

RAFAY AAMIR GULL

(Computer Vision Engineer)

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Location: Cologne Bonn Region, Germany

Executive Summary

Results-driven Computer Vision Software Engineer with 2+ years of experience in **robotics and real-time video analytics**. I leverage production-level C++/Python microservices and deep learning models to significantly boost performance and accuracy, with a keen interest in **robot perception and learning, and embodied AI**.

Skills

Programming Languages & Scripting: Python3, C++, Rust, CUDA, Java, Matlab, Bash Scripting

Software Development: Redis, SQLite, Microservices, FastAPI, RestAPI, Protobuffer, CI/CD, Docker, Unit Testing, Git

Robotics: ROS2, CoppeliaSim, Webots, IsaacSim, IsaacLab, Teleoperation

Machine Learning Deep Learning: PyTorch, LSTM, UNet, ResNet, RetinaNet, CNN

Computer Vision: OpenCV, Open3D, Object Detection and Tracking, Visual Perception, Monocular Depth Estimation, Point Clouds, Colmap, Camera Calibration, Photogrammetry, NeRFs, Gaussian Splatting, and CLIP

Data Analytics & Utilities: Seaborn, Pandas, Numpy, Eigen, Ceres, JSON, MQTT

Experience

Horizon Telecom

Computer Vision Engineer Intern (March 2025 – Jun 2025)

Montceau-les-Mines, France

- Deployed the system from simulation to real-world Sim2Real, integrating it with Doosan M-series Robot controls.
- Developed a **3D scene understanding perception system** for electronics warehousing.
- Achieved accurate **PCB localization and pose estimation**.

HAZEN.AI

Software Engineer (Remote) (March 2023 – December 2024)

Mecca, Saudi Arabia

- Optimized **real-time video analytics** by developing **CUDA C++ kernels** for **NVIDIA Jetson devices**.
- Added **MQTT** and **Redis**-based service to pub-sub tarfiles, images, and path of a folder using Google protobuf.
- Contributed in **end-to-end python application development**, including **launching from scratch**, within an **agile team of 7** for AI for road safety applications.
- Developed cross-platform containerized services using **Docker** for **arm64** and **x86** architectures, **streamlining deployment workflows**.
- Managed **global deployments** across **9+ sites** and ensured **python code quality** with **92% test coverage**.
- Engineered and maintained **C++ microservices** and **REST APIs**.
- Accelerated image feature correspondence by **600%** and improved vehicle speed prediction accuracy by **optimizing** GPU-accelerated distortion correction and object segmentation within our **3D reconstruction and structure-from-motion pipeline**.

BioRobotics Institute (Scuola Superiore Sant'Anna)

Pisa, Italy

Deep Learning Research Intern (Remote) (Supervisor: [Dr. CM Oddo](#) and [Mariangela](#)) (July 2022 – January 2023)

- Deployed LSTM model to an **STM32 IoT Node** for real-time edge inference, enabling on-device predictions.
- Engineered ML preprocessing pipelines for time-series data, improving data quality by **23%**.
- Achieved **97.4% prediction accuracy** by developing and refining a Python LSTM model.

Education

University Of Bonn (October 2025 – Present)

Bonn, Germany

Master of Science Mobile Robotics

Université de Bourgogne Europe (September 2024 – June 2025)

Le Creusot, France

VIBOT M1 Master of Science in Computer Vision (Focused on Robot Perception and 3D Computer Vision)

Information Technology University (September 2019 – May 2023)

Lahore, Pakistan

Bachelor of Science in Electrical Engineering (Focused on Computer Engineering)

Projects

Mimic Me Robot

- Designed an algorithm and code a UR-5 robotic manipulator in a simulated environment to use an RGB camera and move as the human arm moves in real-time.
- OpenCV | Robot teleoperation | Mediapipe | Webots | robot simulation

VP Subject Classification

- Developed** an unsupervised neural network, a **Kohonen Self-Organizing Map (SOM)**, for the classification and identification of human subjects based on marker data.
 - Developed** a system that leverages **Spike-Timing-Dependent Plasticity (STDP)** for learning, mimicking the way the human brain processes information.
 - Explored** biologically plausible neural networks by implementing a **Simple Unsupervised Spiking Neural Network (SNN)** to learn patterns and features in spatiotemporal data.
- Spiking Neural Networks (SNNs) | Spike-Timing-Dependent Plasticity (STDP) | Python3 | Numpy

MLOps-deployments on Cerebrium serverless platform

- Converted a pre-trained PyTorch image classification model to ONNX format, embedding image pre-processing within the model for streamlined inference.
 - Developed Python wrappers for **ONNX** Runtime to enable seamless inference on user-provided images.
 - Deployed containerized model on Cerebrium platform, leveraging auto-scaling for cost-efficient inference.
 - Integrated FastAPI for RESTful API endpoints, achieving a **1.2s E2E response time** (inference + API latency).
- Python FastAPI | RESTful API | PyTorch | ONNX | Docker | Serverless Deployment | MLOps | Cerebrium

HBP-Measurements

- Engineered** a perception system for a watch company to accurately estimate a customer's wrist measurement and other body parts.
 - Utilized a Deep Learning model** and the **SMPL** representation to infer body part dimensions in centimeters from a single RGB image and height input.
 - Delivered** real-time performance at **1 FPS**, ensuring quick and efficient on-the-spot measurements.
- OpenCV | SMPL | Human Pose Estimation | 3D Digital Humans | Tensorflow | Pillow | Numpy | Qt

Incremental Structure From Motion SfM

- Designed and implemented an incremental SfM pipeline from scratch in Python, reconstructing 3D models from unstructured images.
 - Performed camera calibration for mobile phones and Intel RealSense cameras to enhance dataset accuracy.
 - Extracted SIFT features and matched correspondences using OpenCV's BFMatcher, improving feature alignment.
 - Optimized Bundle Adjustment using SciPy's least-squares and PyTorch's Adam optimizer, achieving 4x faster convergence in reprojection error minimization.
 - Enhanced visualization by implementing point cloud colorization from source image.
 - Exported cameras, images, and 3D points to COLMAP for rendering and validation.
- OpenCV | XFeat | LightGlue | PyTorch | COLMAP | 3D Reconstruction

3D Object Detection RetinaNet for Autonomous Robotics

- Optimized an open-source 3D-RetinaNet model with ResNet50 backbone + FPN for real-time 3D scene understanding, achieving 87% detection accuracy on pedestrian recognition.
 - Enhanced inference speed to 25 FPS (real-time performance) for video feeds from autonomous robots, enabling seamless integration.
 - Developed an annotation preprocessing script to streamline dataset preparation for 3D bounding box training.
- 3D-RetinaNet | ResNet50 | Feature Pyramid Network | Real-Time Inference

Publication

- [Robotics Primer for Independent Learners: Background, Curriculum, Resources, and Tips](#)

Certifications and MOOCs

- Fundamentals of Reinforcement Learning (Coursera, University of Alberta)
- Introduction to Intel OpenVINO (Coursera, Intel)
- Robot Perception (Coursera, University Of Pennsylvania-UPenn)
- Neural Networks and Deep Learning (Coursera, Andrew NG)
- Transformer and BERT Model (Coursera, Google)
- Computer Vision Basics (Coursera, University Of Buffalo)
- Master SolidWorks

Language Skills

English (C1) | French (B2) | German (A1)