holcman Group **May 2018 - September 2018**
École normale supérieure (ENS)

Implemented a mathematical model for phototransduction in cones, analyzed raw data and created visualizations, with co-supervisors Prof. David Holcman and postdoctoral associate Jurgen Reingruber.

Yılmaz Group **March 2018 - May 2018**
Koch Institute for Integrative Cancer Research

Used computational methods to help confirm the findings on the gene Hmgcs2 by analyzing single-cell RNA sequencing data, with Prof. Ömer Yılmaz and postdoctoral associate Chia-Wei Cheng.

Graybiel Group **December 2017 - March 2018**
McGovern Institute for Brain Research

Worked on calcium imaging of the large rodent striata dataset, created a pipeline for access and statistical analysis of data, and performed computational and statistical analyses, with Prof. Ann Graybiel and postdoctoral associate Leif Gibb.

Berger Group **June 2015 - August 2015**
MIT Computer Science and Artificial Intelligence Laboratory (CSAIL)

Worked on protein structure search via entropy-based hierarchical clustering, with Prof. Bonnie Berger and Prof. Noah Daniels of University of Rhode Island. Implemented a web-based protein structure search tool, `Esperite` [4, 10].

Bakkal Group **March 2015 - August 2017**
Istanbul Technical University

Worked on modeling of deep-hole drilling and performance of polymer composites, evaluated existing research techniques and recommended improvements, compared experimental and theoretical results and suggested solutions, and produced complete documentation of research, with Prof. Mustafa Bakkal [3, 5].

Publications

[1] **Ekim, B.**, Berger, B., Chikhi, R., Minimizer-space de Bruijn graphs: Whole-genome assembly of long reads in minutes on a personal computer. *Cell Systems*, 12: 1-11 (2021).

[2] **Ekim, B.**, Berger, B., Orenstein, Y., A randomized parallel algorithm for efficiently finding near-optimal universal hitting sets. *Proceedings of the 24th International Conference in Computational Molecular Biology (RECOMB 2020)*, 37-53 (2020).

[3] Kuzu, A.T., Berenji, K.R., **Ekim, B.C.**, Bakkal, M., The thermal modeling of deep-hole drilling process under MQL condition. *Journal of Manufacturing Processes*, 29: 194-203 (2017).

[4] **Ekim, B.**, A novel entropy-based hierarchical clustering framework for ultrafast protein structure search and alignment, *arXiv preprint*: 1701.01975 (2017).

[5] Bakkal, M., Bodur, M.S., Sonmez, H.E., **Ekim, B.C.**, The effect of chemical treatment methods on the outdoor performance of waste textile fiber-reinforced polymer composites. *Journal of Composite Materials*, 51: 2009-2021 (2016).

Conferences, Workshops, and Talks

[6] *Approximate pattern counting in de Bruijn graphs is #W[1]-hard.* Data Structures in Bioinformatics (DSB) 2022, Dusseldorf, Germany, June 2022.

[7] *Minimizer-space de Bruijn graphs.* 25th International Conference in Computational Molecular Biology (RECOMB 2021), Padova, Italy, May 2021.

[8] *A randomized parallel algorithm for efficiently finding near-optimal universal hitting sets.* 24th International Conference in Computational Molecular Biology (RECOMB 2020), Padova, Italy, May 2020.

[9] *Computing universal hitting sets for sequence analysis: Methods and applications.* Sabanci University Program for Undergraduate Research (PURE) Seminar Series, Istanbul, Turkey, July 2019.

[10] *Applications of universal hitting sets (UHS) in sequence analysis.* Webinar for International Society for Computational Biology (ISCB) Regional Student Group (RSG) Turkey, November 2019.

[11] *A novel entropy-based hierarchical clustering framework for ultrafast protein structure search and alignment.* 2nd International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT), Ankara, Turkey, October 2018.

[12] *Haplotype-aware de novo genome assembly: Novel approaches and applications.* Istanbul University Bioinformatics Seminar Series, Istanbul, Turkey, October 2018.

Contributed Posters

[13] *Fast detection of maximal exact matches with universal k-mer sampling.* International Symposium on Health Informatics and Bioinformatics (HIBIT), Izmir, Turkey, October 2019.

[14] *Memory-efficient parallel algorithms for approximating compact universal hitting sets.* Workshop on Algorithms in Bioinformatics (WABI), Niagara Falls, NY, September 2019.

[15] *Parallelizing algorithms for universal hitting sets.* 7th Annual Broad-ISF Symposium, Jerusalem, Israel, July 2019.

[16] *Parallel algorithms for approximating compact universal hitting sets.* MIT Biology Undergraduate Student Association (BUSA) Life Sciences Undergraduate Poster Symposium, May 2019.

Other Work Experience

Massachusetts Institute of Technology (MIT) July 2021 - present
Union Representative, MIT Graduate Student Union (GSU)

Answering questions from fellow graduate students about graduate student rights under the union contract, communicating key provisions, recruiting students into the union and organizing them around workplace issues, and keeping them informed of the latest developments about negotiations with the administration.

Massachusetts Institute of Technology (MIT) August 2019 - present
President, Turkish Student Association (TSA)

Acting president of the only student group for Turkish students. Scheduling meetings, planning school-wide activities, handling finances, and initiating fundraising and outreach events for the Turkish community in the area.

Massachusetts Institute of Technology (MIT) December 2021 - May 2021
Teaching Assistant, Topics in Computational Molecular Biology (18.418)

Organizing guest lectures, grading write-ups, holding office hours, and handling student-staff logistics. Helping instructors prepare and set up materials and information for lectures.

Massachusetts Institute of Technology (MIT) August 2019 - December 2019

Teaching Assistant, Introductory Biology (7.012)

Leading weekly recitation sessions, grading problem sets, proctoring exams, holding office hours, and handling student-staff logistics. Helping instructors prepare and set up materials and information for lectures, revising lecture material with review sessions and exam preparation, and helping students as they complete coursework.

Honors and Awards

Best Student Paper Award **August 2021**
25th International Conference in Computational Molecular Biology (RECOMB 2021)

Departmental Graduate Fellowship **September 2020 - May 2021**
Massachusetts Institute of Technology (MIT)

Keel Foundation Undergraduate Research Innovation Scholar **September 2019**
Massachusetts Institute of Technology (MIT)

Polak Scholar **February 2019 - August 2019**
MIT International Science and Technology Initiatives (MISTI)

Abdul Latif Jameel-Toyota Scholar **September 2016 - May 2020**
Massachusetts Institute of Technology (MIT)

Intel Science Talent Search (STS) Semifinalist **January 2016**
Society for Science and the Public (SSP)

Research Science Institute (RSI) Scholar **June 2015 - August 2015**
Center for Excellence in Education (CEE)

Shelby Davis International Scholar **August 2014 - May 2016**
Davis United World Colleges Foundation

Memberships

International Society for Computational Biology (ISCB)
Society for Science and the Public (SSP)
Society for Industrial and Applied Mathematics (SIAM)
Association for Computing Machinery (ACM)

Relevant Skills

Procedural Programming: C/C++, Go, Java, Julia, MATLAB, Python, R, Rust
Functional Programming: Coq, Haskell
Scripting and Typesetting: awk, Bash, LaTeX, sed
Web Development: HTML/CSS, JavaScript, PHP

Languages

Turkish (native)
English (fluent)
French (conversant)
Spanish (conversant)
Hebrew (beginner)