

Face Detection Project

Objective

The objective of this project is to build, evaluate, and deploy face detection models using a publicly available dataset. The project aims to evaluate proficiency in data preprocessing, model development, training, evaluation, optimization, and deployment using PyTorch or Keras for model building and OpenCV for showcasing the final application.

Dataset

- **Source:** Kaggle
- **URL:** [Face Detection Dataset](#)
- **Description:** The dataset contains labeled images for face detection tasks, including bounding boxes for faces.

Project Components

1. **Data Preparation**
 - Load the dataset and explore the data.
 - Perform data preprocessing, including resizing images, normalizing pixel values, and splitting the dataset into training, validation, and test sets.
2. **Model Development**
 - Implement a basic Convolutional Neural Network (CNN) for face detection using PyTorch or Keras.
 - Optionally, experiment with more advanced models like SSD (Single Shot MultiBox Detector).
 - Utilize transfer learning by employing pre-trained models such as MobileNet, VGG, or ResNet.
 - **Do not use YOLO from Ultralytics.** Encourage the use of alternative algorithms for face detection.
3. **Model Training**
 - Train the model using the training dataset.
 - Implement data augmentation techniques to improve model robustness.
 - Monitor training using metrics such as loss, accuracy, precision, recall, and F1-score.
4. **Model Evaluation**
 - Evaluate the model on the validation and test sets.
 - Use metrics like IoU (Intersection over Union) and mAP (mean Average Precision) for bounding box evaluation.
 - Plot confusion matrices and precision-recall curves.
5. **Model Optimization**
 - Perform hyperparameter tuning to optimize the model.
 - Experiment with different optimizers, learning rates, and batch sizes.

- Implement regularization techniques to prevent overfitting.
- 6. **Deployment**
 - **Use OpenCV to showcase the face detection model.**
 - Create a simple application using OpenCV to demonstrate face detection.
 - Provide a user interface to upload images and display detection results.
- 7. **Documentation**
 - Document the entire process, including data preprocessing, model development, training, evaluation, and deployment.
 - Include comments and explanations in the code for clarity.
 - Prepare a final report or presentation summarizing the project outcomes, challenges faced, and future work.

Submission Guidelines

- Upload your code to a shared drive or repository (e.g., GitHub) and provide the link.
- Ensure that your submission is organized, clear, and easy to follow.
- The project must be completed within 5 days. Deadline for submission: **23 July 2024**

Assessment Criteria

- **Understanding of AI Concepts:** Demonstrated understanding of face detection principles and model development.
- **Technical Skills:** Proficiency in using relevant tools and libraries (e.g., PyTorch, Keras, OpenCV).
- **Problem-Solving:** Ability to preprocess data, develop models, and address challenges during the project.
- **Model Performance:** Quality and accuracy of the developed face detection model.
- **Documentation and Communication:** Clarity and thoroughness of documentation, code comments, and final report/presentation.
- **Innovation:** Creativity in model optimization, data augmentation, and application deployment.