Project Title

“Breast Cancer Classification Using Mammogram Images for Enhanced Early Detection”

Dataset

The dataset used for this project is the **Breast Mammography Images with Masses** dataset. It was published on July 3, 2020 by **Ting-Yu Lin** and **Mei-Ling Huang**. The dataset contains mammogram images of both **benign** and **malignant** breast masses. The dataset consists of images sourced from three primary mammography datasets:

- **INbreast**: 106 images of masses
- **MIAS**: 53 images of masses
- **DDSM**: 2188 images of masses

The dataset is publicly available and can be accessed through the **Mendeley Data** repository.

Project Overview:

This project aims to develop an automated system for **breast cancer classification** using mammogram images. Leveraging **DenseNet121** and **ResNet50**, the system will classify mammograms as benign or malignant. The dataset includes over **24,000 images** from **INbreast**, **MIAS**, and **DDSM**, which are preprocessed for enhanced accuracy.

The project introduces a **hybrid model approach** for better feature extraction and incorporates **Grad-CAM** for explainable predictions, making the model's decisions transparent to healthcare professionals. Designed for **real-time deployment** on resource-limited devices, this project seeks to improve early breast cancer detection and assist in clinical decision-making.

Chosen Models:

- **DenseNet121**: Selected for its efficient reuse of features, minimizing parameters while maximizing accuracy, ideal for medical image classification.
- **ResNet50**: Chosen for its residual connections, which prevent vanishing gradients and excel at detecting both low- and high-level features in mammograms.

While some models may be lightweight , they might not extract features effectively in detailed medical images and lack the necessary connections to capture important recurring features across layers like ResNet50 and DenseNet121.

Programming Language

The project will be implemented using **Python**, leveraging popular deep learning libraries such as TensorFlow and Keras.

Novelty of This Approach

While similar projects exist, ours introduces several innovative aspects:

- **Hybrid Model Approach**: We combine DenseNet121 and ResNet50 for enhanced feature extraction and accuracy.
- **Unique Dataset**: Our dataset integrates images from three distinct sources (INbreast, MIAS, and DDSM), setting it apart from other datasets used in previous research.
- **Explainability Integration**: Utilizing Grad-CAM, we provide visual explanations for model decisions, aiding clinicians in understanding flagged areas.
- **Resource Efficiency**: The model is optimized for deployment on edge devices, enabling real-time cancer detection in resource-constrained settings.
- **Real-Time Application**: Designed for integration into clinical workflows, our solution facilitates immediate breast cancer diagnosis using mammogram images.

Flow Diagram