

Muhammad Taqi Raza

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SUMMARY

Computer Vision Engineer with 2+ years of experience building deep learning systems for 3D reconstruction, monocular depth, optical flow, segmentation, and geometric vision. Experienced in production vision pipelines using PyTorch, OpenCV, and Docker, with robotics research in safety-aware multi-robot navigation, collision avoidance, and trajectory planning. Focused on transitioning into robotics perception, spatial AI, and autonomous systems.

EDUCATION

Bachelor of Science in Computer Science – CGPA: 3.41/4.0
Information Technology University of the Punjab (ITU)
• **Thesis:** Safe Navigation of Multi-Agent Robotic Systems
• **Relevant Coursework:** Deep Learning · Computer Vision · Artificial Intelligence · Cyber-Physical Systems

Sep 2020 – June 2024
Lahore, Pakistan

EXPERIENCE

Computer Vision Research Engineer
Roll.ai — Full-time
• Designed a modular architecture to coordinate multiple vision models for **monocular cinematic camera motion**.
• Improved temporal consistency and 3D reconstruction by addressing cross-frame geometric inconsistencies.
• Reduced visual artifacts using segmentation-aware processing, enabling high-quality 2K production output.
• Built a monocular system combining depth, optical flow, and reconstruction for stable novel view generation.
• Applied diffusion models with motion-guided ControlNet for controllable video generation.
• Optimized inference pipelines across multiple vision projects through parallelization, achieving 3× speedup.
• Containerized systems using Docker for scalable, reproducible deployment.

May 2025 – Present
San Francisco, California, United States

Undergraduate Research Assistant
Information Technology University of the Punjab
• Developed a **safety-aware multi-robot navigation** framework for collision-free planning in dense simulations.
• Designed a dual-controller system combining trajectory planning with fallback safety control.
• Benchmarked navigation algorithms in simulations with 5 to 50 robots using standard robotics metrics.
• Evaluated smoothness, makespan, travel distance, and collision severity to compare safety and efficiency.
• Proposed a precedence-based communication strategy for decentralized multi-robot safety assurance.

Sep 2023 – April 2025
Lahore, Pakistan

Associate Computer Vision Engineer
Hazen.ai
• Trained a variational autoencoder for license plate OCR, commissioned by the **Saudi Data & AI Authority (SDAIA)**.
• Engineered a synthetic data pipeline for **84 Million+** license plate samples across 7 Middle Eastern countries.
• Achieved **98% accuracy** in real-time license plate recognition under diverse real-world conditions
• Ensured high reliability under challenging conditions such as smog, low-light/nighttime, blur, and distorted plates.
• Designed a scalable architecture supporting multi-country deployment without retraining.

July 2024 – Jan 2025
Lahore, Pakistan | Saudi Arabia

HONORS AND AWARDS

BISP-HEC Fully Funded Scholarship
Higher Education Commission of Pakistan
• Secured a fully funded scholarship for the entire duration of undergraduate studies.

2020 – 2024

National Grassroots ICT Research Initiative (NGIRI) Grant
Ministry of IT & Telecom, Pakistan
• Awarded competitive national grant to support research on scalable multi-robot navigation.

2023 – 2024

PROJECTS

Agentic LLM Systems

Turing Enterprises, Inc.

July 2025 – May 2026

Palo Alto, California, United States

- Designed multi-turn Agent Completion workflows involving tool use, function calling, and real-world reasoning.
- Modeled assistant behavior across email, calendar, maps-like tools, ensuring correct API-style execution.

Trend-Aware Deep Learning for Multi-Asset Stock Forecasting

Rawa'a AI

April 2025 – June 2025

Saudi-Arabia

- Trained TiDE and Temporal Fusion Transformer models for multi-asset stock forecasting across **35+ companies**.
- Engineered a **600+ feature** dataset integrating market, macroeconomic, and alternative data sources.
- Incorporated alternative data sources including financial news and social signals.
- Proposed a Trend-Aware Loss to jointly optimize prediction error and directional accuracy, evaluated using RMSE, MAE, and confidence intervals.

Poverty Detection Using Satellite Imagery

Intelligent Machine Lab

Feb 2023 – May 2023

Lahore, Pakistan

- Curated a dataset of 15K+ satellite images using Sentinel-2 and DHS data for poverty prediction
- Trained Deep CNNs and Vision Transformers to capture spatial and socioeconomic correlations
- Achieved **76% accuracy with Vision Transformers**, outperforming baseline CNN models
- Improved interpretability by analyzing feature representations linked to poverty indicators

ADDITIONAL EXPERIENCE

Educational Content and Game Development

- **Teaching Assistant** for Calculus and Analytical Geometry (Fall 2023), leading tutorials for 65+ students.
- Interned at **Educative, Inc.** (2023), writing 60+ tutorials on vision and robotics for 1M+ learners.
- Participated in **Mindstorm Studios' fellowship** (2021); developed a Unity-based runner game *Clean Street*.

SKILLS

- **Programming Languages:** Python, C++, MATLAB
- **Robotics:** Multi-Robot Navigation, Motion Planning, Collision Avoidance, Safety-Aware Planning
- **Computer Vision:** 3D Reconstruction, Monocular Depth Estimation, Optical Flow, Segmentation, OCR
- **3D Vision:** Camera Motion Estimation, Novel View Synthesis, Multi-View Geometry, Temporal Consistency
- **Video AI:** Motion Tracking, Video Segmentation, Diffusion Video Models, ControlNet, Generative Video
- **Machine Learning:** Deep Learning, Vision Transformers, Reinforcement Learning, Multi-Agent Systems
- **Frameworks:** PyTorch, TensorFlow, OpenCV, HuggingFace
- **Tools:** Docker, Git, AWS, Linux, Unity

REFERENCES

Dr. Usama Mehmood

Assistant Professor, Information Technology University

Research Profile: scholar.google.com/citations?user=DJK9-ewAAAAJ&hl=en

Dr. Misbah Irshad

Professor, Information Technology University

Research Profile: <https://www.researchgate.net/profile/Misbah-Irshad>