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

PhD Student in Computer Science and Engineering   13/08/2015 - 10/01/2016
Ohio State University, USA

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 new techniques for visualization and analysis of graphs to their application 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 leveraging network-based approaches in immunology and chronic disease-related projects.

Keywords: Data visualization, Graph layouts, Network science, Pathway analysis, Bioinformatics, Software development

- graph layout algorithms, complexity management of large graphs, graph querying
- visualization and analysis of biological pathways
- pathway-based integrative systems biology
- development of user-friendly graph visualization tools

RESEARCH EXPERIENCE

Postdoctoral Researcher   30/01/2023 - 29/01/2024
Maastricht Center for Systems Biology (MaCSBio), Maastricht University, the Netherlands
Supervised by 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 [1]

Postdoctoral Researcher   01/09/2022 - 25/01/2023
i-Vis Research Lab, Bilkent University, Turkey
Supervised by 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 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 [2]
- Designed and developed fCoSE (fast Compound Spring Embedder) [3] and contributed to the design and development of CoSEP (Compound Spring Embedder with Ports) [4] 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 [5]
- Contributed to the development and maintenance of various Cytoscape.js extensions including cytoscape-expand-collapse and cytoscape-view-utilities [6]

Research Assistant   06/09/2012 - 05/08/2015
Mod-Vis Research Group, Bilkent University, Turkey
Supervised by 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 [7]

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

Website: https://www.wikipathways.org/

Update paper of WikiPathways biological pathway platform that highlights major developments to improve the long-term sustainability of WikiPathways from infrastructure to user interfaces.

[2] **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

Website: https://github.com/iVis-at-Bilkent/syblars

As a web service, SyBLaRS aims to fill the void for programmatically generating graphical representations of biological pathways while optionally highlighting paths or sub-pathways of interest and automatically laying them out.

[3] **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

Website: https://github.com/iVis-at-Bilkent/cytoscape.js-fcose

fCoSE is an automatic layout algorithm for compound graphs with support for a fairly rich set of constraint types. It achieves fast and aesthetic results by combining the best of two worlds: speed of spectral drawing techniques and quality of force-directed layout algorithms.

[4] 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

Website: https://github.com/iVis-at-Bilkent/cytoscape.js-cosep

CoSEP is an algorithm for automatic layout of general compound graphs with support for constrained connection of edges to their source/target nodes via ports.

[5] **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

Website: http://newteditor.org/

Newt is a pathway editor developed to address the need for a customizable web-based component and an end-user application for constructing and visually analyzing biological pathways with state-of-the-art editing, diagramming, complexity management, and experimental data analysis facilities using standard notations SBGN, SBML and SIF.

[6] 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

Website: https://github.com/iVis-at-Bilkent/cytoscape.js-expand-collapse

This study fills an important gap by making efficient implementations of some already known complexity management techniques freely available to tool developers through a couple of open source, customizable software libraries, and by introducing some heuristics which can be applied upon such complexity management techniques to ensure preserving mental map of users.

[7] **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

Website: https://github.com/hasanbalci/TimeLapseAR

This study proposes a novel approach for illumination estimation on time-lapse videos and seamlessly integrating virtual objects in these videos in a visually consistent way.

CONFERENCES / WORKSHOPS / MEETINGS

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

I 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

I was 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

Member of
- Disease Maps Community   02/2023 - present
- WikiPathways Community   02/2023 - present
- Immune Digital Twin RDA Working Group   will start soon

STUDENT SUPERVISION

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 (Network 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, C++, C#, HTML, CSS, Matlab, Cypher, SQL

Libraries and Tools   Cytoscape.js, D3.js, Node.js, React, Git, Docker, jQuery, OpenGL, Unity

Operating Systems   Linux, Windows, MacOS

Databases   Neo4j, MySQL, MSSQL

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