

**CHRIST**(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE

Notice for the PhD Viva Voce Examination

Mr CH Yugandhar, Registration Number: 1981902, PhD Scholar at the Department of Statistics and Data Science, School of Sciences, CHRIST (Deemed to be University) will defend his PhD thesis at the public viva-voce examination on Tuesday, 09 June 2026 at 11.00 am in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

- Title of the Thesis** : **A Machine Learning Approach to Extract and Identify Significant Features from Chest X-Rays for Pneumonia Classification**
- Discipline** : **Data Science**
- External Examiner - I** : **Dr Shivashankar S**
Professor
Karnatak University, Dharwad
Pavate Nagar, Hubballi
Dharwad - 580003
Karnataka
- External Examiner - II** : **Dr Muneeswaran**
Associate Professor
Department of Cyber Security and Digital Forensics
VIT Bhopal University
Bhopal-Indore Highway
Kotri Kalan, Bhopal
Madhya Pradesh - 466114
- Supervisor** : **Dr Manjunatha Hiremath**
Associate Professor
Department of Computer Science
School of Sciences
CHRIST (Deemed to be University)
Bengaluru - 560029
Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar (Academics)**Place:** Bengaluru**Date:** 03 June 2026

ABSTRACT

Pneumonia typically arises from bacterial or viral infections. Viral infections include SARS-Covid, which led to the Corona virus pandemic. Accurate diagnosis at early stages is essential to ensure appropriate treatment. Many diagnostic tools are used in clinical practice. These include RT-PCR tests, chest X-rays (CXR), and computed tomography (CT). Though CT scans and RT-PCR are considered gold standards for diagnosis, they are generally time-consuming, expensive, and not commonly accessible. As a result, many patients rely on chest radiographs for initial evaluation. Radiologists examine chest X-rays for lesions and abnormalities in the lung regions. These inconsistencies lead to interpretation challenges and hence demand supplementary tools to assist radiologists in segregating normal images from abnormal images. Automated solutions are of great value in busy clinics or hospitals and in regions with limited expertise.

X-rays contain clinically relevant patterns at multiple spatial scales. In some areas, there are coarse structures, while in others, there are finer textures or edges. Processing these X-rays happens in three levels, i) low, ii) mid, iii) high. In low-level processing images go through denoising or contrast enhancement, but images stay as they are. In mid-level processing various features are extracted and images are segmented into various sections. Edges, contours, and boundaries are detected. Classification bridges mid and high-level image processing. When one draws meaning from images, it falls into high-level image processing.

This study primarily examines the present landscape of X-ray related diagnostic methods using radiomics applications and various automation techniques using machine learning. Radiomics converts images to data, creating agnostic descriptors. Mid-level image processing is a perfect fit as pneumonia alters lung texture, and the descriptors drawn by radiomics capture heterogeneity in the texture composition. There are two main approaches in automated image classification: machine learning, which uses traditional algorithms like Logistic regression, Support vector machines(SVM), Random forest etc., and the other is deep learning methods. This study uses a classical machine learning approach. It evaluates Support Vector Machines, Logistic Regression, Random Forest, Gradient Boosting, and XGBoost. These models are trained on handcrafted radiomic features from chest X-ray images for three datasets (GWCMC, RAIG, NIGMS). XGBoost algorithm is identified as the most accurate and most generalizable classifier, achieving classification accuracies between 0.96 and 0.99. Classical machine learning is chosen over deep learning for three reasons, namely, i) labelled chest Xray data is limited, ii) clinical use needs interpretable models, iii) the goal is to deploy on low-cost computing hardware.

Keywords: X-ray, Pneumonia, Radiomics, Feature Extraction, XGBoost, Support Vector Machine, Random Forest, Classical Machine Learning

Publications:

1. **C. Yugandhar** and M. Hiremath, "Pneumonia classification from Chest X-Rays using significant feature selection and machine learning." Published in IAES International Journal of Artificial Intelligence (IJ-AI). Publisher: Institute of Advanced Engineering and Science.
2. **C. Yugandhar** and M. Hiremath, "Classification of chest X-ray images using radiomic features and machine learning," South Eastern European Journal of Public Health (SEEJPH), vol. XXV, suppl. 2, 2024, ISSN: 2197-5248, doi: 10.70135/seejph.vi.3135.
3. **C. Yugandhar** and M. Hiremath, "X-Tract: Framework for flexible extraction of features in chest radiographs for disease diagnosis using machine learning," in Proc. Congress on Smart Computing Technologies (CSCT), J. C. Bansal, H. Sharma, and A. Chakravorty, Eds., Smart Innovation, Systems and Technologies, vol. 351. Singapore: Springer, 2023, doi: 10.1007/978-981-99-2468-4_26.\