

SINEM DEMİRKAYA BUDAK

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sinemdemirkayabudak.github.io

Work Experience

- 01.2023 – 09.2024

Bioinformatics Engineer, Velsera Inc., Ankara, TURKEY (Remote)

- Designed, implemented, and productionized a novel Family Trio Analysis Workflow for *de novo* mutation and loss of heterozygosity (LoH) detection
- Developed scalable Python-based pipelines for processing large-scale NGS datasets
- Optimized workflow performance, reliability, and reproducibility for cloud and HPC execution
- Benchmarked computational methods and generated analytical reports and visualizations
- Collaborated with bioinformaticians, scientists, and engineers to deliver production-ready workflows

- 01.2020 – 01.2023

Bioinformatics Analyst, Seven Bridges Genomics Inc., Ankara, TURKEY (Remote)

- Developed, optimized, and maintained automated NGS workflows (QC, alignment, variant calling, and post-processing) on Seven Bridges Platform and other platforms
- Containerized bioinformatics tools using Docker and optimized performance for cloud-based execution
- Integrated multiple tools, APIs, and data sources into reproducible computational pipelines
- Led participation in the precisionFDA Truth Challenge V2, achieving best performance in MHC region variant calling for Illumina short reads
- Contributed to large-scale genomic analysis projects requiring robust, production-grade systems

- 05.2018 – 01.2020

Assistant Project Manager and Lab Specialist, Seven Bridges Genomics Inc., Ankara, TURKEY

- Performed next generation sequencing (NGS) in a national genome project with Illumina NovaSeq 6000 System
- Performed all laboratory processes for NGS like DNA isolation and library preparation, trained and oriented clients about all protocols from blood sample retrieval to NGS data generation
- Took active role in optimizing and benchmarking various bioinformatics tools and workflows on Seven Bridges Platform

- 01.2016 – 04.2018

Teaching & Research Assistant, TOBB University of Economics and Technology (TOBB ETU), Ankara, TURKEY

- Investigated the effects of multiple SNPs on an eye disease utilizing DNA isolation techniques (salt-out and using commercial kit) from several sample types including whole blood, PCR/RFLP, real-time PCR and ELISA methods for investigating isolated DNA
- Researched, ordered and installed lab equipment to a central lab and guided graduate students for using these equipment
- Prepared and submitted research projects, consent, ethics and phenotypic forms for projects including human subjects
- Taught Molecular Biology and Genetics laboratory and Physics 101 laboratory classes

- 07.2013 – 09.2013

Intern, Institute of Systematic Botany and Mycology, University of Munich (LMU München), Munich, GERMANY

- Studied three species of Caricaceae for validating their phylogenetic relationships by utilizing chromosome counting technique (I was acknowledged for my contribution in this publication: <http://www.springer.com/br/book/9783658102661>).
- Helped lab technicians with their regular workflow in several studies including sample collection, sample processing for chromosome counting, PCR, agarose gel electrophoresis, and chromosome counting with DAPI staining under fluorescent microscope

- 10.2014 – 06.2015, 10.2012 – 01.2013
Special Tutor, <http://odevodtu.com>, Ankara, TURKEY
 - Tutored primary and secondary education students in math and science classes

Education

- 09.2018 – 01.2024
PhD, Medical Informatics, Middle East Technical University (METU)
CGPA: 3.75 / 4.00
 - Took PhD courses including programming for informatics, biological databases and data analysis tools, OOP and data structures, structural bioinformatics, probabilistic and statistical modeling for bioinformatics, protein and DNA sequence analysis, fundamentals of mathematics for information systems, medical informatics, research methods and statistics for cognitive science
 - Completed PhD coursework and qualifiers
 - Withdrew prior to thesis due to time constraints
- 01.2016 – 04.2018
Master's Degree, Biomedical Engineering, TOBB University of Economics and Technology (TOBB ETU)
CGPA: 4.00 / 4.00
 - Investigation of the relationship between clusterin genetic polymorphisms and clusterin level of tear and aqueous humor in pseudoexfoliation syndrome and glaucoma (Master thesis study)
- 09.2008 – 06.2015
BSc, Molecular Biology and Genetics, Middle East Technical University (METU)
CGPA: 2.57 / 4.00
 - Spring 2014 – Laboratory practices of green microalgae (*Chlamydomonas reinhardtii*) to produce biodiesel from microalgae
Middle East Technical University (METU), Ankara, TURKEY
 - Fall 2013 – Physiological and biochemical response to boron toxicity in two barley cultivars (Zafer 160 and Tarm 92). To study the effects of boron toxicity; growth of root and shoot, antioxidant defense mechanism (Ascorbate peroxidase, Catalase, Glutathione reductase), relative water content, proline content, H₂O₂ content, malondialdehyde content, protein concentration and the pigment concentration are investigated
Middle East Technical University (METU), Ankara, TURKEY
 - Summer 2013 – Chromosome counting for three species of Caricaceae – *C.parviflora*, *J. caudata*, *J. heterophylla* – by using classical cytogenetic techniques and DAPI staining
Institute of Systematic Botany and Mycology, University of Munich (LMU München), Munich, GERMANY
- 11.2011 – 06.2015
BSc, Business Administration (Open Education), Anadolu University
CGPA: 2.65 / 4.00
- 09.2004 – 06.2008
Mathematics and Science, Mehmet Akif Ersoy High School
Diploma grade: 93.78 / 100

Publications

- Shadrina M, Kalay Ö, **Demirkaya-Budak S**, LeDuc CA, Chung WK, Turgut D, Budak G, Arslan E, Semenyuk V, Davis-Dusenbery B, Seidman CE, Yost HJ, Jain A, Gelb BD. 2025. Efficient identification of de novo mutations in family trios: a consensus-based informatic approach. *Life Science Alliance*.
<https://www.life-science-alliance.org/content/8/6/e202403039>
- Arslan E, Turgut D, Kalay Ö, **Demirkaya-Budak S**, Budak G, Jain A. 2024. Pangenome References Improve Biomarker Estimation from Tumor Sequencing Data. *bioRxiv*. 2024-11.
<https://doi.org/10.1101/2024.11.14.623554>

- Tetikol H S, Turgut D, ..., **Demirkaya-Budak S**, ..., Davis-Dusenbery B N. 2022. Pan-African genome demonstrates how population-specific genome graphs improve high-throughput sequencing data analysis. *Nature Communications*, 13(1), 4384.
<https://www.nature.com/articles/s41467-022-31724-3>
- Olson N D, Wagner J, McDaniel J, ..., **Demirkaya-Budak S**, ..., Zook J M. 2022. PrecisionFDA Truth Challenge V2: Calling variants from short and long reads in difficult-to-map regions. *Cell genomics*, 2(5).
<https://www.sciencedirect.com/science/article/pii/S2666979X22000581>
- Can Demirdöğen B and **Demirkaya-Budak S**. 2023. Influence of clusterin genetic variants on IOP elevation in pseudoexfoliation syndrome and pseudoexfoliative glaucoma in Turkish population. *BMC ophthalmology*, 23(1), p.117.
<https://doi.org/10.1186/s12886-023-02850-3>
- Can Demirdöğen B, **Demirkaya-Budak S**, Özge G, Mumcuoğlu T. 2019. Evaluation of Tear Fluid and Aqueous Humor Concentration of Clusterin as Biomarkers for Early Diagnosis of Pseudoexfoliation Syndrome and Pseudoexfoliative Glaucoma. *Current Eye Research*.
<https://doi.org/10.1080/02713683.2019.1698055>
- Can Demirdöğen B, Koçan Akçin C, Göksoy E, Yakar G, Öztepe T, **Demirkaya-Budak S**, Oflaz S. 2019. Paraoxonase 1 (PON1) promoter (-107T/C) and coding region (192Q/R and 55L/M) genetic variations in pseudoexfoliation syndrome and pseudoexfoliative glaucoma risk. *Graefe's Archive for Clinical and Experimental Ophthalmology*.
<https://doi.org/10.1007/s00417-019-04408-w>

Skills

- **Programming:** Python, JavaScript, R, HTML, SQL, MySQL, PostgreSQL, SQLite
- **Technologies & Libraries:** Docker, CWL, Nextflow, Git, Linux, pysam, Matplotlib, Seaborn, Pandas, Numpy, Scipy, Scikit-learn
- **Bioinformatics tools:** Data analysis (BWA, GATK, STAR, Rabix, IGV, Cytoscape, Autodock4, PyMol, UCSC Chimera, Ensembl API), NGS data QC (FastQC, FastQ Screen, Cutadapt, Atropos, Fastp), data manipulation (SAMTools, BCFTools)
- **Project management:** Jira, Kanban, Agile, Confluence
- **Laboratory:** NGS, Light/Fluorescence Microscope, PCR/RFLP, Electrophoresis, Spectrophotometry/Fluorometer, Library preparation, Real-Time PCR, DNA isolation from several sample types w/ or w/o an automated system, ELISA

Awards, Certificates & Courses

- Best performance for accurately calling variants in the MHC region of Illumina short reads in the precisionFDA Truth Challenge V2 – U.S. Food and Drug Administration, Jun 2020
 - I led the challenge for Seven Bridges and we won the best performance for accurately calling variants in the MHC region of Illumina short reads in the precisionFDA Truth Challenge V2
- Anadolu University Certificate of Honor: 2013 – 2014 Spring Semester
- METU Certificate of High Honor: 2010 – 2011 Fall Semester
- Course certificates:
 - Joining Data in SQL, DataCamp - Feb 2026
 - Intermediate SQL, DataCamp - Jan 2026
 - Introduction to SQL, DataCamp - Jan 2026
 - Understanding Data Engineering, DataCamp - Jan 2026
 - Python Data Associate, DataCamp - Jan 2026
 - Exploratory Data Analysis in Python, DataCamp - Jan 2026
 - Introduction to Statistics in Python, DataCamp - Jan 2026
 - Hello Nextflow, Seqera - Oct 2025
 - Introduction to Data Visualization with Seaborn, DataCamp - Oct 2025

- Joining Data with Pandas, DataCamp - Sep 2025
- Data Manipulation with Pandas, DataCamp - Sep 2025
- Intermediate Python, DataCamp - Sep 2025
- Introduction to Python, DataCamp - Sep 2025
- The 10-Day Python Bootcamp for Engineers and Scientist 2025, Udemy - Sep 2015
- Introduction to Databases and SQL Querying, Udemy - Mar 2019
- Website Design: BELTEK – Technical Education Course of Gazi University/Ankara Metropolitan Municipality, 12.04.2010 – 06.06.2010 (72 hours)

References

Amit Jain – Graph Technology Director
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