Ali Jabbari

AI and Image Processing Engineer

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Professional Summary

Seasoned AI and Image Processing Engineer specializing in deep learning, computer vision, and biomedical signal processing. Combines hands-on industry experience in model optimization and real-time systems with a strong academic background in Brain-Computer Interfaces (BCI). Passionate about architecting innovative solutions for complex challenges in multimodal image matching, visual navigation in GPS-denied environments, low-light enhancement, and EEG-based control systems.

Education

2022 – Present: **Master of Science in Biomedical Engineering**, *Sharif University of Technology*, Tehran, Iran, GPA: 16/20
Specialization: Bioelectric Engineering

Thesis: **Design of an Online BCI System for Rehabilitation Robot Control via Motor Imagery**

Research Focus: Developed deep learning models with attention mechanisms for real-time classification of EEG signals, specifically for lower limb motor imagery (e.g., knee flexion/extension). Created a novel dataset to address data scarcity in this domain.

Supervisors: Dr. Ali Ghazi-Zahedi Ahsaei & Dr. Mohammad Bagher Shamsollahi

2018 – 2021: **Bachelor of Science in Biomedical Engineering**, *Tabriz University*, Tabriz, Iran, GPA: 18/20
Specialization: Bioelectric Engineering

Thesis: **Brain-Computer Interface System Based on Common Spatial Patterns (CSP)**

Key Coursework: Signal Processing, Machine Learning, Medical Device Design, Signal Decomposition Techniques

Technologies: MATLAB, Python, Scikit-learn, CSP Algorithms

Professional Experience

May 2024 – Present: **AI and Image Processing Engineer**, *Rayan Hoshmand Ghadir*, Tehran, Iran

Responsibilities

- Architect and optimize deep learning models for advanced image processing applications
- Implement robust multimodal matching algorithms for RGB and Infrared (IR) sensor fusion
- Develop and deploy a high-precision, real-time visual navigation system using multi-modal image matching for operation in GPS-denied environments
- Engineer real-time computer vision solutions using PyTorch, OpenCV, and the NVIDIA Jetson platform
- Accelerate model inference speed for deployment using optimization tools like TensorRT and ONNX

October 2022 – Present | **Research Assistant**, *Sharif Brain Center*, Tehran, Iran

Responsibilities

- Spearheaded research and development of Brain-Computer Interface (BCI) systems
- Implemented advanced EEG signal processing pipelines, including ICA and adaptive filters, to enhance signal quality
- Conducted ERD/ERS analysis to identify and classify brain activity patterns for motor imagery tasks
- Designed and trained deep learning models for high-accuracy classification of EEG data

Technical Skills

Programming & Languages

Expert: **Python**, **C++**, **MATLAB**, **JavaScript/TypeScript**

Proficient: SQL, Shell Scripting, HTML/CSS

AI & Deep Learning

Frameworks: **PyTorch**, **TensorFlow**, **Keras**, **PyTorch Lightning**

Generative AI: **LLM Integration**, **RAG (Retrieval-Augmented Generation)**, **LangChain**, **Prompt Engineering**

Model Optimization: **TensorRT**, **ONNX**, **Quantization**, **Pruning**, **CUDA Programming**

Techniques: Transfer Learning, Fine-Tuning, Attention Mechanisms, CNNs, RNNs, Self-Supervised Learning

Specialized Models: **YOLO**, **EfficientLoFTR**, **SuperPoint**, **RoMa**, **XFeat**

Computer Vision & Image Processing

Libraries: **OpenCV**, **Scikit-image**, **Pillow**, **Kornia**, **Einops**

Core Techniques: Camera Calibration, Image Filtering & Enhancement, Feature Detection (SIFT, ORB, SuperPoint), Depth Estimation, Object Detection & Tracking

Specialized Areas: Multimodal Image Matching (RGB-IR), Image-Based Navigation, Smart Tracker Systems, Optical Mark Recognition (OMR), Feature Matching & Registration

Data Processing & Analysis

Libraries: **Pandas**, **NumPy**, **SciPy**, **XML Processing**

Techniques: Data Preprocessing, Statistical Analysis, Machine Learning, NLP (Text Classification)

Platforms & Tools

Hardware: **NVIDIA Jetson Platform** (Xavier, Orin), **GPU-accelerated systems**

Automation Tools: **n8n**, **Python Scripting for Automation**

DevOps & Tools: **Git**, **GitLab**, **Docker**, **Linux**, **Windows**

Biomedical Engineering

Signal Processing: **EEG**, **ERD/ERS Analysis**, **Common Spatial Patterns (CSP)**, **ICA**

BCI Systems: **Motor Imagery**, **Real-time Signal Acquisition**, **Neurofeedback**

Medical Imaging: Foundational knowledge of medical image analysis

Key Projects

2023 – Present **Advanced Multimodal Image Matching System**

Description Developed a novel deep learning system for high-precision matching of RGB and Infrared images, outperforming traditional methods in challenging conditions. Utilized CUDA and TensorRT for real-time performance.

Achievement **Improved matching accuracy by over 25%** compared to baseline SIFT/ORB algorithms.

2024 **Airborne Object Detection and Tracking System**, *Personal Project*

Description Implemented a comprehensive YOLOv5-based object detection and tracking system for autonomous drone collision avoidance. Developed for the Airborne Object Tracking Challenge, focusing on Sense and Avoid (SAA) capabilities using monocular vision.

Technologies **YOLOv5**, **PyTorch**, **OpenCV**, **Docker**, **TensorRT**, **NVIDIA Jetson**

Features Real-time object detection, multi-object tracking, collision prediction, containerized deployment.

2024 **EfficientLoFTR ONNX Optimization**, *Personal Project*

Description Optimized EfficientLoFTR (Efficient Local Feature Transform) model for ONNX deployment, achieving faster inference speeds while maintaining high accuracy in feature matching tasks. Implemented both indoor and outdoor variants.

Technologies **PyTorch**, **ONNX**, **EfficientLoFTR**, **Kornia**, **PyTorch Lightning**, **CUDA**

Outcome **Reduced inference time by 40%** while maintaining 95%+ matching accuracy on ScanNet and MegaDepth datasets.

2024 **SuperPoint Interest Point Detection**, *Personal Project*

Description Implemented SuperPoint neural network for self-supervised interest point detection and description. Converted TensorFlow model to PyTorch for improved deployment flexibility and performance.

Technologies **PyTorch**, **SuperPoint**, **OpenCV**, **NumPy**, **SciPy**

Results Achieved **0.662 repeatability** on HPatches illumination changes and **0.965 homography estimation accuracy**.

2024 **OMR (Optical Mark Recognition) System**, *Personal Project*

Description Developed an automated answer sheet processing system using computer vision techniques. Implemented robust bubble detection, grid recognition, and answer extraction with high accuracy across various sheet formats.

Technologies **OpenCV**, **NumPy**, **Computer Vision**, **Image Processing**, **Contour Detection**

Features Automatic sheet alignment, bubble detection, answer clustering, and high-accuracy parsing.

2024 **NLP Text Processing and Analysis**, *Personal Project*

Description Implemented comprehensive text processing pipeline for SMS spam detection and analysis. Developed XML parsing, text preprocessing, and machine learning classification systems.

Technologies **Pandas**, **XML Processing**, **Scikit-learn**, **Machine Learning**

Dataset Processed **5,572 SMS messages** with automated spam classification.

2024 **Low-Light Image Enhancement**, *Personal Project*

Description Engineered a deep learning pipeline to dramatically enhance image quality in low-light conditions, focusing on noise reduction and detail preservation. Implemented and compared multiple state-of-the-art architectures.

Outcome Achieved significant visual and metric improvements (PSNR/SSIM) on standard datasets.

Languages

Persian Native

English Professional Working Proficiency

Professional Development

Courses	Deep Learning Specialization (Coursera), Computer Vision with OpenCV (Udemy), Machine Learning Fundamentals (Stanford Online), Advanced Computer Vision (Self-Study)
Interests	Active open-source contributor, with keen interests in real-time embedded vision systems, generative AI, neuro-robotics, autonomous systems, and workflow automation. Passionate about model optimization and deployment for edge computing applications.