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

Milestone 1: Project Initialization and Planning Phase

Activity 1: Define Problem Statement

The problem statement highlights the urgent need for accurate and efficient detection of COVID-19 from radiographic images. Traditional diagnostic methods can be slow and resource-intensive, necessitating a supplementary tool to aid healthcare professionals. By implementing a deep learning model, we can efficiently analyze radiographic images to identify COVID-19 cases, thereby streamlining the diagnostic process and providing timely assistance to medical practitioners. Early detection can significantly reduce the burden on healthcare systems and enable quicker isolation and treatment of infected patients.

Activity 2: Project Proposal (Proposed Solution)

The project focuses on "COVID-19 Radiography Detection Using Xception." This initiative aims to leverage advanced convolutional neural network (CNN) techniques, specifically the Xception architecture, to classify radiographic images into COVID-19 positive and negative cases accurately. By analyzing patterns and features in the images, the project seeks to develop a robust predictive model that can assist in the early detection and diagnosis of COVID-19. The use of Xception, known for its efficiency and accuracy in image classification tasks, ensures that the model can handle complex image data with high precision.

Activity 3: Initial Project Planning

The Initial Project Planning phase involves defining key objectives, outlining the project scope, and identifying stakeholders critical to the predictive modeling process. This phase includes setting timelines, allocating necessary resources, and formulating an overarching project strategy to ensure successful project execution. Key milestones and deliverables are established to monitor progress and ensure the project remains on track, with regular updates and reviews planned to address any challenges promptly.

Milestone 2: Data Collection and Preprocessing Phase

Activity 1: Data Collection Plan, Raw Data Sources Identified, Data Quality Report

The dataset used for the COVID-19 Radiography Detection project is sourced from Kaggle, containing comprehensive radiographic images labeled with COVID-19 status. Data quality has been rigorously verified, addressing issues such as image resolution and labeling accuracy, and adhering to ethical guidelines to ensure a robust foundation for predictive modeling. The dataset is diverse, including images from different demographics and conditions, enhancing the model's generalizability.

Activity 2: Data Quality Report

The dataset includes detailed radiographic images, with careful verification to address issues like missing data, inconsistent labels, and image artifacts. Ensuring data quality is critical for the reliability and effectiveness of the subsequent machine learning model. Various preprocessing techniques, such as normalization and augmentation, are applied to enhance the dataset, making it suitable for training robust models.

Activity 3: Data Exploration and Preprocessing

Data exploration involves analyzing the radiographic dataset to understand patterns, distributions, and potential outliers. Preprocessing includes tasks such as resizing images, normalizing pixel values, and encoding labels. These steps enhance data quality and ensure the reliability of subsequent analyses and model training. Exploratory data analysis (EDA) techniques are used to visualize the data, uncovering important insights and guiding the preprocessing steps to optimize model performance.

Milestone 3: Model Development Phase

Activity 1: Feature Selection Report

The Feature Selection Report focuses on critical aspects of the radiographic images, such as pixel intensity, texture, and patterns that are indicative of COVID-19. These features are essential for the model to accurately distinguish between COVID-19 positive and negative cases. Advanced techniques, such as feature extraction using convolutional layers, are employed to capture the most relevant information from the images.

Activity 2: Model Selection Report

The Model Selection Report details the rationale behind choosing the Xception model for COVID-19 radiography detection. Xception, with its depthwise separable convolutions, is well-suited for handling complex image data and has demonstrated superior performance in image classification tasks. The choice of Xception is based on its ability to achieve high

accuracy while maintaining computational efficiency, making it suitable for real-world deployment in healthcare settings.

Activity 3: Initial Model Training Code, Model Validation and Evaluation Report

The Initial Model Training employs the Xception architecture on the radiographic dataset, establishing the foundation for predictive modeling. The subsequent Model Validation and Evaluation Report rigorously assesses model performance using metrics like accuracy, precision, recall, and F1-score to ensure reliability and effectiveness in detecting COVID-19 from radiographic images. Cross-validation techniques are used to prevent overfitting and to evaluate the model's generalization capabilities on unseen data.

Milestone 4: Model Optimization and Tuning Phase

Activity 1: Hyperparameter Tuning Documentation

The Hyperparameter Tuning phase involves refining the Xception model to achieve peak performance. This includes adjusting parameters such as learning rate, batch size, and the number of epochs. The goal is to optimize the model for improved predictive accuracy and efficiency in classifying COVID-19 radiographic images. Grid search and random search methods are employed to systematically explore the hyperparameter space and identify the best configuration.

Milestone 5: Project File Submission and Documentation

To complete the project file submission, all necessary files should be uploaded to GitHub in the correct format. The linked documentation provides a comprehensive overview of the project's scope, objectives, and methodologies, ensuring that all aspects of the project are thoroughly documented and accessible. Clear and concise documentation facilitates understanding and reproducibility of the project, enabling others to build upon the work.

Milestone 6: Project Demonstration

Team members will create a video presentation showcasing the project. This involves recording a screen share while providing a clear and concise explanation of the project's goals, methodologies, and outcomes. The presentation should demonstrate the project's execution, highlighting key features and functionalities, and provide an opportunity to showcase skills and knowledge in a practical and engaging manner. Emphasis will be placed on the model's performance, real-world applicability, and the potential impact on COVID-19 detection and diagnosis.