GARIMA SINGHAL

New Delhi, India • garima99nitrkl@gmail.com• www.linkedin.com

EDUCATION

Master of Technology (M.Tech.) in Biomedical Engineering **Aug 2022 - June 2024**

National Institute of Technology Rourkela | Odisha, India

- CGPA: 9.16/10
- Awarded Merit Scholarship based on rank in national level exam
- Thesis on "Optimizing Convolutional Neural Network (CNN) Models for Multiclass Skin Cancer Classification: A Transfer Learning Approach"

Bachelor of Technology (B.Tech.) in Biotechnology **Aug 2018 - May 2022**

Banasthali Vidyapith | Rajasthan, India

- CGPA: 8.46/10
- Gold Medalist — Highest CGPA in the graduating batch.
- Thesis on "Implications of central metabolism in disease severity using in host modeling of SARS-CoV-2 infections"; guide: Dr. Madhuresh Sumit, Indian Institute of Technology (IIT) Delhi

RESEARCH INTERESTS

Medical Image Analysis, AI-based Risk Prediction in Clinical Settings, Multimodal Machine Learning for Healthcare

TECHNICAL SKILLS

- **Programming & Data Science**: Python (pandas, NumPy, scikit-learn), MATLAB
- **Machine Learning & AI**: Supervised/unsupervised learning, convolutional neural networks (CNNs), transfer learning, multimodal learning, feature selection and engineering, model evaluation (ROC/AUC, cross-validation)
- **Medical Imaging & Analysis**: 3D volumetric analysis, radiomics, segmentation, registration, DICOM handling, multi-modal, 3D reconstruction (3D Slicer, ITK-SNAP)
- **Research & Data Handling**: Data preprocessing, statistical analysis, data visualization, literature review, scientific writing
- **Deep Learning Architectures:** CNNs, encoder-decoder networks, transfer learning, generative models, feature extraction
- **Collaborative Research:** Experience working with radiologists, pathologists, and hepatologists in translational research settings

RESEARCH EXPERIENCE

Institute of Liver and Biliary Sciences **Feb 2025 - Present**

Project assistant | Department of Hepatology | PI: Dr. Ashok Choudhury

Project 1: Multimodal Machine Learning for Non-invasive Estimation of Portal Hypertension

- Developing a multimodal deep learning framework for non-invasive estimation of portal hypertension in chronic liver disease patients by integrating CT-derived radiomic features with laboratory parameters, aiming to reduce reliance on invasive HVPG measurements.
- Extracted 3D radiomic features from volumetric CT scans, including shape descriptors, texture features, and intensity statistics

Project 2: Predictive Modeling for Acute Kidney Injury (AKI) in ACLF Patients

- Developed machine learning models to predict 7-day risk of acute kidney injury (AKI) in patients with acute-on-chronic liver failure (ACLF) using routinely collected clinical parameters from electronic health records (EHR).
- The classification achieved an AUC of 0.98, with feature importance analysis showing that routine clinical variables were key predictors; results demonstrated strong clinical relevance for risk stratification and timely intervention in ACLF patients.

Indian Institute of Technology (IIT) Ropar — July 2024 - Dec 2024

Project associate | *Biomedical-Photonics Lab* | *PI: Dr. Rajesh Kumar*

Project 1: Multimodal Data Fusion for Early Detection of Citrus Greening Disease

- Implemented a machine learning–based data fusion approach by combining near-infrared and fluorescence spectra to non-invasively detect Huanglongbing (HLB) in citrus leaves.
- The classification results achieved higher accuracy compared to single-modality analysis, with incorporation of biochemical changes and vegetation indices providing deeper insights for early disease detection and large-scale orchard monitoring.

Project 2: Cross-Modality Image Translation for Pancreatic Tumor Assessment

- Implemented a deep learning–based cross-modality image translation framework to generate SHG-equivalent images from H&E-stained slides, enabling non-invasive analysis of collagen morphology for pancreatic tumor assessment.
- Achieved 95% classification accuracy in distinguishing tumor from normal tissue using machine learning models on translated images, demonstrating strong potential for improving diagnostic workflows in histopathology settings.

National Institute of Technology (NIT) Rourkela — Oct 2023 – May 2024

Master's thesis | *BioMedical Signal And Image Processing Lab* | *PI: Dr. Bala Chakravarthy Neelapu*

- Optimized CNN-based skin cancer classification using transfer learning with data augmentation and preprocessing in MATLAB, achieving 81% accuracy and improved computational efficiency comparable to state-of-the-art models.
- Worked with over 25,000 whole-slide images, developing expertise in handling large-scale medical imaging datasets and gained proficiency in transfer learning approaches applicable to scenarios with limited labeled data

National Institute of Technology (NIT) Rourkela — May 2023 - Sept 2023

Project Intern | *BioMedical Signal And Image Processing Lab* | *PI: Dr. Bala Chakravarthy Neelapu*

Project 1: AI for 2D-to-3D Airway Volume Estimation

- Conducted a systematic review to assess the reliability of 2D imaging modalities in estimating human upper airway volume by comparing them against 3D techniques such as cone-beam CT scans.
- Identified conflicting findings and key limitations of 2D imaging in capturing airway complexity, highlighting a research gap where AI-driven approaches could enhance 2D-to-3D airway volume assessment.

Project 2: Visual Evoked Potential (VEP) Analysis Post-Caffeine Consumption

- Conducted a comparative study using multiple machine learning algorithms to analyze visual evoked potential (VEP) signals and detect changes in the visual pathway following coffee consumption.
- Random Forest classifier achieved the highest accuracy (0.82), revealing underlying biological processes linking caffeine intake to cognitive and visual signal alterations.

Indian Institute of Technology (IIT) Ropar — June 2022 - July 2022

Summer Intern | *Biomedical-Photonics Lab* | *PI: Dr. Rajesh Kumar*

- Conducted a literature review on theories of osteoarthritis and its association with aging, presenting findings that identified aging as a major but not exclusive factor in disease progression.

Indian Institute of Technology Delhi — Jun 2021-Dec 2021

Bachelor's thesis | *Department of biochemical engineering and biotechnology* | *PI: Dr. Madhuresh Sumit*

- Investigated in-host mathematical models to analyze viral infection dynamics and quantify immune responses in SARS-CoV-2 and influenza, assessing implications for disease severity and transmission.
- Demonstrated that integrating metabolic insights with infection models can help identify potential antiviral treatment targets, including candidates for gene therapy.

National Institute of Health and Family Welfare, New Delhi — May 2020 - June 2020

Summer Intern | *Department of Reproductive biomedicine* | *PI: Dr. T.G. Shrivastava*

- Generated antibodies against haptens by conjugating them to carrier proteins to trigger an immune response, and analyzed antibody–antigen interactions using spectrophotometry, ELISA microplate assays, and PCR, gaining hands-on expertise in biochemical techniques.

PUBLICATIONS & CONFERENCES

- Singhal G, Choudhury A, Arora V, Kumar G, Sarin SK. A simple machine learning model considering Serum bilirubin, PT-INR and age can accurately predict the risk of renal failure in patient of ACLF accurately. Journal of Clinical and Experimental Hepatology. 2025;15:102726. doi:10.1016/j.jceh.2025.102726
- Singhal G, Nisha, Uppal G, Kaur M, Sinha R, Kumar R. Assessment of collagen morphology in pancreatic tumor using computational translation of histological images. In: Lecture Notes in Networks and Systems. ; 2026:297-311. doi:10.1007/978-981-95-0701-6_22
- Garima Singhal, Rajesh Kumar, " *Early Detection of Citrus Greening Disease via Fusion of Visible and Near-Infrared Spectra with Machine Learning Approaches*," 2024 (Manuscript in preparation)
- Nisha, Singhal G, Uppal G, Kumar R. First-order Analysis of Stromal Collagen in Chronic Pancreatitis using Cross- Modality Image Translation with Convolutional Neural Networks. Procedia Computer Science. 2025;258:365-373. doi:10.1016/j.procs.2025.04.273
- Singhal G, Rao NM, Amit CS, et al. Analyzing the effect of coffee consumption on visual pathway using visual Evoked Potential (VEP) signals and machine learning algorithms. In: Communications in Computer and Information Science. ; 2025:267-277. doi:10.1007/978-3-031-81342-9_22

CERTIFICATIONS

2024	Completed "**Machine Learning** A-Z: AI, Python & R + ChatGPT Prize [2024]" Udemy course
2019-2020	**Advanced diploma** in **Medical Image Processing**, Dept. of Computer Science, Banasthali Vidyapith
2018-2019	**Diploma** in **Medical Image Processing,** Dept. of Computer Science, Banasthali Vidyapith

ACHIEVEMENTS

2024	Received **Best Paper Award** at the 2nd International Conference on Artificial Intelligence, Computing Technologies, Internet of Things (IoT) and Data Analytics, NIT Raipur, Nov 2024
2018-2022	**Gold Medalist**, Bachelor of Technology (B.Tech.)
2022	Secured **All India Rank (AIR)- 573** in Graduate Aptitude Test in Engineering(GATE)-Biotechnology
2020-2021	Technical **team member** of **'BiOrigin' club**, Banasthali Vidyapith

ADDITIONAL EXPERIENCE

Volunteer, BioXspace-Synergising Stem (E-learning platform) **July 2022-Nov 2022**

- Contributed by managing social media outreach and developing educational content to engage a wider audience in science communication.

Summer Intern, BioXspace-Synergising Stem (E-learning platform) **June 2022-July 2022**

- Completed a summer internship focused on science communication, gaining experience in translating complex scientific concepts into accessible formats.
- Created educational content including infographics, articles, and audio-visual materials to engage diverse audiences.