# Problem Statement

Facial paralysis is a medical condition that results in partial or complete loss of facial muscle movement, often due to nerve damage. Early and accurate detection is crucial for timely treatment and better recovery outcomes. This project aims to develop a deep learning model using transfer learning to automatically detect facial paralysis from images of patients' faces, enabling faster diagnosis and assisting medical professionals in their decision-making process.

# Methods

The project utilizes facial image datasets categorized into 'paralysis' and 'normal' classes. Data preprocessing is performed using ImageDataGenerator for rescaling, flipping, rotation, shear, zoom, and shifts to improve model generalization. The deep learning architecture is built using TensorFlow and Keras, leveraging transfer learning with pretrained networks like VGG16, InceptionV3, and ResNet50. The models are trained on the processed images and evaluated using classification metrics such as accuracy, confusion matrix, and ROC curves.

# Insights

From experimentation, the VGG16-based model achieved the highest classification accuracy compared to InceptionV3 and ResNet50. The use of transfer learning significantly reduced training time and improved performance, especially with limited data. Data augmentation helped the model generalize better to unseen images, reducing overfitting. The final model provides a binary classification output indicating whether facial paralysis is detected or not.

# Challenges

1. Limited Dataset: The small number of training images made it challenging to avoid overfitting, requiring extensive data augmentation.

2. Class Imbalance: The number of normal and paralysis cases was uneven, impacting model learning.

3. Model Selection: Choosing the right pretrained model and tuning hyperparameters required multiple iterations

4. Hardware Constraints: Training deep learning models on high-resolution images was computationally intensive.