21CSC558J - Deep Learning Approaches

Project : 1 - For the register number ending in odd number

Facial Age Group Prediction and Identity Verification using Deep Learning

Problem Statement:

Develop a deep learning model that accurately predicts the age group of a person and verifies their identity by matching a selfie image with their corresponding ID image. The system must utilize a curated dataset of facial images from the Selfies and ID Dataset, encompassing a wide range of age groups, ethnicities, and genders. The objective is to improve the robustness and fairness of facial recognition and age estimation systems using advanced deep learning techniques.

Dataset :
https://www.kaggle.com/datasets/trainingdatapro/age-detection-human-faces-18-60-years

Implementation Stages and Mark Distribution (Total: 20 Marks):

Stage	Description	Marks
1. Problem Understanding and Literature Review	Clearly define the problem and objectives. Review relevant research and existing deep learning approaches for age prediction and face verification.	2
2. Data Preprocessing and Augmentation	Perform data cleaning and preprocessing. Implement suitable image augmentation techniques to increase dataset variability and balance.	3
3. Model Selection and Architecture Design	Choose appropriate deep learning models (e.g., CNN, Siamese Networks). Justify model architecture choices for age prediction and identity verification.	4
4. Model Training and Hyperparameter Tuning	Train the selected models with optimal batch size, learning rate, and epochs. Apply regularization techniques to prevent overfitting.	4
5. Evaluation and Validation	Evaluate model performance using metrics like accuracy, MAE, precision, recall, or AUC as appropriate. Use validation and test sets to ensure generalizability.	3
6. Deployment and Application	Demonstrate a working prototype or interface that takes in selfie and ID images. Show real-time or batch processing for age prediction and identity matching.	2

7. Conclusion and Future Scope	Summarize key findings, performance, and limitations. Suggest potential improvements and future research directions.	2

Total Marks: 20

Project : 2 - For the register number ending in even number

Human Action Recognition using CNN

Problem Statement:

Human Action Recognition (HAR) aims to understand human behavior and assign a label to each action. It has a wide range of applications, and therefore has been attracting increasing attention in the field of computer vision. Human actions can be represented using various data modalities, such as RGB, skeleton, depth, infrared, point cloud, event stream, audio, acceleration, radar, and WiFi signal, which encode different sources of useful yet distinct information and have various advantages depending on the application scenarios. Consequently, lots of existing works have attempted to investigate different types of approaches for HAR using various modalities.

Your task is to build an image classification model using pretrained Convolutional Neural Networks (CNN) with machine learning model (transfer learning approach) that classifies which class of activity a human is performing based on image inputs.

Dataset:
https://www.kaggle.com/datasets/meetnagadia/human-action-recognition-har-dataset/data

Implementation Stages and Mark Distribution (Total: 20 Marks):

Stage	Description	Marks
1. Problem Understanding & Dataset Description	Clear explanation of the HAR problem, real-world relevance, and description of the dataset used (e.g., number of classes, image size, format).	2
2. Data Preprocessing	Image resizing, normalization, data augmentation, and train-test split. Demonstrates good preprocessing pipeline.	3
3. CNN Model Architecture	Proper design of CNN architecture (convolution, pooling, activation, dropout, fully connected layers) suited for image classification.	4
4. Model Compilation & Training	Use of appropriate loss function, optimizer, learning rate, batch size, and number of epochs. Plotting training/validation accuracy and loss.	3
5. Model Evaluation	Evaluation using metrics such as accuracy, precision, recall, F1-score, and confusion matrix on test data.	3
6. Results Interpretation	Explanation of the performance, analysis of misclassifications, and suggestions for improvement.	2

7. Code Quality & Documentation	Clean, modular code with comments and documentation explaining each step of the pipeline.	3

Total Marks: 20
