

COVID-19 X-Ray Diagnosis System

An AI-powered web application for analyzing chest X-ray images to detect COVID-19, Normal, and Viral Pneumonia cases using deep learning.

Python 3.8+ Streamlit 1.28+ TensorFlow 2.0+

Overview

This application uses a trained deep learning model to classify chest X-ray images into three categories:

- **COVID-19 Positive:** X-rays showing patterns consistent with COVID-19 infection
- **Normal:** Healthy chest X-rays with no signs of infection
- **Viral Pneumonia:** X-rays showing patterns consistent with viral pneumonia

Features

-  **Accurate Classification:** Deep learning model for X-ray image analysis
-  **Confidence Scores:** Displays prediction confidence percentages
-  **Professional UI:** Clean, medical-themed interface with color-coded results
-  **Detailed Analysis:** Shows probability distribution across all categories
-  **Fast Processing:** Optimized model loading with caching
-  **Responsive Design:** Works on desktop and mobile browsers

Getting Started

Prerequisites

- Python 3.8 or higher
- pip package manager

Installation

1. Clone the repository:

```
git clone <repository-url>
cd Covid_APP
```

2. Install required packages:

```
pip install streamlit tensorflow opencv-python pillow numpy
```

Running the Application

```
streamlit run app.py
```

The application will open in your default web browser at <http://localhost:8501>

如何看待

1. **Upload Image:** Click on the file uploader and select a chest X-ray image (JPG, PNG, or JPEG)
2. **Analyze:** Click the "🔍 Analyze X-Ray" button
3. **View Results:** Review the prediction, confidence score, and detailed probability breakdown

项目结构

```
Covid_APP/  
|  
|__ app.py           # Main Streamlit application  
|__ covid_19_model.h5 # Trained deep learning model  
|__ README.md        # Project documentation
```

模型信息

- **Architecture:** Convolutional Neural Network (CNN)
- **Input Size:** 224x224x3 (RGB images)
- **Output Classes:** 3 (COVID-19, Normal, Viral Pneumonia)
- **Framework:** TensorFlow/Keras

技术细节

图像预处理管道

1. Convert PIL Image to NumPy array
2. Resize to 224x224 pixels
3. Convert grayscale images to RGB
4. Normalize pixel values (0-1 range)
5. Reshape for model input

依赖项

```
streamlit>=1.28.0  
tensorflow>=2.0.0  
opencv-python>=4.5.0  
pillow>=9.0.0  
numpy>=1.21.0
```

⚠️ 重要免责声明

This application is for educational and research purposes only.

- This tool should NOT be used as a substitute for professional medical diagnosis
- Always consult with qualified healthcare professionals for medical advice
- The predictions are generated by an AI model and may not be 100% accurate
- Medical decisions should never be based solely on this application's output

Use Cases

- **Educational:** Learning about AI in healthcare and medical imaging
- **Research:** Exploring deep learning applications in radiology
- **Demonstration:** Showcasing AI-powered diagnostic tools
- **Prototyping:** Building proof-of-concept medical AI systems

Future Enhancements

- Add support for DICOM image format
- Implement batch processing for multiple images
- Add explainability features (Grad-CAM visualization)
- Include more detailed medical reports
- Add user authentication and history tracking
- Integrate with PACS systems

Model Performance

The model has been trained on chest X-ray datasets to classify the three categories. For detailed performance metrics and validation results, please refer to the model training documentation.

Contributing

Contributions are welcome! Please feel free to submit a Pull Request.

License

This project is licensed for educational and research purposes.

Authors

- Your Name - Initial work

Acknowledgments

- Thanks to the medical community for providing labeled X-ray datasets
- TensorFlow and Streamlit teams for excellent frameworks
- Healthcare workers fighting COVID-19 worldwide

Contact

For questions or feedback, please open an issue in the repository.

Made with ❤️ for healthcare and AI research