Dr. Tushar Rasal

Generative AI, Computer Vision, NLP, and AI-ML Enthusiastic

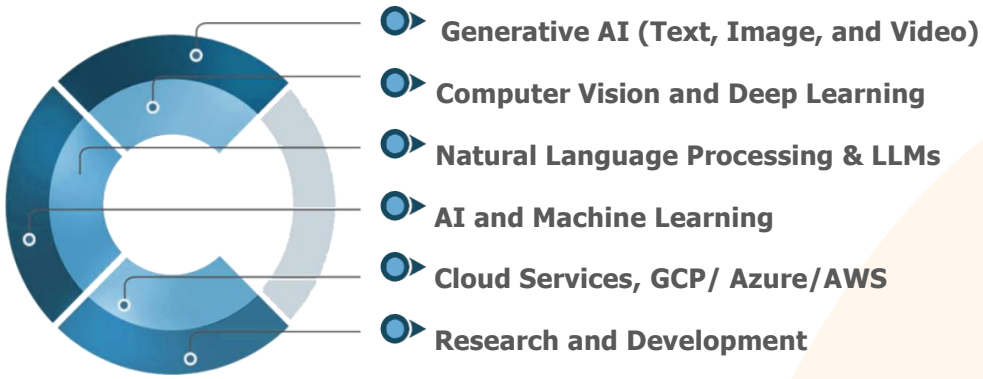
+91-8446449696

www.linkedin.com/in/tushar-rasal-phd https://github.com/tusharrasal

Profile Summary

- Results-driven Full Stack Data Scientist/Researcher with overall 9+ years of experience in specializing Generative AI, Computer Vision, NLP, LLMs, Data Science, and AI-ML.
- Proficient with developing algorithms for Generative AI applications, GANs, Diffusion Models, LLMs, CNNs architectures. Expertise in building and deploying Deep Learning based image classification, Segmentation, and Object detection models with Transfer Learning.
- Proven proficiency in building end-to-end Generative AI and interpretable AI-ML solutions with actionable insights and hands on with different cloud-based services such as GCP, Microsoft Azure, and AWS.
- Earned 55+ plus Certifications related to Generative AI, Data science, Computer vision, Deep learning, and AI-ML associated courses.
- Hands on Experienced in Python development, integration with different database with API, VS Code, Jupyter, Spyder, Flask, Streamlit etc.

SIGNATURE COMPETENCIES



Work Experience

Persistent Systems Limited - Pune, India – Feb 2023 to till date

Data Scientist

- Developed Generative AI applications for various clients with text generation, Q&A, Text summarization, NER, LLM's, VectorDB, RAG framework, on Microsoft Azure cloud platform. Involved in PoCs that use Langchain for various Gen AI use cases by leveraging latest Large Language models.
- Architecting and implementing a Generative AI based POC's for Medical Images, Text Analytics, Natural Language Processing (NLP), LLMs as per project requirement and following technical best practices for it.
- Designed, Developed, and Deployment of Generative Models on Synthetic data Generation, Image to Image, Image to text conversion for Data foundary project.
- Conduct research to stay up to date with the latest advancements in Generative AI, Machine Learning, Deep Learning techniques, and identify opportunities to integrate them into our products and services.

Key Skills and Knowledge

Generative AI

- Synthetic Image Generation, Image Translations with GANs, Variational Autoencoders (VAEs), StyleGAN2, Diffustion Models.
- LLMs(ChatGPT4V, LLama2, Mistral7B, FlanT5), Fine tunning, Prompt Engineering, LangChain, Vector DB (ChoromaDB, Pinecone), RAGs (Langchain, LlamaIndex), BERT.
- Transformer, ViT, & Computer Vision with Deep Learning
- Cloud-based service hands on for GCP, MicrosoftAzure, AWS.

Computer Vision & Deep Learning

- OpenCV, SKLearn, Scikit-image, TensorFlow, Keras, Transfer learning
- CNNs, Image Analysis, Denoising, Object Detection, Optical Charecter Recognition (OCR).
- Image Classification, Segmentation, Tracking.

Natural Language Processing & LLMs

- LangChain,Word2Vec, GloVe, Fasttext, NLTK, Spacy, Scikit-Learn, SciPy, SkLearn, Huggingface.

Sony Research, India (SRI)- Banglore, India – Aug 2022 to Feb 2023
Data Scientist

- Developed a comprehensive chatbot framework that seamlessly integrates conversation flow, backend systems, and data processing, ensuring smooth and efficient operation. Integrated advanced language models, such as GPT-3.5, to facilitate natural language understanding and generation within the chatbot, enhanced its overall linguistic capabilities.
- Design, Develop, and Deployment the AI Model. Filled two USA Patents in SRI. Leading in Research competitions like Challenge Support 2022 (1st Rank SRI, 13th Rank Globally). Carried out Research on Patents such as Digital Twin, Smart training with Diffusion Models, GANs.
- **Skills leveraged are** – Deep Learning, Machine Learning, NLP, LLM, CNNs, TensorFlow, Keras, Scikit-Learn, Python, Vertex AI, JupyterLab, GENAI.

National Institute Of Technology, Goa, India – Jan 2021 to Jan 2023
Doctoral Researcher in Data Science (Ph.D)

- Developed, Implemented algorithms for Image and Video Processing with Deep Learning, CNNs, U-Net, ViT, Transfer learning, and Latent Diffusion with GANs Architectures.
- Five Novel Image processing Algorithms (Image Restoration and Analysis) are Proposed, Implemented and Published (SCI Journals), Designed and implemented novel Deep Learning Models for Segmentation, Classification, and Detection of Gastric Cancer Cells, Multiple Myeloma Plasma Cancer detection using Deep learning, Transfer Learning.
- **Skills leveraged are** – Deep Learning, Machine Learning, CNNs, NLP, TensorFlow, Keras, OpenCV, Scikit-Learn, Python, Vertex AI, JupyterLab, Generative AI.

National Institute Of Technology, Goa, India – Jan 2018 to Jan 2020
Junior Research Fellow (JRF)

- Image, Video Processing with Deep Neural Networks, CNNs, U-Net Architecture. Research work in the Field of Image and Video Processing with Machine Learning, Deep Learning, CNNs, U-Net, ViT, and Latent Diffusion with GANs Architectures.
- Implemented algorithms for Image Restoration, Classification, Image Segmentation and also Published in SCI index international Journals.
- **Skills leveraged are** – Deep Learning, Machine Learning, CNNs, NLP, TensorFlow, Keras, OpenCV, Scikit-Learn, Python, Vertex AI, JupyterLab, GENAI.

Roche - June 2015- Dec 2017
Research And Development Scientist

- Image processing with Deep Neural Networks, CNNs, U-Net Architecture. Responsible for providing hands on expert level assistance to team developers.

DKTE, Maharastra- July 2014- May 2015
Assistant Professor

Shreem Electric LTD, Maharastra- Aug 2011- July 2012
Research Trainee (R & D)

- Transformers, BERT, Fine-tuning base LLM Models, RAG, Vector Stores integrations

AI and ML

- Supervised Learning (Classification & Regression)
- Unsupervised Learning (PCA, K-means Cluster)
- Logistic Regression, SVM, Naïve Bayes, Decision Tree, Random Forest
- PyTorch, Jupyter, Anaconda,Spyder,VS Code, Google Colab.

Data Science Toolkit

- Data Cleaning, Analysis, and Visualization: Numpy, Pandas, Scikit-learn, Matplotlib, Seaborn
- Data Preprocessing, modeling
- Feature Selection, Feature Scaling, Feature Extraction, Feature Engineering, Dimensionality Reduction (PCA).

Additional Skills

- **Version control:** Git, AzureDevOps
- **API Frameworks:** Django, Flask, Flask, Streamlit, Gradino
- **Database:** PostgresSQL, MongoDB,ChromaDB
- Matlab, C++, LaTex Typesetting

SME

- Medical Imaging
- Microscopy Imaging
- AI for Healthcare
- Computer-aided Diagnosis

EDUCATION

Doctor of Philosophy (Ph. D) – Electronics & communication Engineering

Dissertation - Deep Learning & Machine Learning Architectures for Image Analysis

- National Institute of Technology, Goa – 2023 (**CGPA- 8.5**)

Master of Technology (M.Tech) – Electronics - AI and Machine Learning

- RIT Maharastra (Shivaji University) – 2014 (**CGPA-7.47**)

Bachelor of Engineering (B.E) – Electronics Engineering

- KIT kolhapur (Shivaji University) – 2011 (**66.13%)**

Certifications

- Earned **55+ plus** certifications from Google, AWS, Udemy, IBM, Coursera, and other online educational platforms related to Data science, Computer vision, Deep learning, and Associated courses. Please click below to access all the Certificates- https://www.linkedin.com/in/tushar-rasal-02325a39/
- **Databricks Certifications:**
  - Databricks ceritfied Machine Learning Associate
  - Databricks certified Machine Learning Proffestional
- **Generative AI Certifications:**
  - Google- Generative AI Learning Path (Earned 9 diffiernt bages)
  - Career Essentials in Generative AI by Microsoft and LinkedIn
  - Generative AI with Large Language Models by Coursera.
  - Generative AI Fundamentals by Databricks.
  - Evaluating and Estimating Generative AI by Coursera.

Project Details

A. Projects (GenAI, NLP, Computer Vision) (Feb 2023 – present)

- **GenAI-NLP: Generative AI Playground (*Talk to My Data*):**

  Description: Engineered an advanced GenAI-NLP based Customer Data Platform (GenAI LAB) for question-answer system utilizing LLM with a vector-database. The solution with customization such as Ability of add free text as context when user querying, Ability to load multiple prompt, Ability to upload document's (.md, .txt, .docx, .pdf.) as context.

  Roles and Responsibilities:
  - Developed a GenAI-NLP based Customer Data Platform (*GenAI LAB*) involving development of Q&A Chatboat from scratch, Custom Data Analytics & Application Cutomization where user's can upload theire documents and ask query on top of it.
  - Identified and addressed key challenges in question answering using innovative application of GPT 4.0 and prompt Engineering, Zero-Shot, One-shot, Few-Shot techniques.
  - Worked on functionalities like development of Prompt librares, Topic titles, maintaining chat history, App integration with Databases, PDF upload & extraction, RAG, VectorDB, API testing with Postman,
  - Deployment on the cloud based Microsoft azure services. AzureDevOps, Azure KeyVault, Creation of VM, Provisioning PostgresSQL Database on Azure, APP Integration with Database.

Misc.

- LATEX typesetting
- Publishing,
- Patent Filling,
- Market research,
- Training,Consultation

Scholarships and Awards

- Research Fellowship 2018-22
- Doctoral Research Fellowship from Ministry of Human Resources and Development (MHRD), India to pursue Ph.D. program.
- Received Pesistent's Bravo Award for year of 2022-23.

Professional Services

- IEEE student member
- Peer Reviewer: For Journals as Biocybernetics & Biomedical, Journal IJACSA, Digital Signal Processing, and Elsevier Journals.

CONTACT

tusharoptimus@gmail.com
+91 844644 9696

- **Image Analytics-Fraud detection and Prevention for Insurance Claims**:
  Description: Fraud prevention with objective of to analyze discharge summary of different clinics/hospitals along with supporting images. identify if those are duplicates, which would be potential fraudulent scenario.
  Roles and Responsibilities:
  - Design, Develop, and Deployment Model on GCP with OCR, Text recognition, Text detection, Image processing on medical images.
  - Development of different component of architecture with GCP pipelines such as image preprocessing, OCR / Text / Entity extraction, identify the regions (ROIs), Text to identify morphing, Search within the content of the image, Text recognition etc.
  - Deployment with GCP and App integration with GCP services, Google Cloud Vision API, Cloud Natural Language API, App Engine, VM.
- **Generative AI POC's:**
  - Infinite Synthetic Medical Imaging Data Generator(Image to Image Generation)
    Description: Implemenetd 6 different types of GANs (PGGAN, CycleGAN, FastGAN, DCGAN etc) and integrated into single application where user can seamlessly generates infinite number of medical images for different imaging modalities such as X-Ray, CT scan, MRI, Mamamography, Thermal imaging, and Microscopic images. Quality evaluation on six different quality evaluating metrics.
  - Radiological Report Generation (Image to Text Generation):
    Description: Summarizing the X-ray in a form of radiology report Implemented with LLM (Vicuna), which is fine-tuned on medical data &radiology conversations to acquire domain specific relevan features.
  - Dr GenAI Virtual Assistant Chatbot(LLM based Chatboat):
    Description: Microsoft's BioGPT Large fine-tuned on ChatDoctor dataset for Q&A. Implemented prompt engineering to improve the performance of LLM Microsoft's BioGPT.
  - Multimodality Translation (Brain Magnetic Resonance Imaging)
  - Multi-Modal Content Creation For Wellness Care
- **Medical Imaging:**
  - Implementation of diferent usecases of medical imaging domain for diagnosis of X-Ray, CT scan, MRI, and Microscopic imaging.
  - Conduct research to stay up to date with the latest advancements in Generative AI, Deep learning techniques and Identify opportunities to integrate them into company products and services.
- **Warehouse Management:**
  Description: Develop an object detection model using YOLOv5 that can monitor, identify and classify Wooden planks. The objective is to assist Inventory staff in tracking inventory levels, detecting out-of-stock items.
  Roles and Responsibilities:
  - Preprocessed the dataset by resizing images, converting to a compatible format, and annotating the images with bounding boxes. Used tools like LabelImg to annotate the dataset.
  - Implemented the YOLOv8 architecture and trained the object detection model using the annotated dataset. Fine-tuned the model on the specific client dataset and optimize the model's performance.
  - Evaluated the trained model's performance using metrics such as mAP and IoU. Deployed and integrated the trained model into a system that can process real-time images or video feeds

B. Data Science & AI-ML Projects (Aug 2022 – Feb 2023)

- **Respiratory Disease Detection in Noninvasive (COPD, Asthma) with Machine Learning** (Environment: Python, OpenCV TensorFlow, Keras) Data analysis and data engineering. Design, Develop, and Deployment the AI Model. Test the model performance and efficacy.
- **An Artificial Intelligence-based Meta-verse Avatar with Real Object Tactile Feeling and Sound Effects** (USA Patent filed) Developing the Novel and most efficient Machine learning or Deep learning model based on the various model performance parameters.

C. Computer Vision based Research Projects Completed (Jan 2018 – Jan 22)

- **Machine Learning and Deep Learning Architectures for Fluorescent Microscopic Image Analysis** (Environment: Python, OpenCV, Keras, Pytorch) Design, Develop and Implemented a real-time automated image analysis pipeline for object segmentation, classification, and structure localization.
- **Deep EMD Neural Network Framework for Segmentation and Counting of Multiple Myeloma Plasma Cancer.** (Env: Python, OpenCV)
- **Segmentation of Gastric Cancer from Microscopic Biopsy Images using Deep Learning Approach**(Env: Python, OpenCV, Keras, Pytorch)
- **Image Denoising for Fluorescence Microscopy Images using Modified Structure of Wavelet Transform.** (Env: Python, OpenCV)
- **Microscopy Image Noise Reduction using IEMD-based Adaptive Thresholding Approach.** (Env: Python, OpenCV)
- **Deconvolution of Microscopy Images via Feature Derived Fourier Decomposition based Models.** (Env: Python,Tensorflow, OpenCV)

PUBLICATIONS

International Journals (SCI Index)

- *Segmentation of Gastric cancer from microscopic biopsy images using Deep Learning Approach (**SCI - IF 7.525**)* https://doi.org/10.1016/j.bspc.2023.105250, Biomedical Signal Processing and Control system, 2023.
- *Deep EMD Neural Network Framework for Segmentation and Counting of Multiple Myeloma Plasma Cancer Cells (**SCI - IF 4.715**) https://doi.org/10.1016/j.leukres.2022.106950, Leukemia Research, Vol. 122, Nov 2022, 106950, 2023*
- *Mixed Poisson Gaussian Noise Reduction in Fluorescence Microscopy Images using Modified Structure of Wavelet Transform.(**SCI - IF 2.544**)* https://doi.org/10.1049/ipr2.12112, IET Image Processing, 1751-9667,15,7,21
- *Fluorescence Microscopy Image Noise Reduction using IEMD-based Adaptive Thresholding Approach. (**SCI - IF 2.657**)* https://doi.org/10.1007/s11760-022-02226-y, Signal, Image & Video Processing
- *A New Approach for Reduction of the Noise from Microscopy Images using Fourier Decomposition (**SCI - IF 6.514**)* https://doi.org/10.1016/j.bbe.2022.05.001, Biocybernetics & Biomedical Engineering (ISSN: 0208-5216), Vol 42, Issue 2, 2022
- *Deep Learning Approach for Automatic Diagnosis of Myelodysplastic Syndromes (MDS) with Blood Cell Examination: MDS Cell Types Identification Leukemia Research, 2023. (Under Review)*