

Case Study: Face Mask Detection Using Image Recognition

DS 4002 – CS 3 – Rithwik Raman

Purpose

This case study introduces you to the world of image recognition and its applications in public health. You'll work on developing a machine learning model to detect whether individuals in images are wearing face masks, using real-world datasets and advanced neural network techniques. This is an opportunity to build practical experience with data preprocessing, convolutional neural networks (CNNs), and model evaluation metrics. By the end of the project, you'll have gained insights into how machine learning supports societal needs, like health compliance monitoring, while navigating technical challenges like image variability and dataset limitations.

The Task

Your task is to step into the role of a data scientist tasked with solving a critical health technology challenge. Using a provided dataset of 11,800 labeled images, you will:

1. **Preprocess the Dataset:** Resize, normalize, and augment images to prepare them for training.
2. **Build a Machine Learning Model:** Leverage a CNN, fine-tune a pre-trained model (like ResNet or MobileNet), and split the data into training, validation, and test sets.
3. **Evaluate the Model:** Use metrics like accuracy, precision, recall, and F1 score to assess performance.
4. **Draw Insights:** Reflect on the challenges you encounter, such as variations in lighting and facial orientation, and propose potential solutions to improve the model.

GitHub Link: https://github.com/rithwikraman/DS4002_CS3

You will document your work in a structured report and provide a notebook demonstrating the steps taken to preprocess, train, and evaluate the model. You will then upload all the necessary files (scripts, data, etc) into a Github repository.
