EMIR MUHAMMET ARAN

Medical AI & Longevity Researcher | Computer Engineering

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SUMMARY

Undergraduate Computer Engineering researcher decoding cellular senescence and tissue aging with generative vision models and spatial multi-omics. Seeking a summer 2027 internship in medical imaging AI; experienced taking models to deployment (FastAPI, Docker, HuggingFace Spaces).

EDUCATION

Gazi University — **Expected January 2028**

Bachelor of Science in Computer Engineering | GPA: 3.54 / 4.00 — Ankara, Turkey

WORK EXPERIENCE

Research Contributor — Spatial Multi-Omics — **May 2026 – Present (Exp. Mar 2027)**

Solvien Community Research Program — Ankara, Turkey

- Built a spatial proteomics pipeline for gigapixel 38-channel PhenoCycler (CODEX) whole-slide images (NIH SenNet, 51 sections) with Zarr tiling and GPU CellposeSAM v2, extracting dual-masks (membrane/cytoplasm vs. DAPI nuclear) across 47.6M+ single cells.
- Co-registered CODEX with 1.04M 10x Xenium cells (3–5 micron) & built a protein-first hybrid 5-class MLP + gated classifier (30 lineage channels; Mahalanobis/Wasserstein OOD audit) after LODO Go/No-Go falsification rejected scMRDR Masked VAE RNA imputation (r=0.055–0.208 vs. Ridge 0.239–0.268) and benchmarked Novae/Harmony (iLISI=0.0313).
- Applied Ki67-/p16+/p21+ gating & orthogonal gH2AX/HMGB1/Lamin B1 profiling; reconstructed 20,480 DBSCAN islets, ran 10,000-permutation nulls (cKDTree, macrophage p < 1e-4), & stratified donor aging (**GitHub** | **Blog** | **Part 1** | **Part 2**).

Artificial Intelligence Intern (Agentic RAG & LLM Systems) — **Aug 2026**

*Sisoft Healthcare Information Systems (***GitHub***)* — Ankara, Turkey

- Authored two foundational technical reports (32 pages total, synthesizing 100+ sources) on LLM architectures, semantic chunking, and RAG/agentic workflows prior to implementation.
- Built an Agentic RAG prototype (ModernBERT-TR embeddings, FAISS, PyPDFLoader, LangChain 3-tool routing, Gemini 3 Flash, Streamlit) over 7 corporate sustainability PDFs with prompt-enforced grounding checks (15/15 test scenarios).

IoT Engineer Intern — **Jun 2025 – Sep 2025**

Gibrin Robotics | *TOBB Garaj* — Ankara, Turkey

- Programmed ESP32 (Arduino) sensors streaming telemetry to Firebase and Flutter with alerts; optimized 15-second polling, payload caching, and RBAC across 3 modules.

PROJECTS

MSC Bidirectional Aging Simulation — LDM vs. CycleGAN / CUT

Senior Undergraduate Thesis | First-Author Manuscript in Preparation | **GitHub** | **Article**

First-author undergrad thesis (manuscript in prep for bioRxiv) building label-free MSC time-travel from bright-field microscopy (8,312 cells, Mask R-CNN; young-to-senescent). Vs. CycleGAN/CUT: CUT led FID (43.13/48.58); LDM (SDEdit) led bidirectional accuracy (89.36%±0.55% aging, 87.92%±1.27% rejuv vs. CUT 72.48%/94.65%) & 5-seed stability (FID 48.81±0.99 / 54.00±0.54); ResNet-18 + Grad-CAM morphology checks; local Gradio demo.

AURA-Twin AI: Explainable Clinical Patient Digital Twin (DeepSeek-R1 7B)

QLoRA Fine-Tuning & Longitudinal EHR Modeling | **GitHub**

Fine-tuned DeepSeek-R1-Distill-Qwen-7B (4-bit QLoRA, SDPA) on 10-year EHRs to generate 23+ biomarker forecasts (+15 to +180d). Across 3 seeds on MMLU medical subsets (n=30/task), boosted Global Medical Score 26.67% to 42.50% (+15.83%), Clinical Knowledge (+20.00%), & Anatomy (+23.33%); FastAPI SSE (~13 tok/s) + React.

DOOM-FlyWire: Whole-Brain Drosophila Connectome Biophysical Agent (139K Neurons) **GitHub** | **Demo**

Built a biophysical simulation of the complete adult Drosophila connectome (139,248 neurons, 15.1M synapses) using ~60 MB PyTorch sparse CSR SpMV (>200 FPS pure SpMV; 30 FPS live WebSocket stream on HF Spaces) and continuous leaky-integrator dynamics. Mapped visual frames through a 32x32 ommatidia retinotopic array to T4/T5 motion columns, driving motor actions purely from 1,303 Descending Neurons without heuristic overrides; visualizer in Three.js WebGL.

Oxford Nanopore (ONT) Long-Read De Novo Assembly & AMR Mobilome Pipeline

Genomic Bioinformatics & Pathogen Surveillance | **GitHub**

Built a containerized bioinformatics pipeline for raw Oxford Nanopore (ONT) long reads from an unknown MDR isolate. Ran read QC and Flye de novo assembly to reconstruct a 5.3 Mbp circular chromosome + plasmids verified via Bandage. Automated NCBI BLAST API queries (100% K. pneumoniae) and screened 28 resistance genes via ABRicate, isolating a 79kb circular plasmid carrying blaKPC-3 carbapenemase (CRE).

BraTS 2020: Multi-Class Brain Tumor MRI Segmentation **GitHub** | **Live Demo**

Multi-class segmentation on multimodal MRI using U-Net + EfficientNetB0 (from-scratch encoder, Focal Loss), achieving 0.89 Mean Dice (0.91 Edema, 0.89 Enhancing, 0.86 Necrotic), 0.80 IoU, and 90.34% Average Sensitivity on a 320-slice validation subset (slice-level split); deployed interactive Gradio interface.

Breast Cancer Histopathology Detection **GitHub** | **Demo** | **Blog**

164K-param custom CNN on PatchCamelyon (PCam) lymph node patches achieving 91.5% Sensitivity, 81.1% Specificity, and 0.941 AUC across 55,505 held-out patches via Focal Loss with recall-priority thresholding; demo on HuggingFace Spaces.

15-Class Chest X-Ray Disease Classification **GitHub** | **Demo** | **Blog**

Multi-label EfficientNetB0 (patient-level split) overcoming extreme long-tail class imbalance (~50k normal vs. <300 rare cases) and label noise to achieve 0.784 mean AUC via rare-class oversampling and TTA; deployed on HuggingFace Spaces.

Synthetic Vision Pipeline for EV Smart Parking & Anomaly Detection TUBITAK 2209-B Research Grant | **GitHub**

Awarded national funding (TUBITAK 2209-B) to build an EV station AI monitor with YOLOv8m (96.7% mAP50 / 82.7% mAP50-95 across 8 classes on 48 synthetic validation scenes out of 243 total). Generated synthetic training data in NVIDIA Isaac Sim with weather domain randomization and Roboflow automated annotation.

HONORS, COMPETITIONS & LEADERSHIP

- **RARE 26 Grand Challenge (Team TensorMed):** 0.9099 AUROC (95% CI: 0.8837–0.9329), 0.4585 AUPRC on closed test set (158 positives, 1:19 imbalance) via frozen GastroNet (5M endoscopy images) + SSL DINOv3 (LoRA) with MONAI (**GitHub**).
- **NeuroBridge AI Hackathon 2026:** Multimodal Long COVID ensemble (682 FreeSurfer MRI regions ~74% XGBoost acc + 23k+ Blood RNA-Seq genes ~97% GBDT acc), LLM reporting & FastAPI/Next.js dashboard (**GitHub**).
- **TÜBİTAK 2209-B Funded Research:** Awarded national research grant for YOLOv8m EV-station anomaly detection (96.7% mAP50) (**GitHub**).
- **ACUHIT Healthcare Hackathon 2026:** Sole AI developer; built hybrid clinical decision support (Sentence Transformer + TF-IDF + NexGene LLM) on 400,113 10-year clinical EHR episodes with Flask REST API, React SPA, and 13-group safety checks; later evolved into AURA-Twin AI (**GitHub**).
- **Vesuvius Challenge (Kaggle):** Built TensorFlow 3D U-Net volumetric segmentation pipeline with custom IoU loss on X-ray micro-CT scroll scans (Top 39%; **GitHub**).
- **Ostim Game Jam 2025:** 1st Place Winner — Led team in rapid game prototype development.
- **University Student Chapters (MEDCODES & CYBERMEDU — Board Member):** Delivered hands-on Unity workshop from scratch and organized cybersecurity seminar.

TECHNICAL SKILLS

Computational Biology & Spatial Omics: PhenoCycler (CODEX 38-Ch), 10x Xenium, Oxford Nanopore (Flye, ABRicate, BLAST), CellposeSAM v2, Novae, Harmony, Hybrid Phenotype Gating, cKDTree Nulls, DBSCAN, Zarr, FlyWire SpMV.

Deep Learning & AI: PyTorch, MONAI, TensorFlow/Keras, LDM (SDEdit), CycleGAN, CUT, Cross-Modal VAE (scMRDR), DINOv3 (SSL), DeepSeek-R1, QLoRA, SDPA, LODO & OOD Auditing (Mahalanobis, Wasserstein), Mask R-CNN, YOLOv8, OpenCV, HF Transformers, LangChain, Agentic RAG, FAISS, Scikit-learn, XGBoost, Grad-CAM.

Programming, Data & Infrastructure: Python, C, Java, SQL, Bash, PyTorch Sparse CSR, Parquet/PyArrow, SQLite, Git, Linux, Docker, FastAPI, Flask, React, Three.js (WebGL), HuggingFace Spaces, NVIDIA Isaac Sim, Roboflow, ESP32/Arduino, Flutter | **English:** C1 (Advanced).