A Major Project Synopsis

on

Bone Fracture Detection Using Image Classifier

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by

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Chapter 1: Introduction

1.1 Brief of the Project

- Basic image classifier using deep learning libraries like TensorFlow or PyTorch. Train it on a small dataset of images and classify them into predefined categories.

- An image classification app is a software application designed to analyse and categorize images based on their visual content.

- The image classification app, developed using **Python** in **VS Code** with **PyTorch** and **VGG** architecture, functions by leveraging the camera to capture images in real-time. These images are then processed through a pre-trained VGG model fine-tuned on a diverse dataset of living beings. PyTorch facilitates seamless model creation, training, and inference. Upon capturing a picture, the app quickly analyses it, utilizing the trained model to distinguish various living beings present in the image.

1.2 Technology Used

1. **Programming Language**: **Python** is a widely used programming language in the field of deep learning due to its simplicity, flexibility, and robust ecosystem of libraries and frameworks.

2. **Convolutional Neural Networks (CNNs)**: CNNs are the primary technology used for image classification tasks due to their ability to learn hierarchical features from images.

3. **Deep Learning Frameworks**: **PyTorch**, are popular framework for building, training, and deploying CNN models. **Apache MXNet** is an open-source deep learning framework known for its scalability and efficiency, making it suitable for both research and production environments.

4. **Platform**: In this project, **VS Code** provides a robust development environment, offering seamless integration with Python, facilitating code writing, debugging, and version control, thereby accelerating the creation of the image classification app.

5. **Transfer Learning**: Pre-trained CNN model **VGG** is commonly used as a starting point, with fine-tuning on specific datasets to adapt to the classification task.

Chapter 2: Proposed Methodology

1. **Problem Definition:**

- Clearly define the task as creating an image classification application to identify the disease according the image.

- Specify the objective as achieving high accuracy in classifying the disease to assist doctors and surgeons.

2. **Data Collection and Preparation**:

- Ensure proper labelling of images with the corresponding disease.

- Split the dataset into training (60%), validation (20%), and testing (20%) sets

3. **Model Selection**:

- Choose a suitable deep learning architecture for image classification tasks, such as a Convolutional Neural Network (CNN).

- Consider popular architectures like VGG, which have shown strong performance on similar tasks.

- Evaluate the feasibility of transfer learning by leveraging pre-trained models on ImageNet to expedite training and improve performance.

4. Training:

- Utilize techniques like learning rate scheduling and early stopping to prevent overfitting and improve convergence.

- Monitor the model's performance on the validation set and adjust hyper parameters accordingly.

5. Deployment:

- Deploy the trained model as part of an image classification application with a user-friendly interface.

- Provide users with the ability to upload medical images of X-rays, CT scans, MRIs or ultrasounds and receive classification results in real-time.

Chapter 3: Applications and Scope

1.1 Applications And Scopes:

- **Disease Diagnosis**: Medical image classification aids in the early and accurate detection of various diseases, including cancer, cardiovascular diseases, neurological disorders, and more. By analysing medical images such as X-rays, MRIs, CT scans, and ultrasounds, classifiers can assist radiologists and clinicians in identifying abnormalities and making timely diagnoses.

- **Tumour Detection and Segmentation**: Image classification techniques can be used to identify and classify tumours within medical images. This includes distinguishing between benign and malignant tumours, as well as segmenting tumour boundaries for precise localization and measurement.

- **Organ Segmentation**: Automated segmentation of organs and anatomical structures from medical images is essential for treatment planning, surgical navigation, and radiation therapy. Classification algorithms help in accurately delineating organ boundaries and differentiating between different tissues and structures.

- **Image Enhancement and Reconstruction**: Classification methods can contribute to enhancing the quality of medical images by reducing noise, artifacts, and enhancing contrast. This improves the interpretability of images and aids in better visualization of anatomical details.

- **Monitoring Disease Progression**: By analysing sequential medical images taken over time, classification algorithms can track the progression of diseases, such as monitoring tumour growth or assessing the effectiveness of treatment interventions.

1.2 References :

- **Chat-Gpt**
- **https://www.sciencedirect.com**
- **https://github.com**