**Task 3: Transfer Learning for GSNR Prediction**

**Objective:**

In this assignment, you will learn and apply transfer learning techniques by training a model on a European dataset and then fine-tuning it for predicting GSNR (General Signal-to-Noise Ratio) on a USA dataset. You will explore both feature extraction and fine-tuning methods in transfer learning.

1. **Understanding Transfer Learning:**

* Research and read about transfer learning, focusing on its principles, benefits, and common techniques. Look for reliable sources such as academic papers, textbooks, and reputable online articles.
* Understand the concepts of feature extraction and fine-tuning in transfer learning.

1. **Data Preparation:**

* Obtain the European and USA datasets provided.
* Preprocess the datasets as necessary (e.g., handling missing values, normalization).

1. **Model Training on European Dataset:**

* Choose a suitable model architecture for GSNR prediction.
* Train the model on the European dataset.
* Evaluate the model's performance on a validation set.

1. **Transfer Learning - Feature Extraction:**

* Freeze the initial layers of the trained model.
* Replace the final layers with new layers suitable for the USA dataset.
* Train only the new layers using the USA dataset.
* Evaluate the performance of the model on the USA validation set.

1. **Transfer Learning - Fine-Tuning:**

* Unfreeze some of the earlier layers of the trained model.
* Fine-tune the entire model (or most of it) on the USA dataset.
* Evaluate the performance of the model on the USA validation set.

1. **Comparison and Analysis:**

* Compare the results of the feature extraction method and the fine-tuning method.
* Analyze the performance differences and discuss possible reasons for these differences.
* Provide visualizations (e.g., training/validation loss curves, GSNR prediction accuracy) to support your analysis.

1. Report:

Include code snippets and relevant plots in your report.

Deadline: 5th July 2024