



Implementing Transfer Learning Techniques





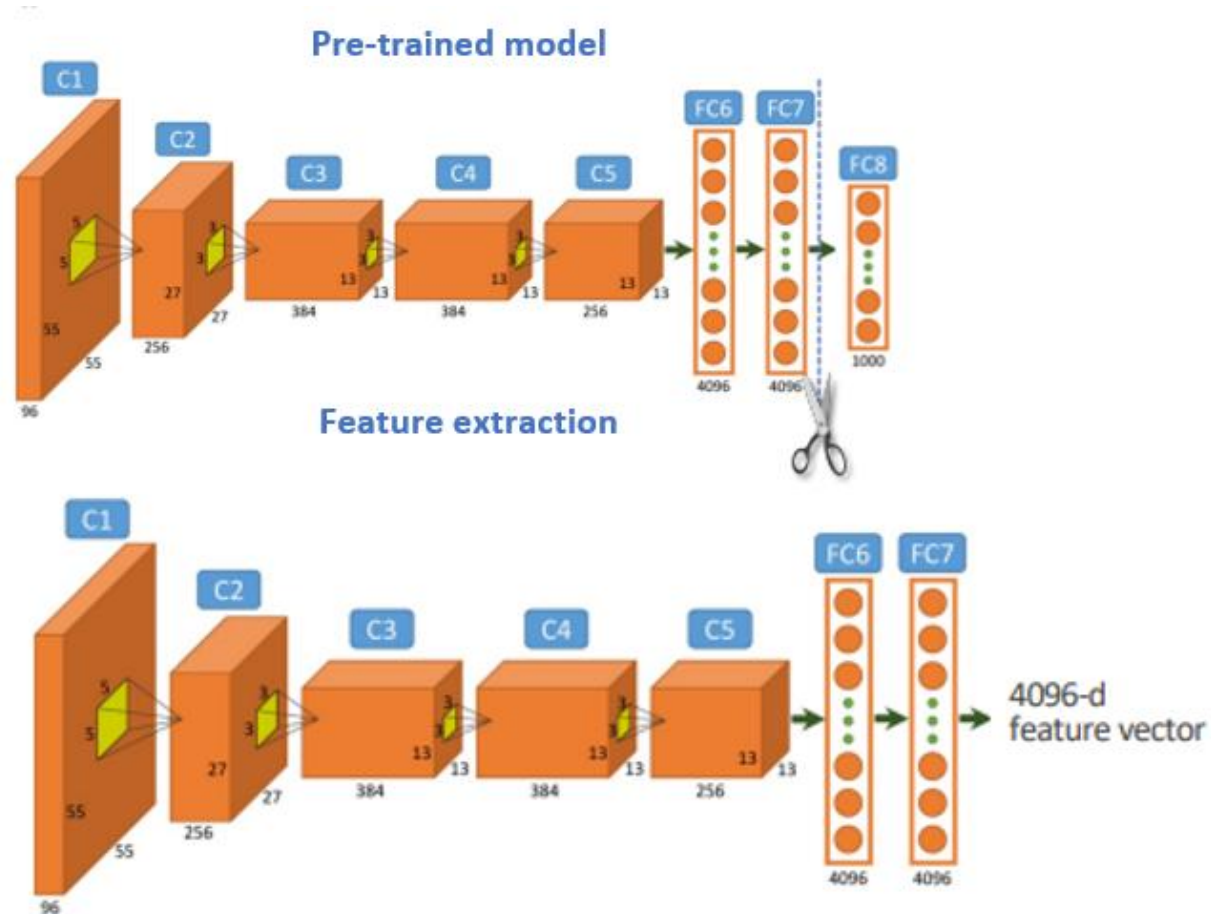
Implementing Transfer Learning Techniques - Objectives

1. Understand Feature extraction.
2. Understand Fine-tuning.
3. Understand LoRA.
4. And compare/contrast these strategies.





What is Feature Extraction?





Feature Extraction Workflow



Select Pre-Trained Model (e.g., ResNet, EfficientNet, BLIP). Closeness to target task/domain helps.



Load Model (with pre-trained weights).



Freeze Early/Base Layers.



Modify/Replace Output Layer(s) for the target task/classes.



Preprocess Data (match model's expected input format).



Extract Features (pass data through frozen layers).



Train *Only* the New Output Layers using extracted features.

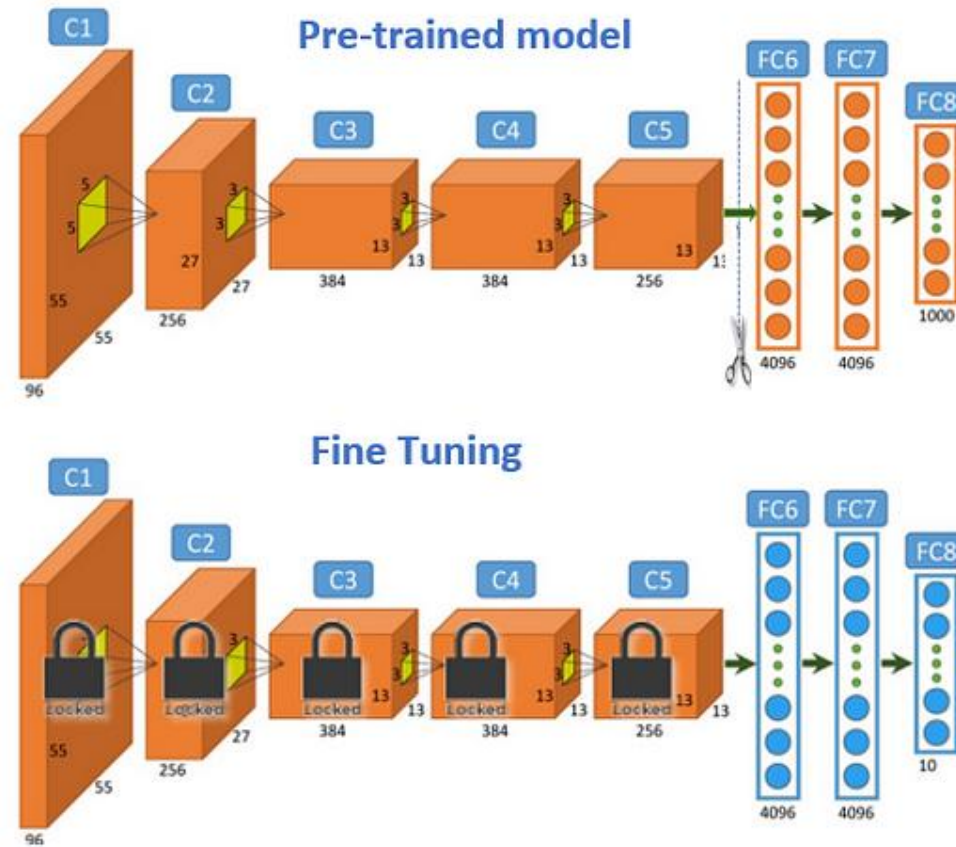


Evaluate and Optimize.





What is Fine-Tuning?





Fine-Tuning Workflow



Select Pre-Trained Model.



Load Model (with pre-trained weights).



Determine Layers to Unfreeze (based on task similarity).



Modify Output Layers.



Adjust Learning Rates (Lower LR for pre-trained layers, higher for new layers is common).



Preprocess Data.



Train the (Partially) Unfrozen Model (monitor validation loss).





Evaluate and Optimize.





Quick Quiz!

Question 1: In which scenario is Feature Extraction generally preferred over Fine-tuning

- A) When the target dataset is very large and very different from the source dataset.
 - B) When you have limited computational resources and the target task is similar to the source task.
 - C) When you need the model to learn completely new low-level features.
 - D) When you want to update all layers of the pre-trained model.
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Answer: B





Quick Quiz!

Question 2: What is a key difference in the workflow between Fine-tuning and Feature Extraction?

- A) Only Fine-tuning requires selecting a pre-trained model.
- B) Only Feature Extraction requires modifying the output layer.
- C) Feature Extraction uses higher learning rates than Fine-tuning.
- D) Fine-tuning involves unfreezing and retraining some base layers, while Feature Extraction keeps them frozen.

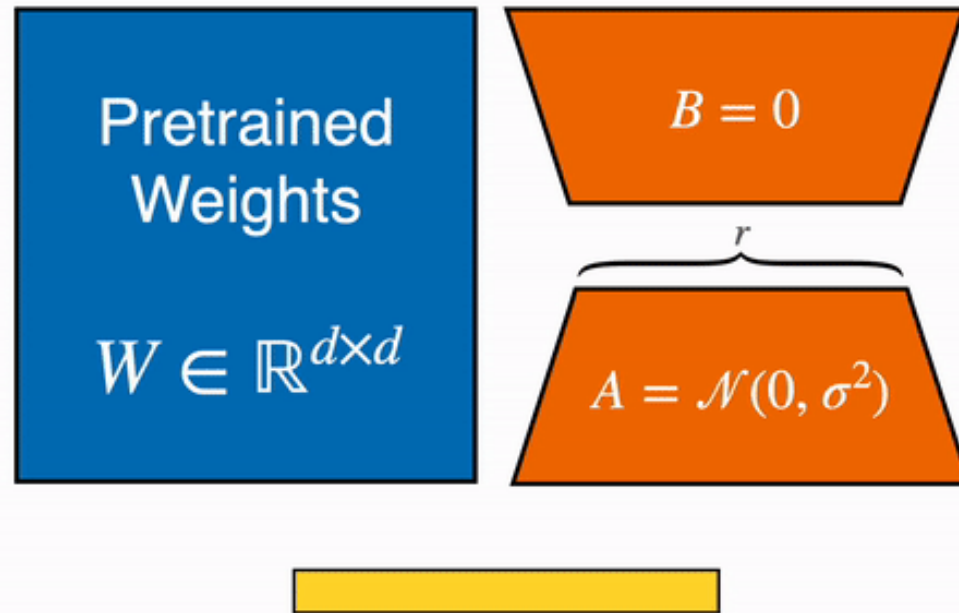


Answer: D

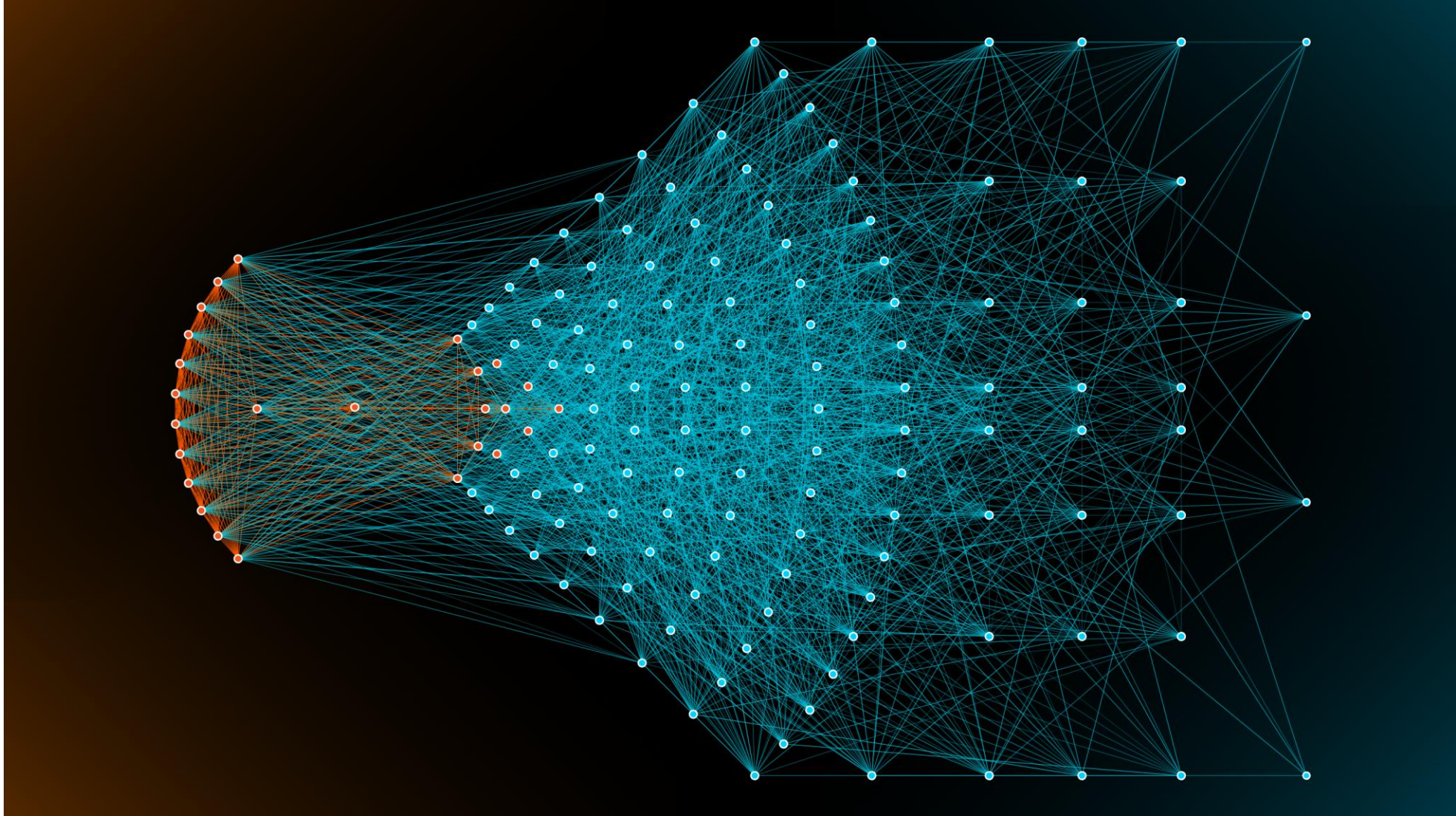




What is LoRA?



When is LoRA Most Effective?





LoRA Workflow



Select Pre-Trained Model



Identify Target Layers for LoRA (Often attention layers).



Apply LoRA Adaptation



Preprocess Data.



Train the Model with LoRA

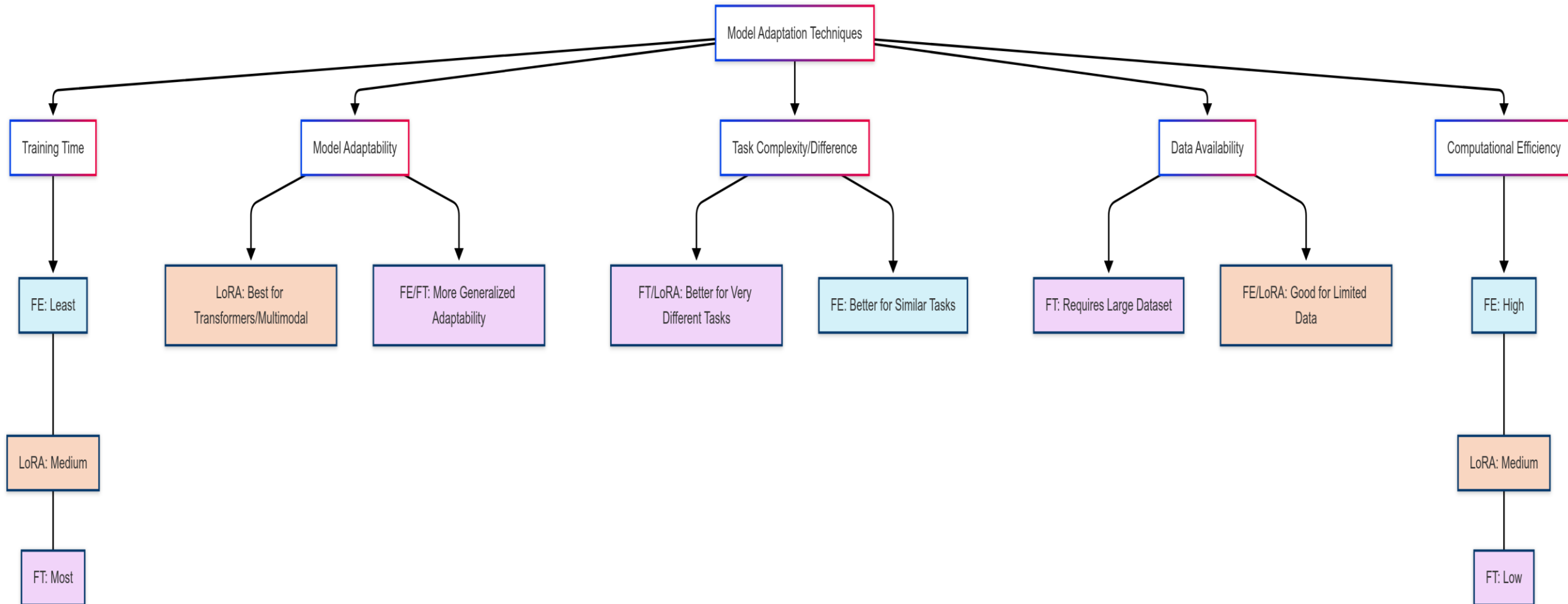


Evaluate and Optimize (Tune LoRA rank ' r ', alpha ' α ').





Choosing Your Strategy: Key Factors





Quick Quiz!

Question 1: If you have a very large target dataset quite different from the source data, and sufficient compute resources, which technique is likely MOST flexible for adapting the model?

- A) Fine-tuning
- B) LoRA
- C) Feature Extraction
- D) Domain Adaptation



Answer: A



Implementation Exercise!!!

