

## Task 7

### Task: Exploration of Deep Learning in Computer Vision with Transfer Learning

**Deadline for Presentation: Thursday, May 2<sup>nd</sup>**

**Team Members: Maximum four allowed**

#### **Objective:**

This task aims to familiarize trainees with deep learning techniques in computer vision, with a focus on transfer learning. Trainees will work on a computer vision problem, utilize transfer learning with pre-trained models, and evaluate the performance of the transferred models.

#### **1. Dataset Selection (15 marks):**

- Choose a computer vision dataset suitable for classification or object detection tasks. The dataset should be publicly available and appropriate for transfer learning experiments.
- Ensure the dataset contains a sufficient number of images and corresponding labels for training and evaluation.

#### **2. Transfer Learning Implementation (35 marks):**

- Preprocess the selected dataset, including data augmentation techniques such as rotation, flipping, and resizing.
- Choose a pre-trained deep learning model (e.g., VGG, ResNet, Inception) suitable for transfer learning.
- Implement transfer learning by loading the pre-trained model and fine-tuning it on the selected dataset.
- Train the transferred model on the dataset and monitor its performance during training.
- Evaluate the performance of the transferred model on a separate validation set and compare it with the performance of a model trained from scratch.

#### **3. Model Comparison and Evaluation (30 marks):**

- Compare the performance of the transferred model with that of a model trained from scratch using appropriate evaluation metrics (e.g., accuracy, precision, recall).
- Analyze the strengths and weaknesses of the transferred model compared to the model trained from scratch.
- Discuss the implications of transfer learning in computer vision tasks and its potential benefits for real-world applications.

#### **4. Fine-tuning and Hyperparameter Tuning (15 marks):**

- Fine-tune the hyperparameters of the transferred model to optimize its performance further.
- Experiment with different hyperparameters such as learning rate, batch size, and optimizer settings.
- Report on the impact of hyperparameter tuning on the performance of the transferred model.

#### **5. Presentation (5 marks):**

- Prepare a concise presentation summarizing the dataset, transfer learning implementation, model comparison, and evaluation.
- Present the findings to peers, highlighting key insights, challenges encountered, and lessons learned during the experimentation process.

**Total Marks: 100**

**Note:**

- Trainees are encouraged to seek guidance from instructors and peers, experiment with different pre-trained models, and explore additional techniques for improving model performance.
- Transfer learning offers a powerful approach to leverage pre-trained models and adapt them to new tasks, reducing the need for extensive training data and computational resources.
- The presentation aims to provide a clear and comprehensive overview of the experimentation process and findings related to transfer learning in computer vision tasks.