

# Rakesh Thakur

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## Education

<b>Indian Institute of Technology Gandhinagar</b> <i>Master of Technology in Computer Science Engineering (M.Tech)</i>	Gujarat, India 2020 – 2024
<b>Indian Institute of Technology Gandhinagar</b> <i>Master of Technology in Biological Engineering (M.Tech)</i>	Gujarat, India 2020 – 2024
<b>Lovely Professional University</b> <i>Bachelor of Technology (B.Tech)</i>	Punjab, India 2016 – 2020

## AI Researcher

<b>Indian Institute of Technology Gandhinagar (Lingo Lab)</b> Researcher	Gujarat, India Jan 2021 – Jun 2024
<b>Description:</b> Scraped 76GB of text for low-resource languages using BeautifulSoup, Selenium, Scrapy, and other tools, and pre-trained models on GPT, BERT, and RoBERTa.	
<b>Skills Developed:</b> Python, Linux, Bash/Shell scripting, Data Scraping, Part-of-speech Tagging, LLM fine-tuning, LLM prompting, PyTorch, TensorFlow, React.js, Flask, Servers, Scientific writing.	
<b>Indian Institute of Technology Gandhinagar (Comp Bio Lab)</b> Researcher	Gujarat, India Aug 2021 – Dec 2022
<b>Description:</b> Worked on identifying the binding pocket of Rev-erb beta using computational tools.	
<b>Skills Developed:</b> Python, Linux, Bash/Shell scripting, AlphaFold, Gromacs, working on different Servers, Bioinformatics tools (e.g., NCBI, PDB, UniProt, GenBank), Biopython, Biostatistics, Data Analysis, Scientific Writing.	

## Research Project Involvements (4 Crore)

### 1. AI-Driven Detection and Characterization of Lung Nodules for Cancer Diagnosis

**Collaboration:** Rajiv Gandhi Cancer Institute and Research Centre, New Delhi

**Funding Agency:** Indian Council of Medical Research (ICMR)

**Budget:** 2 Cr

**Role:** Collaborator

**Status:** Submitted

**Team:** Dr. Kundan Singh Chufal (PI), Dr. Dhruv Sharma, Dr. Ullas Batra, Prof. M.K. Dutta, Dr. Irfan Ahmed, Rakesh Thakur

### 2. AI-Based Predictive Model for Hepatotoxicity in TB Patients

**Collaboration:** King George's Medical University (KGMU), Lucknow

**Funding Agency:** Indian Council of Medical Research (ICMR)

**Budget:** 2 Cr

**Role:** Collaborator

**Status:** Submitted

**Team:** Dr. Rajiv Garg (PI), Dr. Anand Srivastava, Dr. Sandeep Bhattacharya, Dr. Anit Parihar, Dr. Sumit Rungta, Prof. M.K. Dutta, Dr. Irfan Ahmed, Rakesh Thakur

## Experience

### Assistant Professor

Amity University

**Experience Year**

Jan 2025 – Present, Noida, India

**Description:** Working on multiple projects to develop multimodal AI models for AIIMS, KGMU, and Rajiv Gandhi Cancer Hospital. Additionally, contributing to dataset creation for automated fact-checking and state-of-the-art advancements in the field while also assisting startups as an AI developer.

### Assistant Professor

Chandigarh University

**Experience Year**

Jul 2024 – December 2024, Chandigarh, Punjab

**Description:** Deliver courses, guide student projects, and mentor students for innovation and career growth. Develop curriculum and conduct research in AI/ML to advance knowledge and applications.

### ML Engineer

PRIMO WEBSOFT

**Experience Year**

Jan 2020 – Dec 2020, Indore, MP

**Description:** Developed and deployed machine learning models for web-based applications, focused on predictive analytics and user personalization. Collaborated with cross-functional teams to integrate ML solutions into production environments.

#### Teaching Assistant (Data Centric)

**Experience Year**

Indian Institute of Technology Gandhinagar

Jan 2024 – May 2024, Gandhinagar, Gujarat

**Description:** Mentored 50 B.Tech students in Python programming, provided personalized guidance, assessments, and dynamic learning experiences, fostering academic improvement and passion for technology.

#### Teaching Assistant (Computing)

**Experience Year**

Indian Institute of Technology Gandhinagar

Aug 2023 – Dec 2023, Gandhinagar, Gujarat

**Description:** Guided more than 50 B.Tech students in mastering Python programming through personalized instruction and assessments. Designed engaging and adaptive learning experiences to meet each student's needs. Promoted academic advancement and skill enhancement.

## Publications

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### Unlocking Model Insights: A Dataset for Automated Model Card Generation

*Arxiv, 09/2023*

**Shruti Singh, Hitesh Lodwal, Husain Malwat, Rakesh Thakur, Mayank Singh**

<https://arxiv.org/abs/2309.12616>

Introduces a dataset of 500 QA pairs for 25 ML models to automate model card generation. Evaluates ChatGPT-3.5, LLaMa, and Galactica in generating model cards and highlights gaps in research paper comprehension.

### Investigating REV-ERB $\beta$ Binding Pocket Dynamics with Implications for Rational Design of Small Molecule Modulators

*bioRxiv, 04/2024*

**Shriyansh Srivastava, Rakesh Thakur, AM Vishnu, Ashutosh Srivastava**

<https://doi.org/10.1101/2024.04.13.589008>

Characterized REV-ERB $\beta$  ligand-binding domain dynamics via molecular dynamics and docking studies. Findings aid rational drug design for metabolic disorders.

### Brain-Inspired Encryption Techniques for Medical Imaging

*IEEE, Silchar Subsection Conference (SILCON 2024)*

*2024*

**Shanu Khare, Navjot Singh Talwandi, Payal Thakur, Rakesh Thakur, Bhavana Bansal, Kalpana Singh**

<https://ieeexplore.ieee.org/document/10910555>

Explores brain-inspired encryption techniques for securing medical imaging data, leveraging neural processing principles to enhance data security, privacy, and efficient analysis.

### Cloud-Based Data Analytics for Business Intelligence

*IEEE, 2nd International Conference on Advances in Computation, Communication, and Information Technology (ICAICCIT)*

*2024*

**Navjot Singh Talwandi, Akhilesh Kumar Shah, Rakesh Thakur, Shanu Khare, Payal Thakur**

<https://ieeexplore.ieee.org/document/10912298>

Analyzes cloud-based data analytics platforms for Business Intelligence (BI), highlighting their advantages, challenges, and future trends to enhance data-driven decision-making.

### Cloud-Based Virtual Reality Training Platform for Occupational Safety

*IEEE, 2nd International Conference on Advances in Computation, Communication, and Information Technology (ICAICCIT)*

*2024*

**Kirti, Navjot Singh Talwandi, Rakesh Thakur, Kalpana Singh**

<https://ieeexplore.ieee.org/document/10912406>

Evaluates the effectiveness of virtual reality (VR) in occupational safety training through systematic analysis, highlighting its advantages, challenges, and future research directions.

## Design Registrations Granted

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**Design ID: 436591-001**

**Title: Dataset Labeling AI Device**

**Link:** [https://drive.google.com/file/d/1\\_C22m-WeFsEi1XADGGNzyjvWBDKfrQ11/view?usp=drive\\_link](https://drive.google.com/file/d/1_C22m-WeFsEi1XADGGNzyjvWBDKfrQ11/view?usp=drive_link)

**Design ID: 437191-001**

**Title: Microgravity Electromagnetic Tool Stabilization Device**

**Link:** [https://drive.google.com/file/d/1BtMYvsSD13LFFAaU16Ma98yp2YUbMf3T/view?usp=drive\\_link](https://drive.google.com/file/d/1BtMYvsSD13LFFAaU16Ma98yp2YUbMf3T/view?usp=drive_link)

## Skills

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**AI Machine Learning:** Deep Learning, NLP, GenAI, Finetune, LangChain, RAG

**AI Tools MLOps:** MLflow, Hugging Face, Unisloth, AugmentToolkit, MLOps

**Data Analytics:** MySQL, PowerBI

**Web Scraping Automation:** BeautifulSoup, Scrapy, Selenium, ScrapeGraphAI

**Development Deployment:** PyTorch, TensorFlow, OpenAI, FastAPI, Streamlit, Flask, Django, Docker

**Programming Languages:** Python, C, C++, R

**High-Performance Computing:** Vega, Aneeshur, ParamAnanta

**Language Modeling:** LLMs, Llama-2, OpenHathai, Mistral AI, Claude AI

**Generative AI Applications:** GANs, VAEs, Stable Diffusion, Text-to-Image Models

## Projects

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### Handwritten Text Recognition with Transformer OCR

- Fine-tuned Fine-tuned `microsoft/trocr-small-handwritten` on IAM and Imgur5K datasets, using data augmentation and preprocessing, achieving CER = 10.67 and WER = 20.47, with challenges including noisy data, stylized handwriting, and resource constraints.

### RAG-Powered Retrieval System

- Developed a retrieval-augmented generation (RAG) system leveraging LangChain and PyTorch to retrieve context-specific documents and generate coherent responses. - Implemented dynamic document retrieval with vector embeddings using FAISS for scalable performance.

### LangChain for Dynamic Workflows

- Built a document pipeline using LangChain to process, summarize, and perform Q&A tasks on legal and medical documents. - Integrated Streamlit for an interactive user experience.

### Mini LLMs with Fine-tuning

- Fine-tuned pre-trained transformer models (GPT-2 and GPT-4) on domain-specific datasets to create mini LLMs for specialized applications. - Used Hugging Face Transformers and PyTorch Lightning for accelerated training and evaluation.

### Agentic AI Chatbot

- Designed an autonomous agent using LangChain and OpenAI to handle multi-step tasks, including scheduling, data scraping, and summarization. - Deployed on Flask for web access with integrated logging for monitoring decisions.

### AugmentToolkit for Data Synthesis

- Created a toolkit for data augmentation in NLP tasks, enhancing performance on imbalanced datasets using back-translation, synonym replacement, and noise injection. - Developed Python modules for automated augmentation pipelines.

### TensorFlow-based Deep Learning Models

- Developed image classification and NLP pipelines using TensorFlow and Keras for real-time applications like spam detection and face recognition. - Leveraged TensorBoard for performance visualization.

### MLFlow Workflow for Experiment Tracking

- Implemented a machine learning lifecycle management system using MLflow, tracking hyperparameters and model metrics for collaborative experimentation. - Deployed models on AWS S3 and served via Flask APIs.

### Web Scraping Framework with ScrapeGraphAI

- Designed a Python framework for large-scale web scraping using Scrapy and BeautifulSoup with integrated graph-based visualization for insights. - Automated job scraping from LinkedIn, providing analytics for in-demand skills.

## Certifications (30+)

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- Supervised Machine Learning: Regression and Classification (Coursera).
- Unsupervised Learning, Recommenders, Reinforcement Learning (Coursera).
- Fundamentals of Digital Image and Video Processing (Great Learning).
- Advanced Learning Algorithms (Coursera).
- Software Defined Networking (Coursera).

## Community Experience

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**Volunteer in IndoML 2022** Indian Institute of Technology, Gandhinagar, Gujarat — Dec 2022  
Innovative consulting and collaborative leadership in organizing and managing sessions.

**Volunteer in IEEE ANT 2022** Indian Institute of Technology, Gandhinagar, Gujarat — Dec 2022  
Engaged in collaborative cross-functional coordination and event execution.

**Volunteering in Nyasa** Indian Institute of Technology, Gandhinagar, Gujarat — Dec 2022  
Promoted collaborative growth and communication excellence while contributing to community welfare initiatives.

## Extra-Curricular Activities

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**Contingent Leader, E-Summit 2024** IIT Bombay — 2024  
Led a team to represent the institution at the prestigious E-Summit.

**ICVGIP Conference** IIT Gandhinagar — 2022  
Participated and contributed to discussions on advancements in computer vision, graphics, and image processing.

**Contact-Rich Manipulation by Humans and Robots, Workshop** IIT Gandhinagar — 2022  
Explored the principles and techniques of human-robot interaction.

**Transformer Architecture for Computer Vision, Workshop** IIT Gandhinagar — 2022  
Engaged in hands-on sessions on applying transformer models to computer vision tasks.

**”Hack Rush” Hackathon, Workshop** IIT Gandhinagar — 2022  
Developed innovative solutions and collaborated with peers during an intensive hackathon.

**IndoML Symposium, Conference** IIT Gandhinagar — 2021  
Participated in discussions on the latest machine learning research and applications.

## Languages

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**English:** Proficient

**Hindi:** Proficient

**Nepali:** Proficient