

Fine-tuning vs Feature Extraction



Feature Extraction

Freeze pre-trained model, train only new classifier

- ✓ Faster training
- ✓ Requires less data
- ✓ Lower computational cost
- ✓ Fixed feature representation



Fine-tuning

Update pre-trained weights with small learning rate

- ✓ More task-specific adaptation
- ✓ Better final performance
- ✓ Requires more resources
- ✓ Adapts feature representation



Decision Factors

Dataset Size

Task Similarity

Available Resources



Typical Strategy

1. Feature Extraction



2. Evaluate



3. Fine-tune if needed



Advanced Technique

Layer-wise fine-tuning: Gradually unfreeze deeper layers for progressive adaptation