Rajkumar Vaghashiya

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Education

Saarland University March 2023 — Ongoing
Master of Science in Computer Science (Grade: 1,2) *Saarbruecken, DE*

- Relevant courses: Machine Learning, High-Level Computer Vision, Quantum AI

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

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

Experience

Research Assistant (HiWi) Oct 2023 — Mar 2024
Max Planck Institute for Informatics *Saarbruecken, DE*

- Formulated a classical learning model into QUBO for optimization using Adiabatic Quantum Computing
- Designed and evaluated experimental protocols for using the QUBO in 3D Computer Vision tasks

Freelance Developer Nov 2021 — Sep 2022

- Developed object recognition pipeline with 80% accuracy using TensorFlow for optimized inventory management
- Utilized unsupervised learning technique for real-time object localization and segmentation from retail shelf images
- Generated embeddings from a pre-trained model to analyze and identify similar objects in the unlabeled dataset

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

- Curated a custom dataset for ocular biomarkers with clinician-verified ground truth
- Implemented a ML model using TensorFlow for diagnosing Retinopathy with AUC of 0.98
- Integrated SHAP for explaining ocular biomarker impact on disease severity grading

Jan 2020 — July 2020

- Implemented clinician-in-the-loop deep learning and image processing pipeline for computing retinal parameters
- Achieved results within ±8% of the research benchmark SIVA in 3 months using OpenCV and TensorFlow
- Conducted review of clinical AI-based retinal imaging telecare services in India to improve care 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 with 95% accuracy
- Generated embeddings using a pre-trained language model (ELMo) for semantic mapping of test cases
- Implemented an interactive tool for visualizing the 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 of a product
- Simulated user roles and strategies such as designer, critic, etc. for custom goal-based design evaluation
- Assessed the strategies in DALL-E, ChatGPT, and Bing Chat for controlled design diversification

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

- Merged and optimized codebases with near real-time 3D pose tracking from single view camera setup
- Utilized the generated pose data to simulate a 3D virtual twin of human actors in Unity

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

- Leveraged synthetic data for robust real-time object segmentation and recognition in retail shopping carts
- Achieved 90% accuracy rate with a custom-trained YOLOv8 model using PyTorch

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

- Adapted SinGAN model for synthetic medical image generation using a single image input
- Reduced training time by 10% using JAX to speed up the generation
- Assessed its applicability 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*

- Designed and implemented deep learning pipeline for medical image analysis using Python, TensorFlow, OpenCV
- Developed a custom image processing pipeline with near real-time image segmentation
- Applied data augmentation strategies to achieve balanced class distributions
- Trained a custom autoencoder for image denoising and a custom CNN for image recognition
- Achieved an accuracy rate of 0.88 for cancer cells and 0.98 for normal cells across the entire pipeline
- Maintained accuracy for newer 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
- Implemented qualitative and quantitative colorimetric analysis of microplate wells using Python, OpenCV

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

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

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

Skills

Coding:	**Python**, C, C++, Java, JavaScript
Frameworks:	**TensorFlow, Keras, PyTorch**, Qiskit, Flask, JAX
Tools and Technologies:	Git, OpenCV, Intel OpenVINO, Jupyter, LaTeX Docker, Figma, Google Cloud Platform
Languages:	English (C1), Gujarati (C2), Hindi (C2), German (A2)

Extracurricular

Google Developer Student Clubs : Campus Lead — Aug 2023 – July 2024

- Organized weekly/biweekly technical sessions during the semester for introducing students to cutting-edge technologies and developments in Computer Science
- Organized a Machine Learning Study Jam series with hands-on coding tutorials on classical ML algorithms and concepts

Eastern European Machine Learning Summer School: EEML — July 2021, 2022
Selective Admission — *Budapest, HU*

Qiskit Global Summer School on Quantum Machine Learning: QGSS — July 2021
Selective Admission — *Remote*

- Certificate of Quantum Excellence (Score: 100%)

Edge AI for IoT Developers Nanodegree: Udacity-Intel — Dec 2019 – July 2020
Selective Scholarship — *Remote*

Certifications

- IBM Certified Associate Developer - Quantum Computation using Qiskit v0.2X — Feb 2022
- Machine Learning Engineering for Production (MLOps) (Coursera) — Sept 2021
- Generative Adversarial Networks (Coursera) — April 2021
- AI for Medicine (Coursera) — July 2020

Achievements

- IBM Quantum Challenge - Fall 2021: Advanced (Score: 100 %) — Nov 2021
- IBM Quantum Challenge Africa 2021: Advanced (Score: 100 %) — Sept 2021
- Winner of Schweickert Challenge in Hackdays Rhein-Neckar 2021 — March 2021
- Winner of Capgemini iSprint 2019 (West Divison) — August 2019
- Winner of Economic Times Campus Stars 2.0 (2018-19) — July 2019
- Finalists in Smart India Hackathon 2019 — March 2019