**Model Development Phase**

**Project Name:** COVID-19 Chest X-Ray Image Classification

### **Model Selection Report**

In this project, multiple deep learning approaches were evaluated for classifying chest X-ray images into three categories: COVID-19, Bacterial Pneumonia, and Normal.  
 Factors such as training accuracy, validation accuracy, confusion matrix, and loss curves were considered to select the most suitable model.

**Models:**

**Model 1: VGG16 (Transfer Learning) :**

• Pretrained CNN (VGG16) using ImageNet weights.

• Added custom dense layers (Flatten → Dense → Dropout → Softmax).

• Achieved strong performance and generalization due to transfer learning.

• Selected as the final model.

**Model Development Steps :**

| **Model steps** | **Description** |
| --- | --- |
| Step 1: Dataset Loading & Preprocessing | Loaded chest X-ray dataset from train, validation, and test folders. Resized all images to 64×64, normalized pixel values (rescale 0–1), and generated batches with ImageDataGenerator. |
| Step 2: Splitting Dataset | Used ImageDataGenerator with Validation\_split = 0.2 to automatically split training data into 80% training and 20% validation. Separate test set used for final evaluation. |
| Step 3: Label Encoding | Labels (COVID-19, Normal, Bacteria) were automatically one-hot encoded by flow\_from\_directory. |
| Step 4: Training the model | Custom CNN trained as baseline.  VGG16 Transfer Learning fine-tuned with additional dense layers for classification. |
| Step 5: Evaluation | Compared models using training/validation accuracy, loss curves, and confusion matrix.  VGG16 achieved higher accuracy and stability, making it the chosen model. |
| Step 6: Prediction | The final VGG16-based model was used to predict disease class on unseen test X-ray images. |