



practicum
building ai knowledge

Transfer Learning Concepts





Transfer Learning Concepts - Objectives

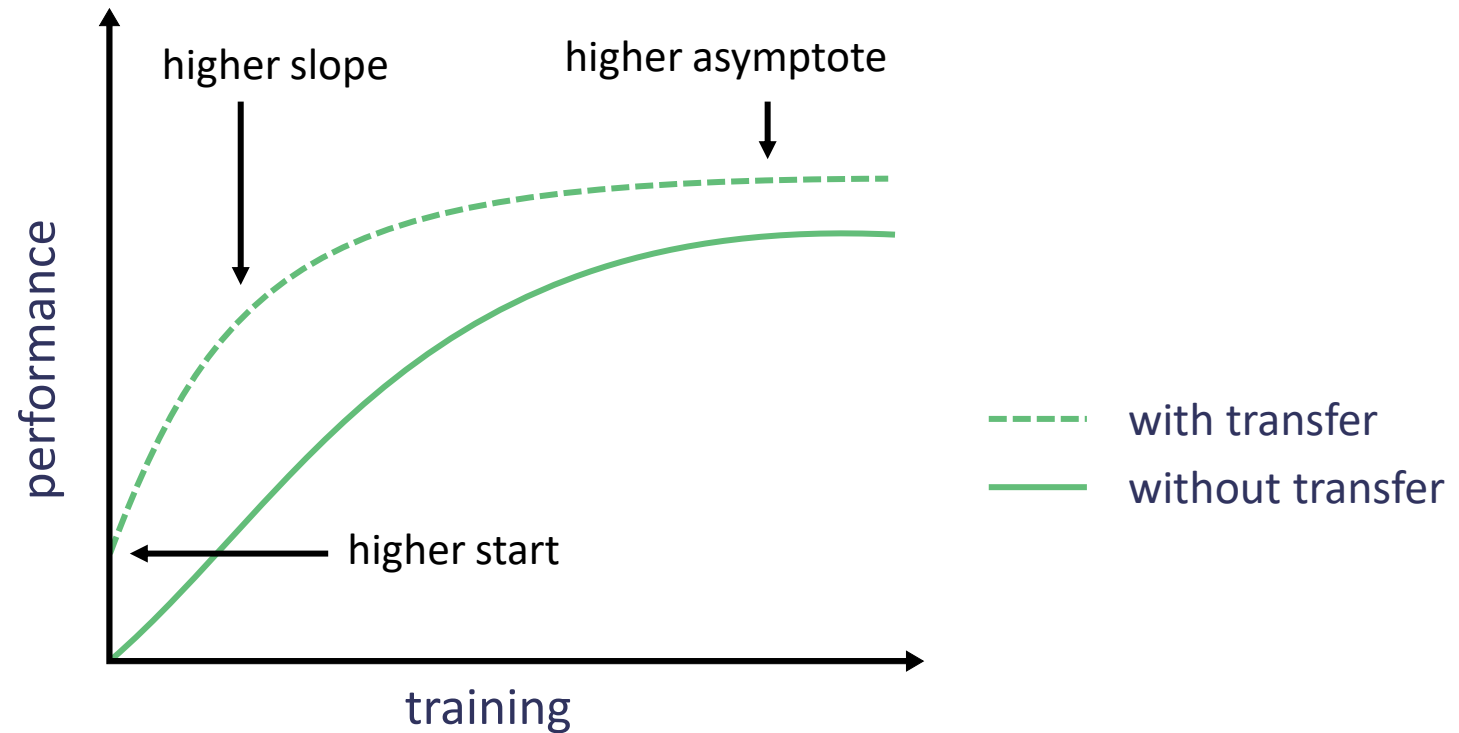
1. Define transfer learning and its benefits.
2. Identify common deep learning tasks using transfer learning.
3. List the steps in a typical transfer learning workflow.
4. Differentiate between key techniques (feature extraction, fine-tuning, LoRA).
5. Explain how knowledge is leveraged from pre-trained models.





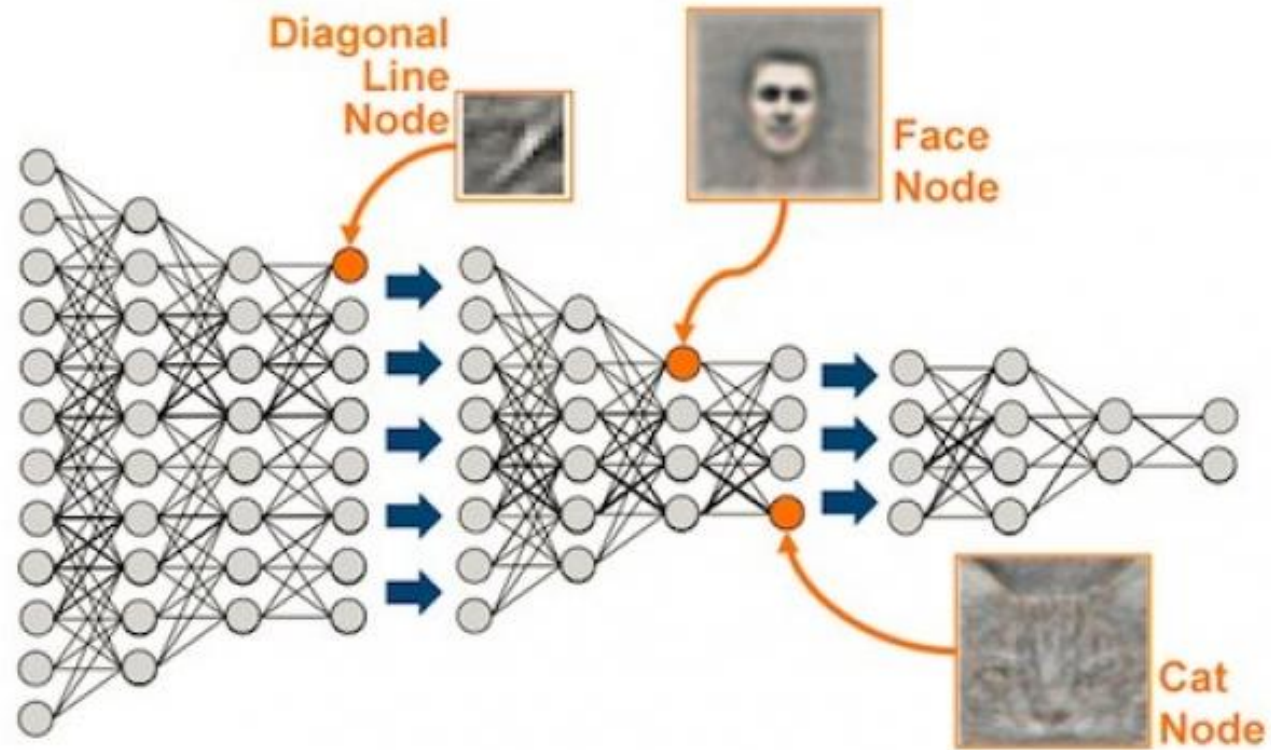
What **is** Transfer Learning?

Leveraging knowledge from a pre-trained model to solve a new but related problem.





Deep Learning Refresher





Deep Learning Refresher - Hyperparameters

- Learning Rate
- Batch Size
- Regularization
- Optimizer
- Epochs

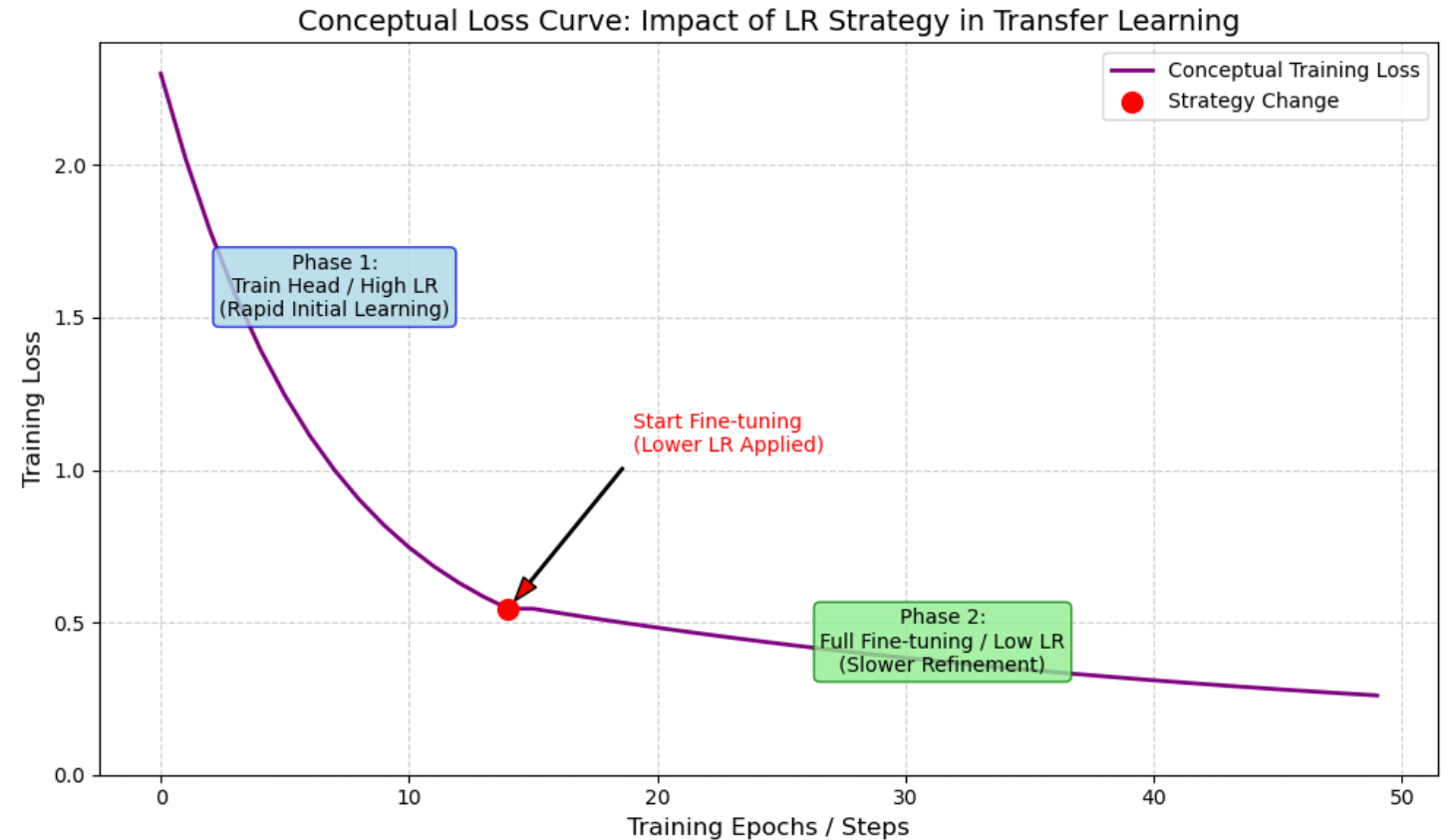
- And a new one: Frozen Layers





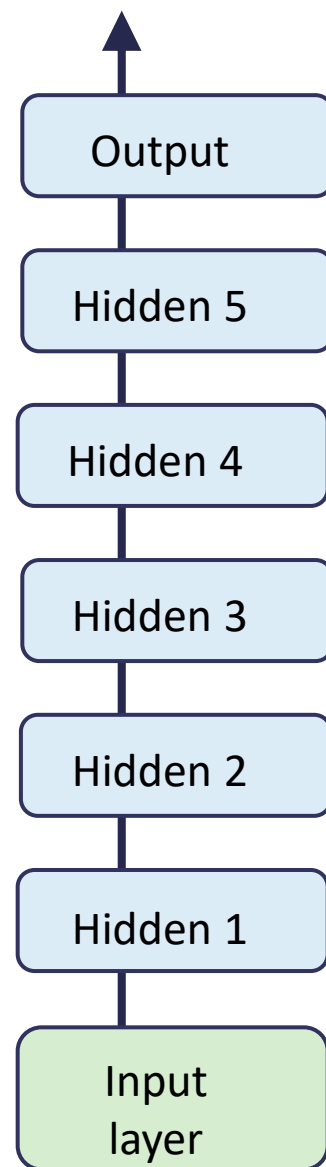
Learning Rate

- Pre-trained layers typically require lower learning rates (10^{-5} to 10^{-4}).
- Newly added layers, however, often benefit from a higher learning rate (10^{-3}).



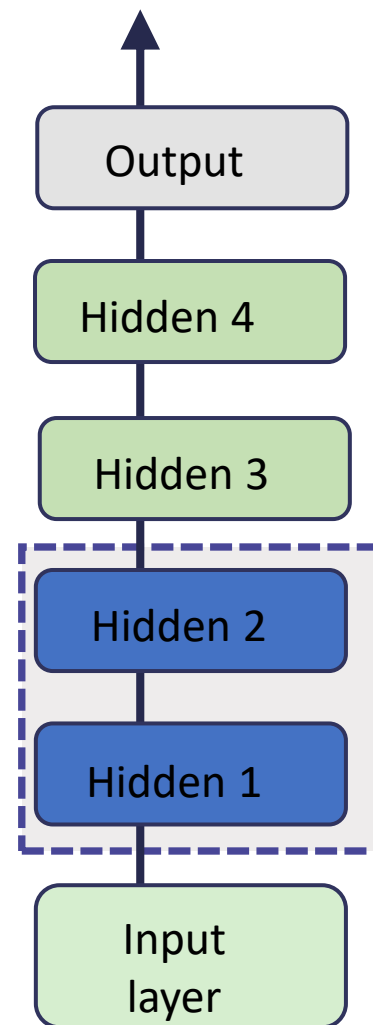
Freezing Layers

- “Freezing” layers is a coding technique of specifying pre-trained layers of a model to **not** update their parameter weights during training.



**Existing
DNN for
task A**

Reuse



**New DNN
for similar
task B**



Trainable
weights



Fixed
weights





Quick Quiz!

Question 1: What is the primary benefit of using a lower learning rate for pre-trained layers during transfer learning?

- A) To speed up training significantly.
- B) To help the model learn new features faster.
- C) To avoid drastically changing weights that already capture useful information.
- D) To initialize the new layers correctly.



Answer: C





Quick Quiz!

Question 2: True or False: Transfer learning typically requires more data and computational resources than training a model from scratch.

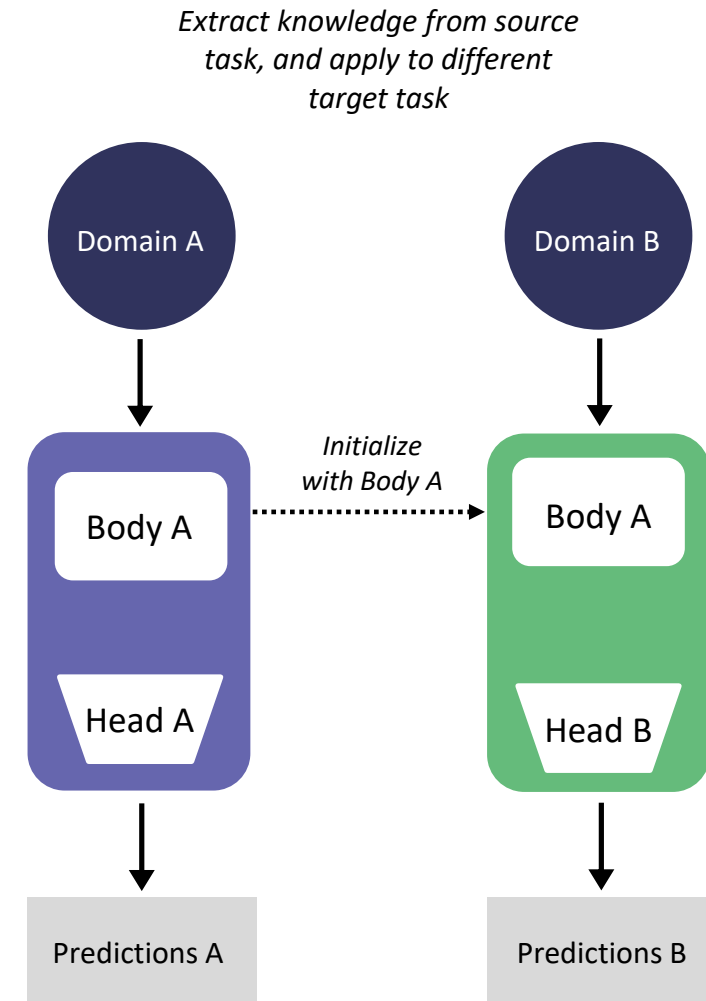


Answer: False



Key Terminology

- Task
- Domain
- Source
- Target



Domain Transfer vs Adaptation



○ Domain Transfer

○ Domain Adaptation



Task Transfer vs Adaptation

○ Task Transfer

○ Task Adaptation





Benefits of Transfer Learning



EFFICIENCY



PERFORMANCE

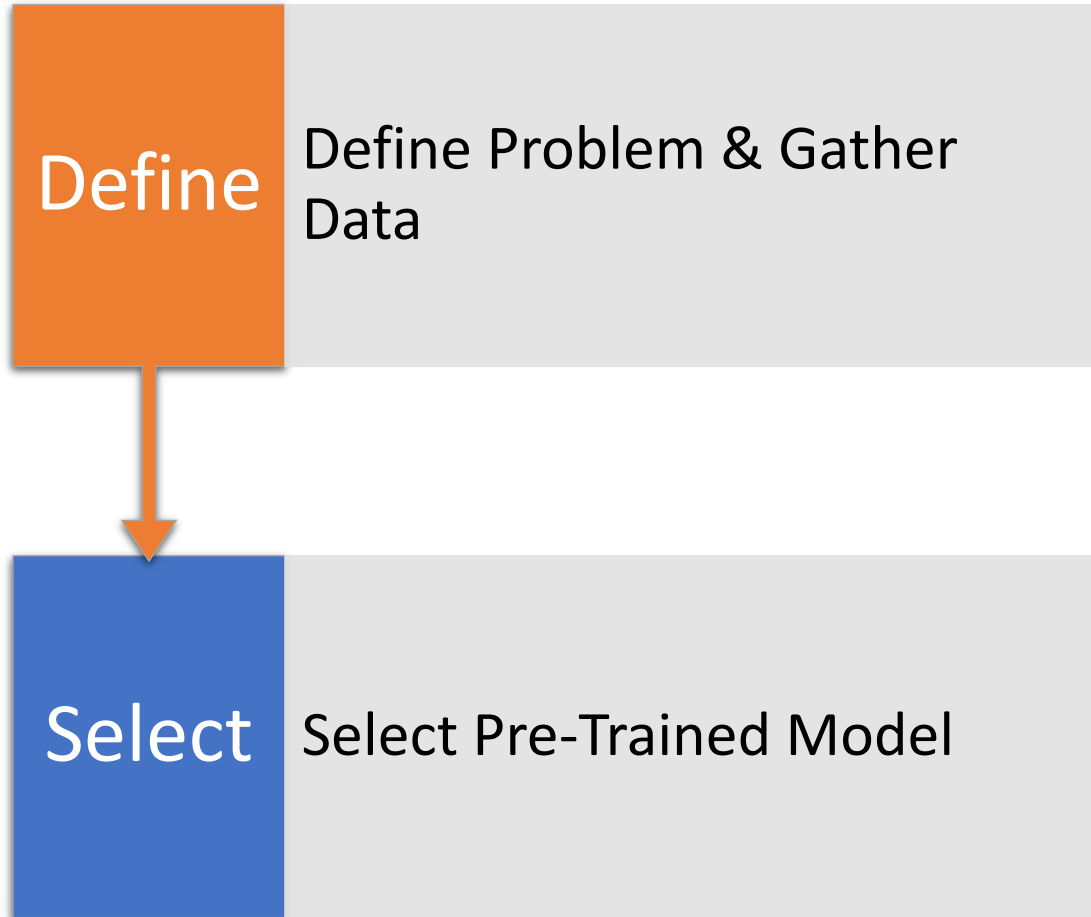


ADAPTABILITY



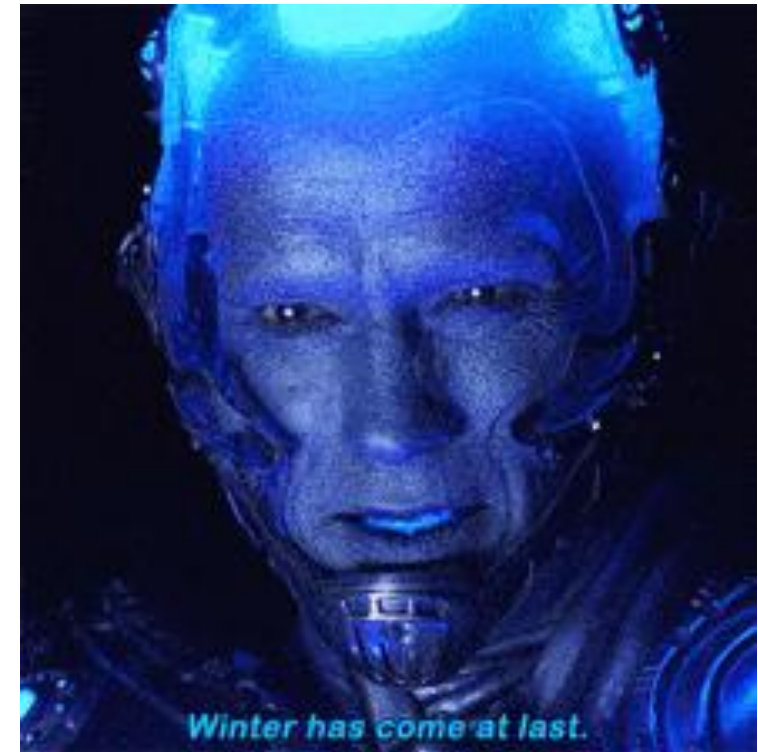
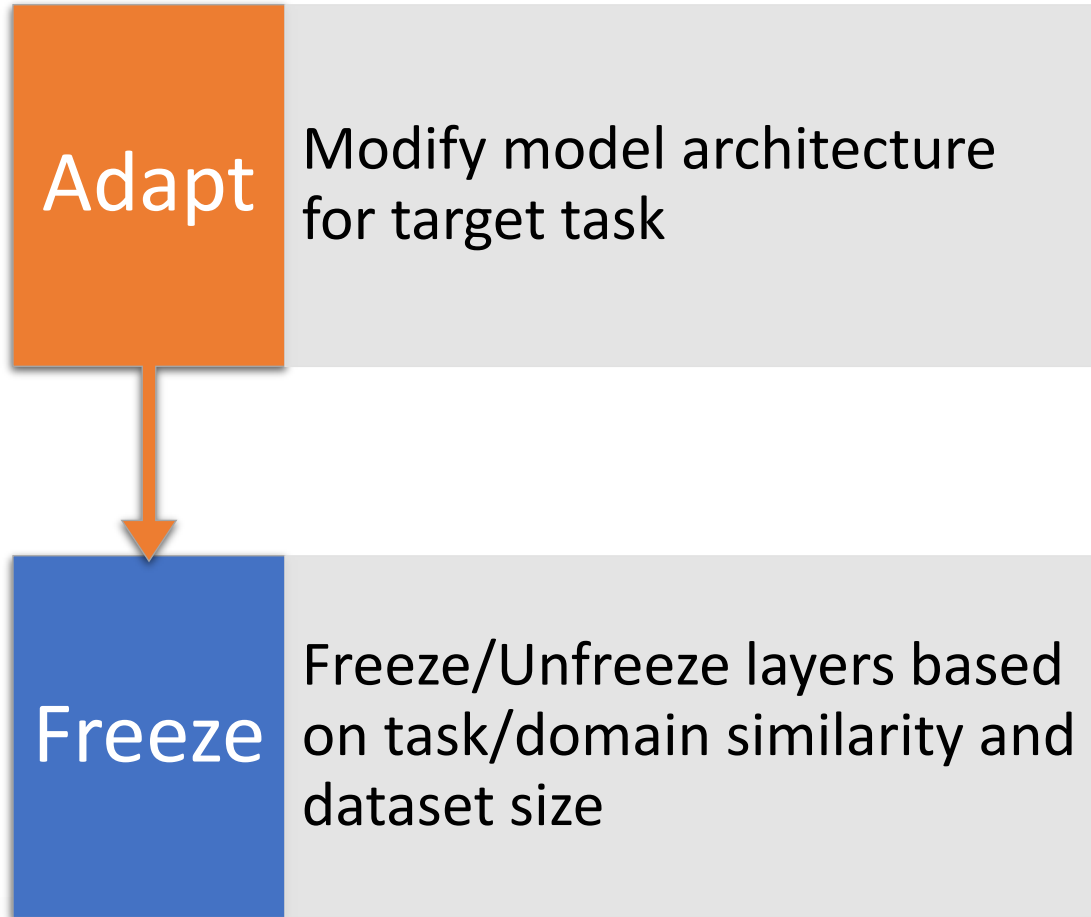


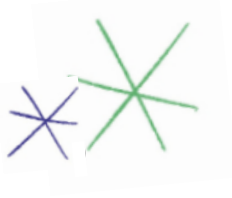
Typical Workflow - Phase 1: Setup & Prep



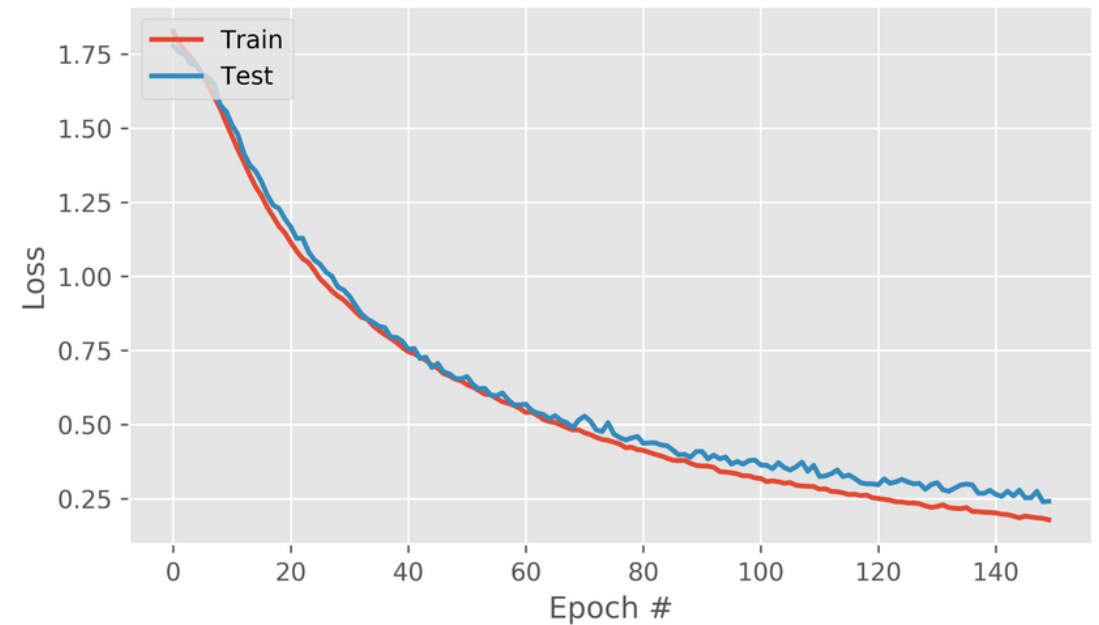
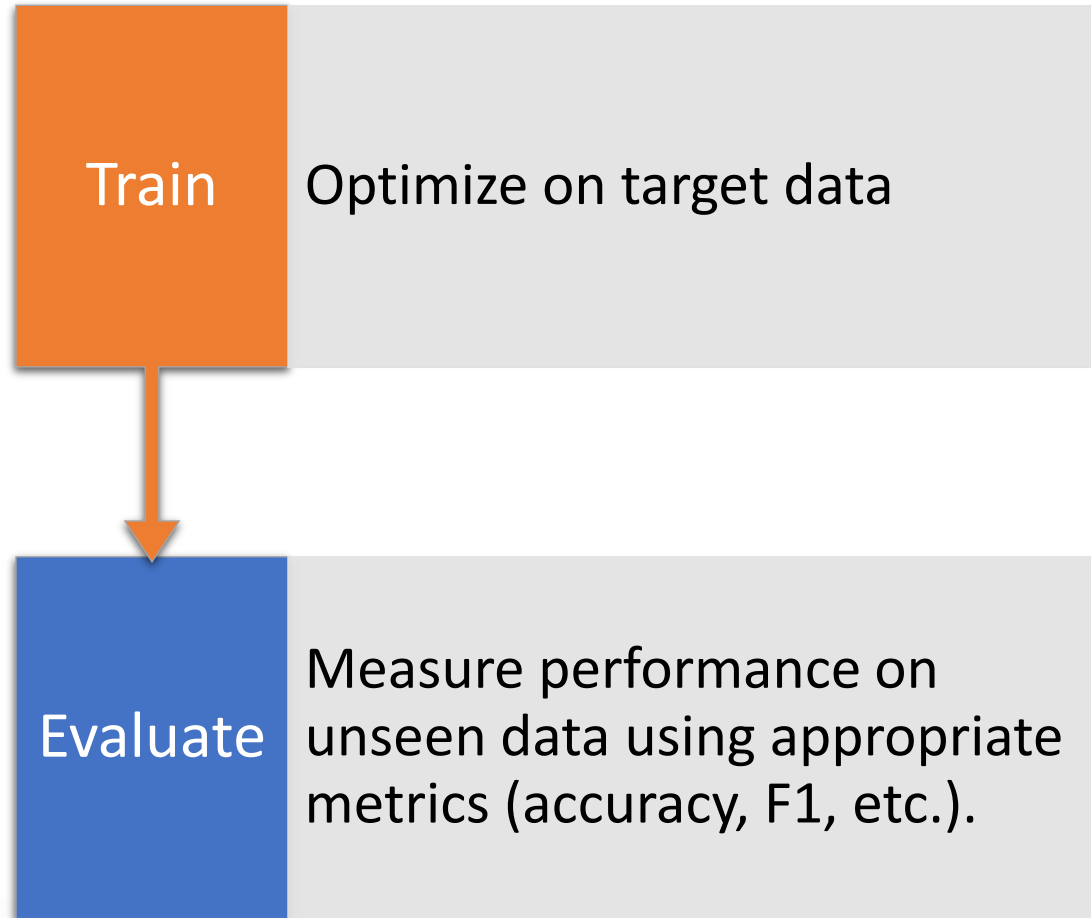


Typical Workflow - Phase 2: Adaptation

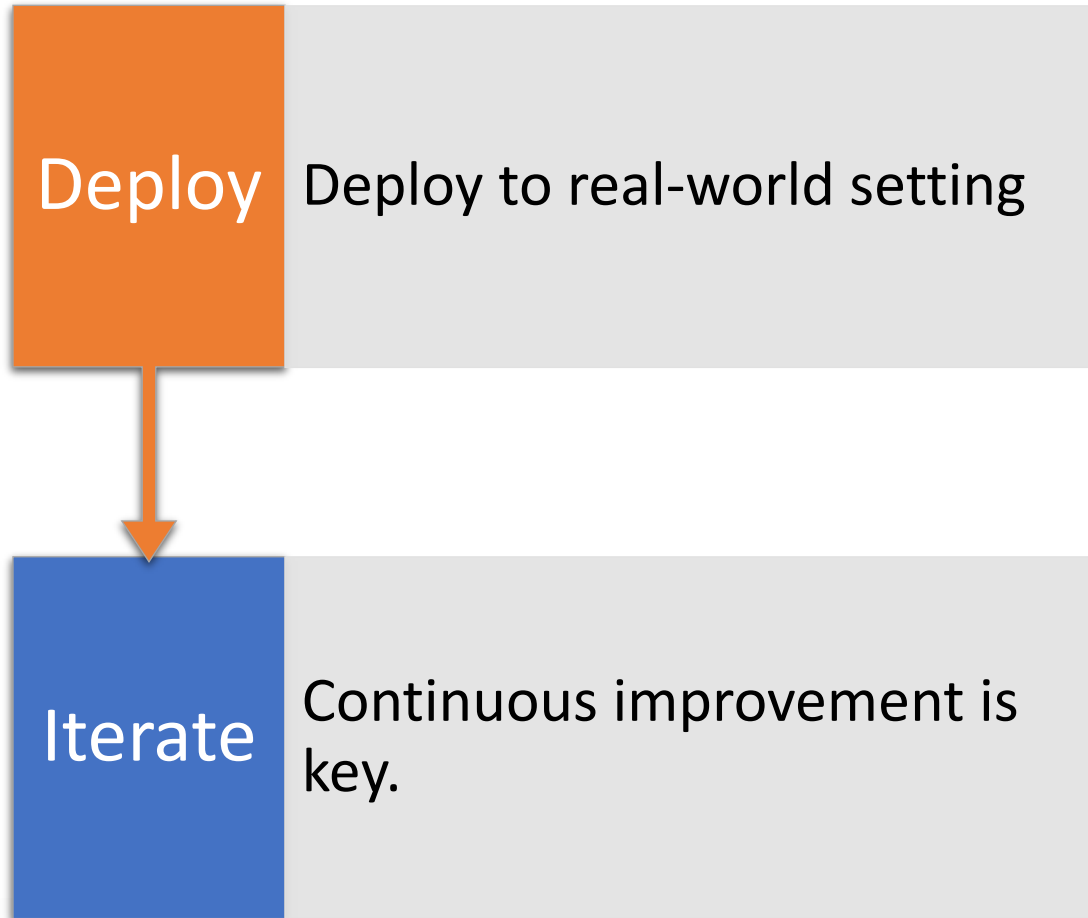




Typical Workflow - Phase 3: Training & Evaluation



Typical Workflow - Phase 4: Deployment & Iteration





Quick Quiz!

Question 1: Which transfer learning technique typically involves freezing *all* layers of the base pre-trained model?

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



Answer: C





Quick Quiz!

Question 2: If your target task domain is very *different* from the source model's domain, what layer freezing strategy is generally recommended?

- A) Freeze all layers.
- B) Freeze only the last layer.
- C) Unfreeze only the first few layers.
- D) Unfreeze most or all layers.



Answer: D





Potential Pitfalls (Brief Mention)

- Catastrophic Forgetting
- Negative Transfer
- Domain Shift



Fine-Tuning Exercise!!!

