AGE DETECTION

MODEL USING IMDB-WIKI DATASET -REPORT

INTRODUCTION

- This report summarizes my internship experience, focusing on the project of fine-tuning a pretrained Convolutional Neural Network (CNN) model, specifically VGGFace, for the task of age detection using the IMDB-WIKI dataset. The objective was to adapt an existing deep learning model to predict age more accurately based on facial images. This project allowed me to delve into advanced concepts of deep learning, particularly in transfer learning, data preprocessing, and model evaluation.

BACKGROUND

- The IMDB-WIKI dataset is one of the largest publicly available collections of labeled face images with age and gender information. The VGGFace model, developed by the Visual Geometry Group at Oxford, is a well-known CNN architecture pre-trained on a large dataset for face recognition tasks. However, fine-tuning is necessary when applying it to age prediction due to the differences in task objectives. The main challenge was to adjust the model's parameters to optimize performance for the specific task of age estimation, which involves regression rather than classification.

LEARNING OBJECTIVES

- The primary learning objectives of this project are as follows:
- 1. To understand the principles and application of transfer learning in deep learning models.
- 2. To gain hands-on experience with CNN model fine-tuning.
- 3.To develop skills in data preprocessing, model evaluation, and GUI development.
- 4.To learn how to handle and optimize large-scale datasets in a machine learning pipeline.

ACTIVITIES AND TASKS

1.Data Preprocessing:

- Loaded images from the IMDB-WIKI dataset, resized them to 224x224 pixels, and normalized pixel values.

• Extracted age information from filenames based on the difference between the date of birth and the year the photo was taken.

• Split the dataset into training and validation sets using an 80-20 ratio.

2.Model Fine-Tuning:

• Loaded the pre-trained VGGFace model with its convolutional layers frozen.

• Added custom dense layers on top for regression, with the final layer outputting the predicted age.

• Compiled the model using the Adam optimizer and mean squared error as the loss function.

• Trained the model on the preprocessed data and evaluated its performance on the validation

3.Fine-Tuning:

• Unfroze the last few layers of the VGGFace model to allow fine-tuning.

• Recompiled the model with a lower learning rate and continued training to improve accuracy.

4.Model Evaluation:

• Evaluated the model's performance using the Mean Absolute Error (MAE) metric.

• Saved the trained model for future use.

5.GUI Development:

• Created a simple GUI using Tkinter to allow users to upload an image and predict the age using the trained model.

SKILLS AND COMPETENCIES

During this project, I developed several key skills:

• Deep Learning: Acquired in-depth knowledge of CNNs, transfer learning, and model fine-tuning techniques.

• Data Preprocessing: Learned how to handle large image datasets and implement effective preprocessing pipelines.

• Model Evaluation: Gained experience in evaluating regression models using metrics like MAE.
• GUI Development: Developed proficiency in creating user interfaces with Tkinter to enhance the usability of machine learning models.

FEEDBACK AND EVIDENCE

Feedback from my supervisor highlighted the importance of careful data preprocessing and the value of fine-tuning in improving model performance. Evidence of my work includes the code implementation, model training logs, and the final GUI application. The model demonstrated improved accuracy after fine-tuning, with a significant reduction in validation error.

CHALLENGES AND SOLUTIONS

Throughout the project, I encountered and addressed several challenges:

• Data Quality: The IMDB-WIKI dataset contained mislabeled or corrupt images, which I addressed by implementing error handling during data loading.

• Overfitting: The model initially overfitted to the training data, which I mitigated by using dropout layers, reducing model complexity, and applying early stopping during training.

• Computational Resources: The training process was resource-intensive, which I managed by optimizing batch sizes and utilizing cloud-based resources when necessary.

OUTCOMES AND IMPACT

The fine-tuned VGGFace model achieved a satisfactory MAE on the validation set, demonstrating its potential for accurate age prediction. The project enhanced my understanding of deep learning and transfer learning and provided practical experience in applying these concepts to real-world problems. The GUI application made the model accessible for non-technical users, demonstrating the practical impact of the project.

CONCLUSION

This internship allowed me to apply theoretical knowledge to a complex machine learning project, refining my skills in deep learning, data handling, and software development. The successful completion of the project, including the development of a functional GUI, reflects the achievement of the learning objectives and provides a solid foundation for future work in artificial intelligence and machine learning.