Jitender Singh

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SKILLS

Programming: Python (expert), C++ (hands-on), SQL (hands-on), Java (hands-on)

Frameworks & Technologies: PyTorch, PyTorch Lightning, Keras, HuggingFace Transformers, Lightning, MONAI, XGBoost, Scikit-Learn, auto-sklearn, Optuna, NumPy, Pandas, LiteLLM, Ollama, LangChain

Natural Language Processing (NLP): LLM Fine-tuning, Prompt Engineering, Retrieval-Augmented Generation (RAG), Whisper, F5-TTS

DevOps & MLOps: Docker, Kubeflow, MLflow, Weights & Biases (W&B), Google Cloud Platform (GCP), FastAPI, Git, CI/CD, Workflow Orchestration (DAG Pipelines), Experiment Tracking, Attrs, Pydantic

Computer Vision & Medical Imaging: Segmentation, Object Detection, Lesion & Abnormality Detection, Cross-Attention & Fusion Methods, 3D-Slicer, DICOM, NIfTI, MRI, CT, X-Ray, DTI, DKI, FSL, MRICron

AI Research Areas & Interests: Computer Vision, Natural Language Processing (NLP), Reinforcement Learning, Agentic AI, AI Agents, LLMs, Vision-Language Models (VLMs), Transfer Learning, Semi-Supervised Learning, Self-Supervised Learning, Visual Question Answering (VQA), Multi-Modal Learning, Multi-Task & Multi-Label Classification, System Design, Design Patterns

Experimental / Prototype / Debugging Tools: Cursor, Warp, VSCode, Streamlit, Gradio, Jupyter Notebook

Languages: English (fluent), Hindi (fluent), Punjabi (native)

WORK EXPERIENCE

CTO / AI Engineer   Apr 2022 - Present
Manentia AI (early-stage startup)   *Bangalore, Karnataka, India*

- Designed, developed, and deployed an AI-driven scan-to-report radiology workflow in production reducing reporting time by 45-50% by automated abnormalities, pathologies, lesion detection and report generation with direct PACS connectivity. It uses 2D and 3D CNNs and ViT vision models for image feature extraction across various modalities such as CT, MRI, DX, MG, PET, etc. and LLMs for report generation. The system supports segmentation, detection, classification, and generation tasks with a feedback loop for self-training, and automated pipeline selector based on modality and body part examined.
- Built a feedback-driven self-training system that reuses radiologists' final reports for model refinement and optimisation, addressing the challenge of limited annotated medical data.
- Developed an LLM + RAG-powered clinical reporting chat app for structured radiology reports, reducing reformatting time by 20% (validated by 15 radiologists).
- Built a DICOM-aware pipeline selector with AI fallback for missing metadata or non-DICOM inputs, including a 99.8% accurate modality classifier trained on 1.2M samples and 98% accurate zero-shot body-part classifier, routing studies to the correct DAG pipelines.
- Designed, developed, and deployed CDSCO-approved (regulated under standards similar to FDA [U.S.] and CE-mark [EU MDR/IVDR]) 3D CT Pulmonary Nodule Detection (lung segmentation: 0.98 AUC, lobe segmentation: 0.90 AUC, nodule segmentation: 0.87 AUC, classification: 93% accuracy) compliant with Fleischner Society 2017 guidelines.
- Filed a patent titled "Lung Nodule Detection and Classification with Automatic Report Generation."
- Led a cross-functional AI R&D team delivering production-grade AI solutions for X-Ray and CT workflows.
- Contributed to 4 RSNA 2025 (accepted), 4 ECR 2025 (published), and 3 ERS 2025 (accepted) abstracts through team collaboration. (detailed list below)
- Developed a 2D deep learning pipeline from data munging to deployable deep neural network for Lung Disease Classification using X-Ray Imaging.

MRI Image Processor and Analyst   Jul 2021 - Mar 2022
Radiodiagnosis and Imaging Department, PGIMER   *Chandigarh, India*

- Performed statistical analysis on Diffusion Kurtosis Imaging (DKI) brain imaging including image preprocessing and registration as part of the NIH-funded research grant "MRSI and DKI Evaluation of HIV-1 Clade C Infection in the Whole Brain" in collaboration with the University of Miami School of

Medicine and awarded/supported/administered by Fogarty International Center, U.S. National Institutes of Health (NIH).
- Performed statistical analysis on DTI pediatric brain imaging including image processing and registration for a clinical research study on Infantile Tremor Syndrome (ITS) in North India. code

Medical Machine Learning Research Assistant
CBIL Lab, Indian Institute of Technology (IIT) Ropar

Mar 2019 - Mar 2022

Rupnagar, Punjab, India

- Developed "VQAMixUp", a SOTA medical Visual Question-Answering and Generation (VQAG) method, achieving top performance on ImageCLEF-VQA-MED benchmark with approximately 65% fewer parameters, in collaboration with Inception Institute of Artificial Intelligence (IIAI), Abu Dhabi. Publication
- Built a risk prediction model for Postpartum Depression (PPD) by combining neural networks and tree-based classifiers. Applied auto-sklearn for hyperparameter optimization and model ensembling, alongside tabular data feature engineering, achieving ~75% accuracy as part of the ongoing Swedish *Mom2B* study in collaboration with Uppsala University Hospital. Publication
- Designed and implemented a lightweight (4.5M parameters only) custom CNN algorithm using mixed asymmetric kernels achieving 0.91 AUC on *Deeplesion* hand-labeled test dataset using semi-supervised training for efficient medical image analysis. Publication
- Organized, collected, and cleaned ~1.5TB unlabeled CT scans dataset for semi-supervised training.
- Contributed to MRI–PET multi-modal Alzheimer's classification (92.9% accuracy) as part of the "GLA-GAN" study. Publication

Machine Learning Research Intern
LASII group, Indian Institute of Technology (IIT) Ropar

Aug 2018 - Feb 2019

Rupnagar, Punjab, India

- Developed Computer Vision-based automatic collage maker Android app in collaboration with Samsung India.
- Developed *Garuda*: A Deep Learning-based background danger detection while taking selfies Android app achieving 89% accuracy in real world camera feed with inference run-time average of 300ms per frame. demo, Times of India (TOI), Gadgets Now, Publication

Machine Learning Innovation Fellow
Savera.ai startup (Sungineers Energy Private Limited)

July 2018 - Dec 2018

Remote

- Developed an end-to-end rooftop detection and segmentation pipeline for Indian buildings using aerial/satellite imagery, leveraging U-Net with Keras/TensorFlow to achieve 92.2% accuracy and 61.44 IoU on the Inria and Massachusetts Buildings datasets. code, medium.com; datasciencecentral.com

AI Research Fellow
Axis India Machine Learning Lab

Aug 2017 - May 2018

Jaipur, Rajasthan, India

- Implemented a deep learning–based face recognition and verification system using FaceNet with Inception ResNet v1 and MTCNN for face alignment, achieving 99.2% accuracy on the LFW dataset with TensorFlow.
- Studied Computer Vision, Natural Language Processing, Machine Learning, Deep Learning, and Reinforcement Learning fundamentals from scratch.
- Contributed as assistant speaker with Prof. Jaskirat Singh in several Machine Learning workshops to raise awareness among college students and industry professionals.

EDUCATION

M.E. in CSE (Artificial Intelligence & Machine Learning Specialization)
Chandigarh University

Aug 2020 - Aug 2022

Ajitgarh, Punjab, India

CGPA - 9.11 / 10.0
- **Gold medalist** for outstanding academic achievement
- Dissertation: *Medical Visual Question Answering and Generation* code
- Graduate semester project: *Molecular Chemical Images to Text Translation* code

Bachelor of Technology in Computer Science and Engineering

Jul 2013 - Jul 2017

CGPA - 7.24 / 10.0
- Dissertation: *Real-time Twitter Sentiment Analysis with Big Data and Hadoop Ecosystem* code
- Undergrad semester projects: *Teacher Review System* code, *Home Automation System* code, extension

PUBLICATIONS & INTERNATIONAL CONFERENCES

- Accepted abstracts in Radiological Society of North America (RSNA) 2025
  - AI-Based Detection and Grading of Calcification in Coronary Arteries, Aorta, And Aortic Valve Using Chest CT Scans (Poster)
  - AI-Driven Analysis of Brain CT for Intracerebral Hemorrhage Detection (Poster)
  - AI-Driven Liver Lesion Detection in Abdominal CT with Automated Reporting (Poster)
  - Real-Time AI Reporting for Chest X-Rays and Chest CT Scans: Seamless Integration into the Radiology Workflow (Oral)
- Published abstracts in European Congress of Radiology (ECR) 2025
  - AI-based Prediction and Automatic Reporting of Chest Abnormalities in Chest X-Ray Images. Publication
  - Lung Nodule Detection and Classification with Automatic Report Generation Using Artificial Intelligence. Publication
  - AI-based Coronary Artery Calcium Segmentation and Agatston Score Estimation using Chest CT scans. Publication
  - AI-enabled Prediction and Automatic Reporting of Chest Abnormalities in CT scans. Publication
- Accepted abstracts at the European Respiratory Society (ERS) Congress 2025
  - AI-driven Mediastinal Lymph Node Segmentation and Automatic Reporting in Chest CT
  - AI-based rib fracture detection and reporting in chest CT scans
  - Automatic detection and reporting of chest CT findings based on AI
- **2025:** Apoorva Sikka, Skand Peri, **Jitender Singh**, Usma Niyaz, Deepti R Bathula *"MRI to PET Cross-Modality Translation using Globally & Locally Aware GAN (GLA-GAN) for Multi-Modal Diagnosis of Alzheimer's Disease"* The Journal of Precision Medicine: Health and Disease. Publication
- **2024:** AS Ben Geoffrey, **Jitender Singh**, Deepti Mittal, Gurjeet Kaur, Syed Azmal Ali *"Data-Driven and Artificial Intelligence Approaches for System-Wide Prediction of the Drugable Proteome to Drug Discovery in Farm Animals"* Springer Nature Switzerland, Chapter, pp 155-172, 19. Publication
- **2023: Jitender Singh** and Surender Singh, *"Simple Methods is All You Need for Medical VQA: An ImageCLEFs Med-VQA Task Methods Review"* ICAIDS 2022: GRENZE International Journal of Engineering and Technology, Volume 9, Issue 1, Pages: 2292-2299. Publication
- **2023: Jitender Singh**, Dwarikanath Mahapatra, and Deepti R. Bathula, *"Medical VQA: MixUp Helps Keeping it Simple"* IVCNZ 2022: Image and Vision Computing, LNCS, Volume 13836, pp 402-414, Publication
- **2022:** A. Bilal, D. Bathula, E. Bränn, E. Fransson, **J. Singh**, F. Papadopoulos, and A. Skalkidou, *"Mom2B: a study of perinatal health via smartphone application and machine learning methods"* European Psychiatry 65 (S1), S574-S575 Abstract
- **2021: Jitender Singh** and Dr Surender Singh, *"Automatic Image Alignment and Fusion in a Digital Photomontage"* ITSS-IoE Publication
- **2021: Jitender Singh** and Deepti R. Bathula. *"Domain-Specific, Semi-Supervised Transfer Learning for Medical Imaging"* CODS-COMAD Publication
- **2020: Jitender Singh**, Syed Azmal Ali, and Gurjeet Kaur. *"Recent update on COVID-19 in India: Is locking down the country enough"* medRxiv Publication
- **2019: Jitender Singh** and Abhinav Dhall. *"Garuda: A Deep Learning-Based Solution for Capturing Selfies Safely"* ACM IUI Publication

OPEN SOURCE CONTRIBUTION & PERSONAL PROJECTS

Gen AI Content Generator   Apr 2025 - May 2025
- Built a local pipeline for automated, story-based animated videos (with audio and background sound effects) from a single-line prompt, running on an RTX 4090 (24GB). Generated scenes using prompt-tuned diffusion model workflows (Flux.1dev + ComfyUI), videos with FramePack, audio via F5-TTS, and compiled outputs using MoviePy. All prompt templates were manually crafted; final refinements assisted by Windsurf, Roo Code with GPT-4.1, and GPT-4o.

Stock Market Technical Analysis and Trader   Apr 2025 - May 2025
- A vibe-coded frontend and a manually engineered backend. Migrated from a Dash-based interface to a modern Next.js frontend styled with Tailwind and HeroUI. Used Cursor with Sonnet 3.7/4, GPT-4.1, and Gemini 2.5 Pro for AI-assisted development and trading insights.

AI Research Assistant (AIRA)   Mar 2025 - Apr 2025
- A graph-based tool for summarizing and exploring academic papers and notes using topic- and paper-level RAG with LLMs. Developed with Next.js, ReactFlow, FastAPI, Ollama, and LiteLLM using models like Sonnet 3.7/4 and GPT-4.1. [code]

Mozilla's Common Voice Contributor   Jun 2021 - Aug 2021
- Donating voice clips in three languages for common voice open dataset
- Recorded clips validator for three languages (Punjabi, English, Hindi)

Artificial Intelligence Search Algorithms Interactive Web App project   Nov 2020 - Jan 2021
- Developed an interactive web app to visualize uninformed search algorithms in runtime. [code], [short article]
- Implemented breadth-first search, depth-first search, depth limited search, and iterative deepening depth-first search with Romania's city map as search state space

Auto Photomontage Web App project   Nov 2020 - Jan 2021
- Developed a computer vision and image processing based automatic montage/collage maker web app. [code], [short article]
- The system uses face detection, residual saliency detection, image auto-orientation, smooth image-to-image transition, and image border blending algorithms

YAMLF: Yet Another Machine Learning Framework project   Jun 2020 - Aug 2020
- Developed a lite PyTorch based Machine Learning Python wrapper module named YAMLF for easy neural networks training and testing. [code]
- Implemented several boiler-plate functions for supervised & semi-supervised learning image & text classification

REFEREES

Deepti R. Bathula | *Associate Professor* | Indian Institute of Technology (IIT) Ropar, India
- Mob. No.: +919501196606
- Email: [bathula@iitrpr.ac.in]

Jaskirat Singh | *Machine Learning Researcher and Trainer* | Axis India Machine Learning Lab, India
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