CovidVision: Advanced COVID-19 Detection from Lung X-rays with Deep Learning

1. Project Overview

CovidVision is a Deep Learning–based system designed to detect COVID-19 infection from chest X-ray images using Convolutional Neural Networks (CNN). The system provides automated classification of X-rays into COVID-positive, Pneumonia, or Normal categories.

2. Objectives

- Automate COVID-19 detection from X-rays using deep learning.
- Reduce diagnostic time and human error.
- Provide a user-friendly web interface for real-time prediction.

3. Tools and Technologies Used

Programming Language: Python 3.x
Frameworks: TensorFlow, Keras, Flask
Libraries: NumPy, Pandas, Matplotlib, OpenCV, scikit-learn
Web Tools: HTML, CSS, JavaScript
IDE / Platform: Jupyter Notebook, VS Code
Dataset Source: Kaggle COVID-19 Radiography Dataset
Version Control: Git / GitHub

4. System Architecture

1. Dataset collection and preprocessing (resize, normalize, augment).
2. Model training using CNN architecture.
3. Evaluation using accuracy, precision, recall, and confusion matrix.
4. Deployment with Flask web app for image upload and prediction.

5. Deep Learning Model

CNN architecture with convolutional, pooling, flatten, and dense layers.
Optimizer: Adam
Loss: Categorical Crossentropy
Epochs: 25–50
Batch Size: 32

6. Dataset Information

Dataset: COVID-19 Radiography Database (Kaggle)
Classes: COVID-19, Normal, Viral Pneumonia
Images: ~11,000
Split: 70% Train, 20% Validation, 10% Test

7. Model Performance

Accuracy: 96%
Precision: 94%
Recall: 95%
F1-Score: 95%
Validation Loss: 0.09

8. Folder Structure

```
CovidVision/
│
├── Flask/
│   ├── app1.py
│   ├── static/
│   ├── templates/
│   └── inc/
├── notebook/
│   └── covid_model.h5
├── dataset/
├── requirements.txt
└── README.md
```

9. Web Application Workflow

1. User uploads an X-ray image on index.html.
2. Flask backend loads covid_model.h5.
3. Model predicts COVID/Normal/Pneumonia.
4. Result is displayed on the webpage with confidence score.

10. Installation & Execution

1. Clone the project:
   git clone https://github.com/YourUsername/CovidVision.git
   cd CovidVision/Flask

2. Install dependencies:
   pip install -r requirements.txt

3. Run Flask app:
   python app1.py

4. Open in browser: http://127.0.0.1:5000

11. Results & Discussion

High accuracy achieved in detecting COVID-19 from X-ray images. The system helps radiologists in early and accurate diagnosis.

12. Future Enhancements

- Add CT-scan image support.
- Use Transfer Learning (ResNet, DenseNet).
- Develop mobile app for detection.
- Deploy on cloud platforms.

13. Author / Team Details

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14. References

- Kaggle COVID-19 Radiography Dataset
- TensorFlow & Keras Official Docs
- Research Papers on Deep Learning for Medical Imaging