

SEMA NUR BOZDAG

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Blog: scipeak.info · Podcast: The Wet Lab Coder

PROFILE

M.Sc. student in Bioinformatics and Systems Biology with a background in Molecular Biology and Genetics. Works at the intersection of experimental embryology and computational biology: hands-on experience in mouse preimplantation embryo culture, cryopreservation and assisted reproduction, combined with deep learning for biomedical image analysis. Current research focuses on non-invasive, interpretable AI-assisted assessment of in vitro embryo development. Interested in computational biology, biological simulation and digital twin modelling.

EDUCATION

M.Sc. in Bioinformatics and Systems Biology — Istanbul University, Istanbul, Türkiye 2024 – 2026
Thesis: *Assessment of In Vitro Mouse Embryo Development with Deep Learning*
Advisors: Asst. Prof. Ali Cihan Taskin, Asst. Prof. Murat Gezer

B.Sc. in Molecular Biology and Genetics — Balıkesir University, Balıkesir, Türkiye 2018 – 2022
Thesis: *Silencing of the KLK4 Gene with shRNA*
Advisor: Prof. Feray Kockar

PUBLICATIONS & CONFERENCE PRESENTATIONS

International indexed conference abstracts

Usta E, **Bozdag SN**, Gunduz ZN, Ozturk GB, Okyar A, Taskin AC. The study of ritonavir on embryotoxicity: preliminary study. *FEBS Open Bio*. 2025;15:506–507.

National conference presentations

Bozdag SN, Gunduz ZN, Taskin AC. Technologies transforming embryo selection in IVF: machine learning, omics and cloud-based systems. 6th National Laboratory Animal Science Congress, Aksaray, Türkiye, September 2025. Poster P-16. (*presented in Turkish*)

Taskin AC, **Bozdag SN**, Gunduz ZN. From embryo to adulthood: new applications in reproductive biotechnology and behavioural monitoring systems. 6th National Laboratory Animal Science Congress, Aksaray, Türkiye, September 2025. Conference paper. (*presented in Turkish*)

Gunduz ZN, **Bozdag SN**, Taskin AC. Transgenic animals: production methods, gene control strategies and research applications. 6th National Laboratory Animal Science Congress, Aksaray, Türkiye, September 2025. Poster P-15. (*presented in Turkish*)

RESEARCH INTERESTS

Computational biology · Biomedical imaging · Computer vision · Developmental biology and embryology · Systems biology and multi-omics integration · Biological simulation and digital twin modelling · Explainable AI

AWARDS

1st Place — Sabanci University & InsiderOne Hackathon May 2026

- Designed and implemented NeuroPass, an end-to-end machine learning system predicting blood–brain barrier permeability and ADMET properties from molecular descriptors.
- Built a two-layer architecture combining a dynamic consensus ensemble with rule-based explainability and LLM integration, reaching 0.94 ROC-AUC.
- Deployed containerised FastAPI services for real-time inference.

Stack: Python, scikit-learn, FastAPI, LangChain, Docker

RESEARCH EXPERIENCE

Graduate Researcher — Istanbul University

2025 – Present

Deep learning-based assessment of in vitro mouse embryo development (M.Sc. thesis project)

- Built a multi-stage deep learning pipeline for segmentation of preimplantation mouse embryo brightfield microscopy images followed by developmental quality classification.
- Developed fusion models integrating image-derived morphological and texture features for embryo competence prediction.
- Applied explainable AI methods to interpret model predictions and improve transparency of automated assessment.
- Assembled and curated the imaging dataset, including embryo culture, image acquisition and mask annotation.

Graduate Researcher — Collaborative Research Projects, Istanbul University

2025 – 2026

- Boron-supplemented culture media: investigated effects of boron supplementation on tissues of offspring born after embryo transfer; performed RNA isolation and qPCR-based gene expression analysis, with longitudinal weight monitoring.
- Assisted reproduction: supported superovulation protocols and in vitro embryo collection and handling for a graduate thesis project.
- IVF and behavioural analysis: coordinated weekly experimental workflows (hormone administration, embryo retrieval, culture media preparation) and conducted longitudinal behavioural monitoring of IVF-born offspring using the HomeCage system, including video recording and data analysis.

Undergraduate Researcher — Balikesir University

2022

- Designed shRNA constructs targeting the KLK4 gene; performed molecular cloning, transformation and cell culture experiments to validate knockdown, followed by statistical analysis of expression data.

PROFESSIONAL EXPERIENCE

Molecular Biologist — Sapiens Genetics, Istanbul, Turkiye

Dec 2023 – Sep 2024

- Performed genetic analyses for hereditary cancer panels using MLPA, single-gene testing and clinical exome sequencing (CES).
- Interpreted variant data and prepared clinical diagnostic reports.
- Followed laboratory quality assurance and documentation procedures.

Intern — Gene and Cell Therapy Centre, Akdeniz University, Antalya

Jan – Feb 2022

- Contributed to a study on obesity-induced blindness using adenoviral vectors in animal models; performed cell culture including iPSC culture, and assisted with tissue fixation and immunohistochemistry.

TECHNICAL PROJECTS

NeuroPass — Blood–brain barrier permeability and ADMET prediction system. Ensemble ML models with rule-based explainability, served via containerised FastAPI endpoints. (Python, scikit-learn, FastAPI, Docker, LangChain)

PFAS-Permeation-Analysis — Exploratory analysis of PFAS physicochemical descriptors and membrane permeation behaviour.

github.com/SNB-bioinfo/PFAS-Permeation-Analysis

Embryo Development Visualisation — Interactive browser-based 3D visualisation of eight stages of mouse preimplantation embryo development, built with Three.js and integrated into the SciPeak platform.

scipeak.info/embryo-sim.html

COMPUTATIONAL SKILLS

Programming & tools Python, Git/GitHub, Jupyter, Google Colab (GPU)

Deep learning PyTorch, semantic segmentation, image classification, transfer learning

Machine learning scikit-learn, XGBoost, Random Forest, NumPy, pandas

Explainable AI SHAP, Grad-CAM

Image analysis OpenCV, scikit-image, ImageJ/Fiji

Other GraphPad Prism

EXPERIMENTAL SKILLS

Reproductive biology: Superovulation and hormone administration, zygote and embryo collection, in vitro embryo culture, embryo transfer (N-set), vitrification and cryopreservation, IVF procedures, brightfield embryo imaging

Molecular biology: RNA isolation, qPCR, recombinant DNA cloning, shRNA design, Western blot, MLPA, clinical exome sequencing

Cell & tissue: Cell culture, iPSC culture, tissue fixation, paraffin embedding, immunohistochemistry

Animal work: Certified laboratory animal handling, longitudinal behavioural monitoring (HomeCage)

SCIENCE COMMUNICATION & OUTREACH

- Founder & Editor — SciPeak (scipeak.info)** 2026 – Present
- Bilingual (Turkish/English) science communication platform; write and publish explanatory pieces on artificial intelligence, molecular biology and embryology for a general and early-career scientific audience.
 - Designed, built and maintain the site independently, including its interactive educational content.
- Founder & Host — The Wet Lab Coder (Spotify, Apple Podcasts, YouTube)** 2026 – Present
- Podcast with early-career researchers; produced in Turkish, with English-language content on YouTube.
 - Episode topics include digital twins, DNA data storage, organ-on-a-chip systems, single-cell RNA sequencing, breast cancer research and medical image processing.
 - Responsible for the full production chain: research, scripting, recording, editing and visual assets.

SELECTED CERTIFICATES

June 2026	International Future AI Summit — BAU
Dec 2025	Cryopreservation in Assisted Reproductive Technologies — RBMO
Nov 2025	Fundamental Principles in Cryopreservation — QUARTEC (Marc Van den Bergh)
Sep 2025	Mature Thinking: Innovations in IVM — RBMO
Jul 2025	AI: New World — TRIA
Jan 2025	Certificate of Use of Experimental Animals — Acibadem University
Sep 2024	Genetic Treatment Approaches — Cihan Tastan

LANGUAGES

Turkish Native

English Upper-intermediate (B2) — academic reading and writing, scientific content production in English