HASAN BALCI

PERSONAL INFORMATION

Date of birth: 27 March 1989
Nationality: Turkish
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EDUCATION

PhD in Computer Engineering 05/09/2016 - 18/08/2022
Bilkent University, Turkey
Supervisor: Prof. Dr. Ugur Dogrusoz
Thesis Title: “Fast Compound Graph Layout with Constraint Support”
CGPA: 3.77/4.00

MS in Computer Engineering 06/09/2012 - 05/08/2015
Bilkent University, Turkey
Supervisor: Prof. Dr. Ugur Gudukbay
Thesis Title: “Sun Position Estimation on Time-lapse Videos for Augmented Reality Applications”
CGPA: 3.69/4.00

BS in Computer Engineering 27/08/2007 - 17/06/2012
Bilkent University, Turkey
CGPA: 3.58/4.00

RESEARCH INTERESTS

My research interests range from developing novel methods for the visualization and analysis of graphs to their applications in the bioinformatics field. During my PhD, my main focus was on graph layout algorithms, complexity management of large graphs, and their application on biological pathways by also developing web-based visualization tools and services. Recently, my focus has been on developing new techniques that leverage large language models (LLMs) to facilitate and expand the use of graph-based biological notations like Systems Biology Graphical Notation (SBGN).

RESEARCH EXPERIENCE

Postdoctoral Researcher 03/06/2024 - present
Computational Biology Branch, National Library of Medicine (NLM), NIH, USA
Supervised by Dr. Augustin Luna

- Designing and implementing layout and visualization methods specialized for SBGN, such as digitizing hand-drawn maps, enabling the merging/splitting of existing maps, and performing layout refinements specific to SBGN standards [2]
- Working on updating the SBGN specifications, including refining notation rules, ensuring consistency across standards, and incorporating community feedback [1]

Postdoctoral Researcher 30/01/2023 - 29/01/2024
Maastricht Center for Systems Biology (MaCSBio), Maastricht University, the Netherlands
Supervised by Dr. Martina Summer-Kutmon

- Worked on a project that leverages knowledge graphs on drug repurposing for COVID-19 and its long-term effects (post-COVID)
- Worked on a project that explores the innate immune response against live and inactivated SARS-COV-2 virus
- Contributed to WikiPathways biological pathway platform [5]

Postdoctoral Researcher 01/09/2022 - 25/01/2023
i-Vis Research Lab, Bilkent University, Turkey
Supervised by Dr. Ugur Dogrusoz

- Worked on design and implementation of a research project named "Effective Analysis of Big Data Through Graph Visualization with A Unified Complexity Management Framework" supported by The Scientific and Technological Research Council of Turkey (TUBITAK)

Research Assistant 05/09/2016 - 18/08/2022
i-Vis Research Lab, Bilkent University, Turkey
Supervised by Dr. Ugur Dogrusoz

- Designed and developed a layout service named SyBLaRS (Systems Biology Layout & Rendering Service) which is a web service to lay out graphs in SBGNML, SBML, GraphML and JSON formats and/or produce corresponding images of the layouts in the backend [6]
- Designed and developed fCoSE (fast Compound Spring Embedder) [7] and contributed to the design and development of CoSEP (Compound Spring Embedder with Ports) [8] layout algorithms
- Worked on design and implementation of a research project named "Efficient Layout Algorithms for Compound Graphs With Support for Ports and Constraints" supported by TUBITAK
- Participated in Google Summer of Code 2017 with a project which aims visual quality and performance improvements in CoSE (Compound Spring Embedder) layout algorithm
- Lead development and maintenance of Newt Pathway Viewer and Editor which is a web based, open source viewer and editor for pathways in SBGN, SBML and SIF formats [9]
- Contributed to the development and maintenance of various Cytoscape.js extensions including cytoscape-expand-collapse and cytoscape-view-utilities [10]

Research Assistant 06/09/2012 - 05/08/2015
Mod-Vis Research Group, Bilkent University, Turkey
Supervised by Dr. Ugur Gudukbay

- Worked on a research project named "An Augmented Reality Environment for Interactive Crowd Simulation" supported by TUBITAK and developed a method for sun position estimation and tracing in time-lapse videos [11]

Undergraduate Research 09/2011 - 06/2012
Bilkent University, Turkey

- Worked on senior design project named "Turkish Sign Language Converter via Microsoft Kinect" that converts the signs in Turkish Sign Language to textual form

PUBLICATIONS

[1] **H. Balci**, A. Rougny, R. Overall, I. Balaur, …, and A. Luna, "Systems Biology Graphical Notation: Process Description language Level 1 Version 2.1", 2025. (Under Review)

[2] **H. Balci** and A. Luna, "User-Guided Force-Directed Graph Layout", arXiv preprint arXiv:2506.15860, 2025. DOI: 10.48550/arXiv.2506.15860

[3] A. Niarakis, G. An, L. Ladeira, …, **H. Balci**, …, and R. Laubenbacher, “Building Immune Digital Twins: An International and Transdisciplinary Community Effort”, ImmunoInformatics, 2025. DOI: 10.1016/j.immuno.2025.100060

[4] A. Niarakis, R. Laubenbacher, G. An, Y. Ilan, …, **H. Balci**, …, and J. A. Glazier, “Immune digital twins for complex human pathologies: applications, limitations, and challenges”, NPJ Systems Biology and Applications, 10(01), 141, 2024. DOI: 10.1038/s41540-024-00450-5

[5] A. Agrawal, **H. Balcı**, K. Hanspers, S. L. Coort, M. Martens, D. N. Slenter, …, and A. R. Pico, “WikiPathways 2024: next generation pathway database”, Nucleic Acids Research, 52(D1), D679-D689, 2024. DOI: 10.1093/nar/gkad960

[6] **H. Balci**, U. Dogrusoz, Y. Z. Ozgul, and P. Atayev, ”SyBLaRS: A web service for laying out, rendering and mining biological maps in SBGN, SBML and more”, PLOS Computational Biology, 18(11), pp. 1-12, 2022. DOI:10.1371/journal.pcbi.1010635

[7] **H. Balci** and U. Dogrusoz, ”fCoSE: a fast compound graph layout algorithm with constraint support”, IEEE Transactions on Visualization and Computer Graphics, 28(12), pp. 4582-4593, 2022. DOI: 10.1109/TVCG.2021.3095303

[8] A. Okka, U. Dogrusoz, and **H. Balci**, ”CoSEP: a compound spring embedder layout algorithm with support for ports”, Information Visualization, 20(2-3), pp. 151-169, 2021. DOI: 10.1177/14738716211028136

[9] **H. Balci**, M. C. Siper, N. Saleh, I. Safarli, L. Roy, M. Kilicarslan, R. Ozaydin, A. Mazein, C. Auffray, O. Babur, E. Demir, and U. Dogrusoz, ”Newt: a comprehensive web-based tool for viewing, constructing, and analyzing biological maps”, Bioinformatics, 37(10), pp. 1475-1477, 2021. DOI: 10.1093/bioinformatics/btaa850

[10] U. Dogrusoz, A. Karacelik, I. Safarli, **H. Balci**, L. Dervishi, and M. C. Siper, ”Efficient methods and readily customizable libraries for managing complexity of large networks”, PLOS ONE, 13(5): e0197238, 2018. DOI: 10.1371/journal.pone.0197238

[11] **H. Balci** and U. Gudukbay, ”Sun position estimation and tracking for virtual object placement in time-lapse videos”, Signal, Image and Video Processing, 11(5), pp. 817-824, 2017. DOI: 10.1007/s11760-016-1027-x

CONFERENCES / WORKSHOPS / MEETINGS / TALKS

COMBINE Workshop 2025 20/10/2025 - 23/10/2025
Participated online

Hosted a breakout session on SBGN, collaboratively working on the update of the Activity Flow and Hybrid PD-AF specifications.

Gave a lightning talk titled “From Sketch to SBGN: An AI-Assisted Workflow for Map Creation”.

Disease Maps Community Online Meetings 30/01/2025
Participated online

Gave a talk titled “SBGN Hybrid PD-AF Notation”.

NIH Artificial Intelligence Symposium 2025 16/05/2025
NIH Bethesda Campus, MD, USA

Poster: Automatic Conversion of Hand-Drawn to Interactive Pathway Diagrams Using Large Language Models

HARMONY Workshop 2025 15/04/2025 - 18/04/2025
Participated online

Hosted a breakout session on SBGN, collaboratively working on the update of the Activity Flow specification.

Disease Maps Community Online Meetings 30/01/2025
Participated online

Gave a talk titled “Advancing SBGN: Insights into Layout and AI-Assisted Tools”.

COMBINE Workshop 2024 02/09/2024 - 05/09/2024
Participated online

Hosted a breakout session on SBGN, collaboratively working on the update of the Process Description specification.

BioHackathon Europe 30/10/2023 - 03/11/2023
Participated online

Worked on a project named “Extending interoperability of experimental data using modular queries across biomedical resources”.

Y. Gadiya, A. Ammar, E. Willighagen, D. Martinat, A. C. Sima, **H. Balci** & T. Abbassi-Daloii, (2023). BioHackEU23 report: Extending interoperability of experimental data using modular queries across biomedical resources, 2023. DOI: 10.37044/osf.io/mhsqp

Building Immune Digital Twins Workshop 15/05/2023 - 02/06/2023
Paris, France

Selected to join a three-week workshop that brought together researchers across disciplines for activities ranging from extended active teamwork on specific immune digital twin projects to lectures, discussion and working groups, and brainstorming sessions

Bioinformatics & Systems Biology Conference 2023 09-10//05/2023
Egmond aan Zee, The Netherlands

Poster: From WikiPathways to Drug Repurposing for COVID-19: Utilizing Knowledge Graphs to Identify Novel Therapies

Demo: SyBLaRS: Systems Biology Layout and Rendering Service

7th Disease Maps Community Meeting 03-05//04/2023
Maastricht, The Netherlands
Member of Local Organization Committee

COMMUNITIES

Editor in

- Systems Biology Graphical Notation (SBGN) [1] 01/2025 - present

Member of

- Building Immune Digital Twins (BIDT) Community [3] [4] 05/2023 - present
- Disease Maps Community 02/2023 - present
- WikiPathways Community 02/2023 - present

STUDENT SUPERVISION

Google Summer of Code (GSoC) mentor in NRNB 05/2024 - 09/2024

- Aditya Saini - GPML support in Newt
- Tushar Chowdhury - Cytoscape layout plugin to support Cytoscape.js layouts

Helped supervision of 09/2016 - 07/2023

- Joshua Muller, BS, MaCSBio, Maastricht University
- Osama Zafar, MS, Bilkent University
- Mubashira Zaman, MS, Bilkent University
- Alihan Okka, MS, Bilkent University

TEACHING EXPERIENCE

Practical instructor / lecturer / tutor 02/2023 - present

Maastricht University, NL

- Computer practical instructor on network biology, Bachelor Biomedical Sciences
- Proposal writing coach, Master Systems Biology (Systems Biology course)
- Lecturer, Master Systems Biology (Network Biology course)
- Tutor, Master Systems Biology (Network Biology course)

Teaching Assistant 06/2012 - 08/2022

Bilkent University, Turkey

- CS473 - Algorithms I, CS421 - Computer Networks, CS319 - Object-Oriented Software Engineering, CS202 - Fundamental Structures of Computer Science II, CS201 - Fundamental Structures of Computer Science I, CS102 - Algorithms and Programming II, CS101 - Algorithms and Programming I

INTERNSHIPS

Summer Intern 06/2011 - 07/2011

ASELSAN, Turkey

- Developed a database application to be used as an inventory list by using C# and MSSQL

Summer Intern 06/2011 - 07/2011

The Central Bank of the Republic of Turkey, Turkey

- Developed a database application for the purchasing department by using PHP and MySQL

SKILLS

Programming Skills	Javascript, Java, R, Python, HTML, CSS, Matlab, Cypher, SQL
Libraries and Tools	Cytoscape.js, Node.js, React, Git, Docker, jQuery, OpenGL, Unity
Operating Systems	Linux, Windows, MacOS
Databases	Neo4j, MySQL

AWARDS AND HONORS

Full Graduate Scholarship, PhD, Bilkent University	09/2016 - 08/2022
Graduate Scholarship, The Scientific and Technological Research Council of Turkey	09/2012 - 08/2014
Full Graduate Scholarship, MS, Bilkent University	09/2012 - 08/2015
Graduation with High Honor Degree, BS, Computer Engineering, Bilkent University	06/2012
Senior Design Project Innovation Award	05/2012
Full Undergraduate Scholarship, Bilkent University	08/2007 - 06/2012
Achieved 1167th position in University Entrance Exam (among 1.5 million students)	06/2007