Rajkumar Vaghashiya

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Education

Saarland University March 2023 — Ongoing
Master of Science in Computer Science *Saarbruecken, DE*

- Grade: 1.3 (In German grading, 1.0 = best)
- Coursework: ML, Human-Computer Interaction, High Level Computer Vision, Quantum AI, 3D Computer Vision
- Scholrships: Saarland Scholarship Summer (2024,2025), Deutschlandstipendium (2025)

Pandit Deendayal Energy University Aug 2016 — Aug 2020
Bachelor of Technology in Computer Engineering *Gandhinagar, IN*

- GPA: 9.89 / 10.0 (Gold Medalist)
- Scholarship: Merit-cum-Means Scholar (2016-2020)
- Research Project: Clinical AI for Ophthalmic Disorder Prognosis (at Forus Health Pvt. Ltd.)

Experience

Research Assistant Mar 2025 — June 2025
Max Planck Institute for Informatics *Saarbruecken, DE*

- Initiated benchmarking of parameterized quantum circuits with CUDA-Q and PyTorch, enabling scalability analysis for QML workloads.
- Led literature review on quantum-optimized multi-model fitting in noisy point clouds, assessing applicability for robust shape fitting and 3D reconstruction.

AI and Data Science Intern Sep 2024 — Feb 2025
BMW Group *Munich, DE*

- Built multimodal anomaly detection pipelines for automotive quality assurance, achieving 100% recall and >95% precision on production data.
- Developed a hybrid defect inspection pipeline combining foundational models, classical computer vision, and statistical methods, reducing manual audit time by 70%.
- Designed and implemented a VLM-based OCR pipeline for compliance documentation with >85% extraction accuracy on complex backgrounds, automating previously manual audits.

Research Assistant Oct 2023 — Aug 2024
Max Planck Institute for Informatics *Saarbruecken, DE*

- Converted large-scale 3D vision datasets into binary representations via state-of-the-art autoencoder, reducing storage overhead by 35% while preserving fidelity.
- Applied contrastive learning in PyTorch to enhance query retrieval, increasing matching accuracy by 52%.
- Simulated quantum ML models for pattern retrieval, establishing feasibility of hybrid AI–quantum methods.

ML Developer (Freelance) Nov 2021 — Sep 2022

- Developed an object recognition pipeline for inventory management using TensorFlow and OpenCV, achieving >80% accuracy.
- Applied unsupervised learning for real-time object segmentation of retail shelf images, reaching >90% accuracy.
- Computed object recognition on unlabeled datasets via embedding similarity using pre-trained models for enhancing detection efficiency.

Clinical AI Research Intern Jan 2021 — June 2021
Forus Health Pvt. Ltd. *Bengaluru, IN*

- Implemented a TensorFlow-based classification model for disease severity grading, achieving AUC of 0.98.
- Integrated SHAP for interpretability, quantifying parameter influence on model predictions.
- Curated and clinically validated datasets for eye disease diagnosis, ensuring high-quality training data.

Jan 2020 — July 2020

- Led a team of 5 interns to develop a clinician-controlled image processing pipeline for disease parameter analysis.
- Achieved results within ±8% of research benchmark SIVA in 3 months using OpenCV and TensorFlow.
- Conducted a review of AI-based retinal imaging telecare services in India to enhance clinical outreach.

Teaching Assistant — AI for Everyone (20IC206T) Sept 2020 — Dec 2020
Pandit Deendayal Energy University *Gandhinagar, IN*

Machine Learning Intern June 2019 — July 2019
Capgemini *Gandhinagar, IN*

- Developed a semantic search tool for impact analysis in software testing, achieving 95% accuracy.
- Generated embeddings using a pre-trained language model for semantic mapping of test cases.
- Built an interactive visualization tool for search results using Python, t-SNE, and matplotlib.

Projects

GenAI for Interactive Systems Nov 2023 — Apr 2024
Human-Computer Interaction Lab, Saarland University *Saarbruecken, DE*

- Developed reproducible prompting strategies for generating diverse conceptual designs to support product ideation using DALL-E, ChatGPT, and Bing.
- Simulated user roles such as designer and critic for custom goal-based design evaluation.

3D Pose Tracking Apr 2023 — Sep 2023
Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI) *Saarbruecken, DE*

- Merged and optimized codebases for near real-time 3D human pose tracking from a single-camera setup.
- Utilized pose data to simulate 3D virtual twins of human actors in Unity.

Synthetic Data for Boosting AI Apr 2023 — Sep 2023
DFKI *Saarbruecken, DE*

- Leveraged synthetic data to improve real-time object segmentation and recognition in retail shopping carts.
- Achieved 90% accuracy across diverse environments using a custom-trained YOLOv8 model with PyTorch.

MediSinGAN July 2021 — Feb 2022
EEML Summer School *Remote*

- Adapted a single-input GAN for synthetic medical image generation, reducing model training and eval time by >10% using JAX.
- Evaluated applications in image-to-image translation and image segmentation.
- Ranked among the top 3 projects at EEML Summer School 2021.

Intelligent Cell-Line Analyzer Aug 2019 — Feb 2022
PDEU *Gandhinagar, IN*

- Developed a medical image processing pipeline for segmentation and classification of cell lines.
- Achieved 0.88 accuracy for cancer cells and 0.98 for normal cells across the pipeline.
- Preserved accuracy for new classes using only 10% of previous samples via transfer learning.

AI-powered Microplate Reader for Point-of-Care Applications Sept 2020 — Nov 2020
Indian Institute of Science (IISc), Bengaluru *Remote*

- Developed a real-time microplate image segmentation pipeline with adaptive calibration.
- Performed qualitative and quantitative colorimetric analysis of microplate wells using Python and OpenCV.

SESAU: Secure and Smart University Nov 2017 — Jan 2019
PDEU *Gandhinagar, IN*

- Led ORSP-PDEU funded IoT project (INR 145,000) to simulate a smart university for resource optimization.
- Deployed prototype modules for equipment control and authorized access in a computer lab.
- Utilized Raspberry Pi for prototyping and communicated via MQTT with JSON-structured data.
- Achieved 50% energy savings in light and PC usage during idle periods.

Skills

Coding:	**Python**, C++
Frameworks:	**PyTorch**, OpenCV, TensorFlow-Keras
Tools and Technologies:	**Git, Linux,** GenAI, LLMs, Statistics, Intel OpenVINO, Edge AI, SQL, Docker, Google Cloud Platform (Vertex AI), MLOps, Figma, UI/UX
Languages:	English (C1), German (B2)

Publications

- Vaghashiya, R., Shin, S., Chauhan, V., Kapadiya, K., Sanghavi, S., Seo, S., & Roy, M. (2022). Machine Learning Based Lens-Free Shadow Imaging Technique for Field-Portable Cytometry. *Biosensors*, *12*(3). doi:https://doi.org/10.3390/bios12030144
- Vaghashiya, R., Kapadiya, K., Nandwani, I., Thakore, R., Seo, D., Seo, S., & Roy, M. (2020). An Optimized Neural Network Architecture for Auto Characterization of Biological Cells in Digital Inline Holography Micrographs. In *2020 IEEE International Conference on Healthcare Informatics (ICHI)*. doi:10.1109/ICHI48887.2020.9374330
- Thakore, R., Vaghashiya, R., Patel, C., & Doshi, N. (2019). Blockchain - based IoT: A Survey. *Procedia Computer Science*, *155*, 704–709. doi:https://doi.org/10.1016/j.procs.2019.08.101
- Vaghashiya, R., Thakore, R., Patel, C., & Doshi, N. (2019). IoT – Principles and Paradigms. In *International Journal of Advanced Trends in Computer Science and Engineering* (Vol. 8(1.6), pp. 153–158). doi:https://doi.org/10.30534/ijatcse/2019/2481.62019

Extracurricular

- Google Developer Groups on Campus Organizer — Aug 2023–Ongoing
- PenteQost Summer School 2024 — May 2024
- Eastern European ML Summer School — July 2021, 2022