UNIVERSITY OF LEEDS

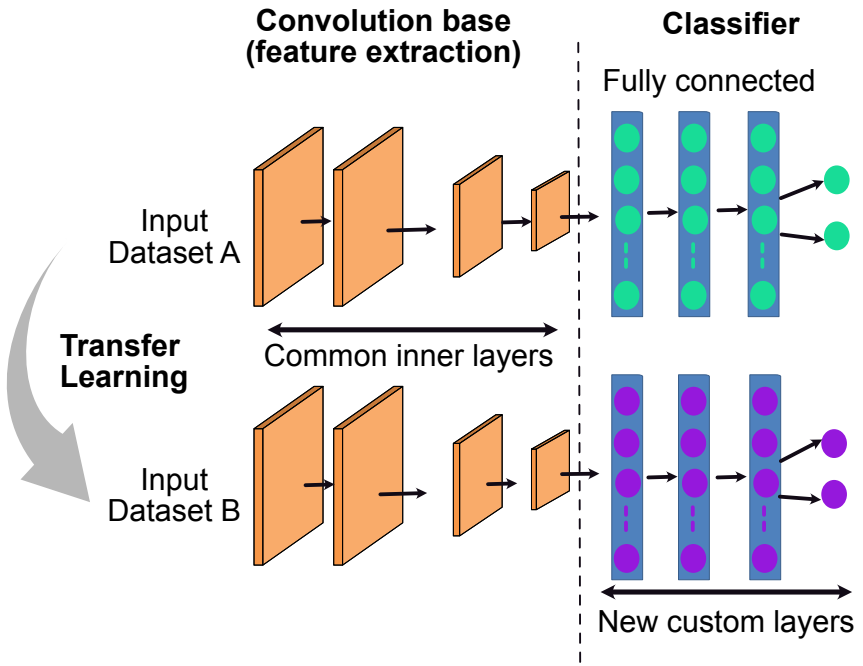
Transfer learning

Deep Learning - COMP5625M

2022-23

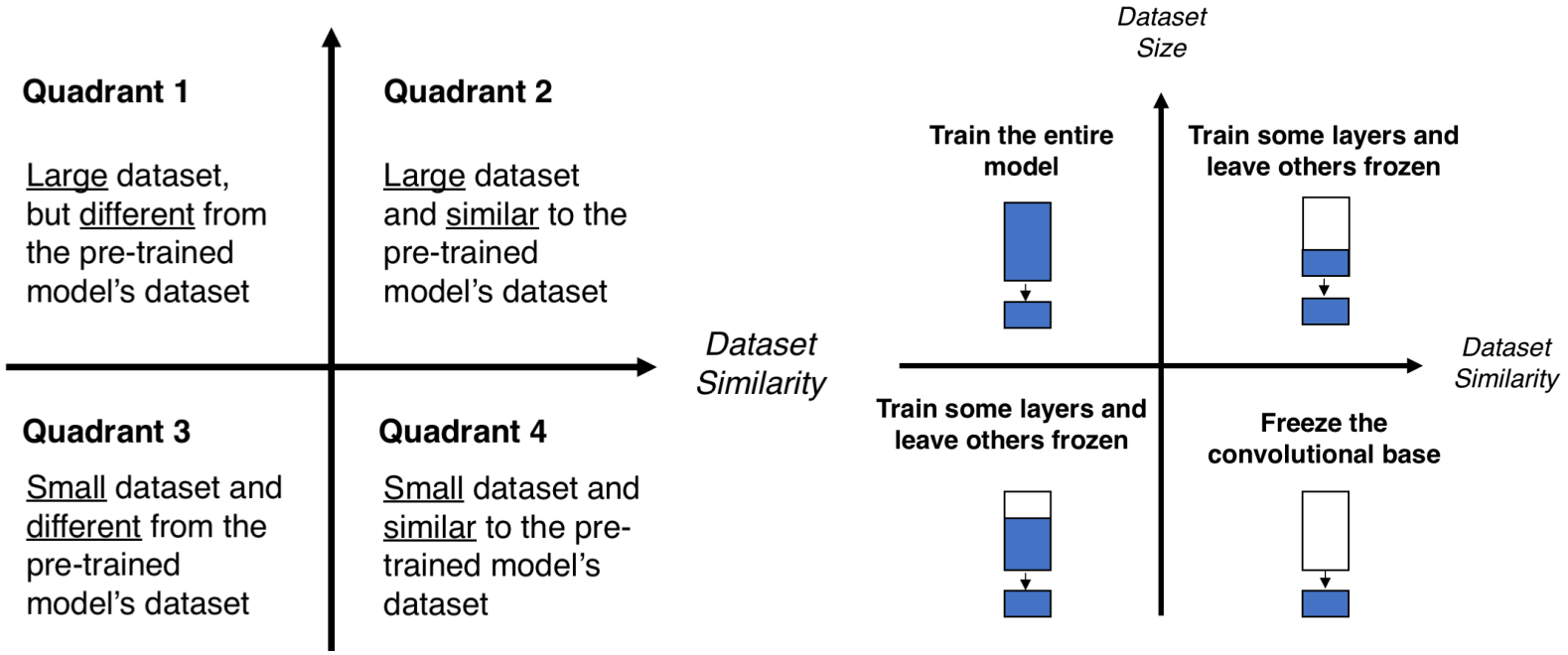
Transfer learning

- Instead of training networks from scratch –
  - Take network trained on different dataset (domain with more samples e.g., imageNet classification)
  - Adapt the trained model to new dataset (domain with less samples, e.g., medical images classification)
- Variations
  - same domain, different task
  - different domain, same task



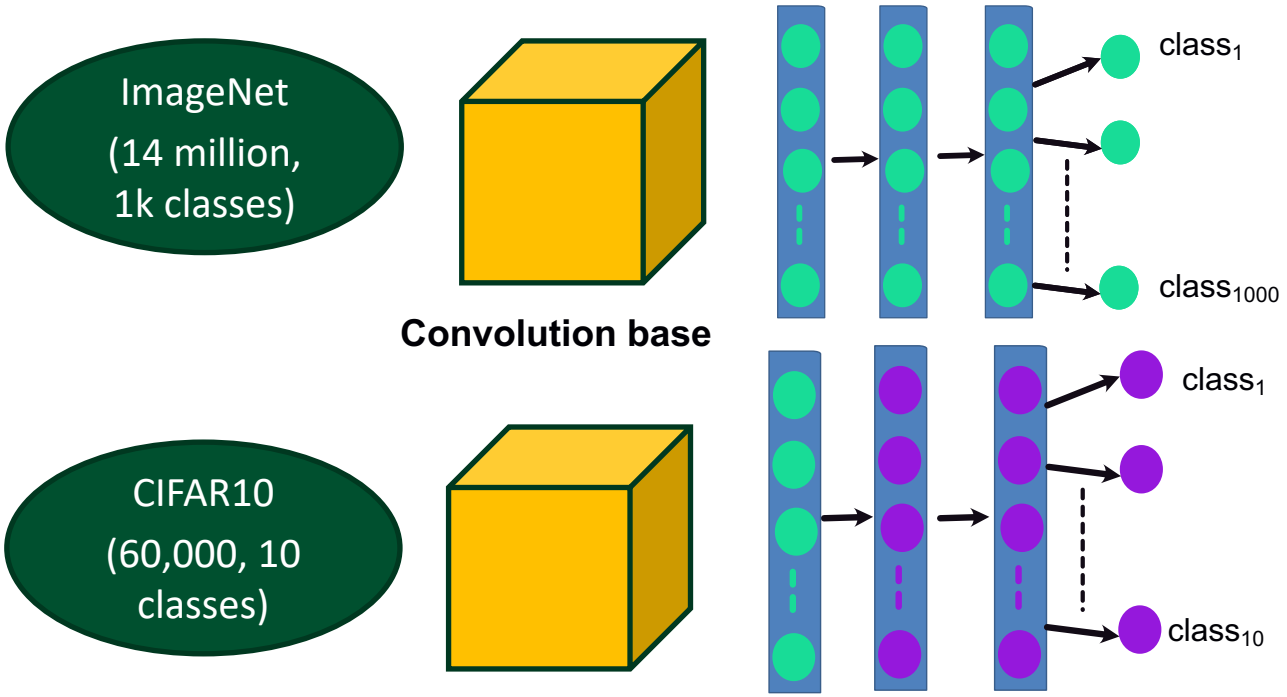
Transfer learning: Fine tuning

- Use a pre-trained model that fits your purpose to fine-tune on another dataset B
  - Train an entire model: Start training model from scratch (large dataset, more computation)
  - Train some layers, freeze others: Lower layer features are general (problem independent) while higher layer features are specific (problem dependent – freeze)
  - Freeze convolution base and train only last FC layers (small dataset and lower computation)



Transfer learning: Fine tuning

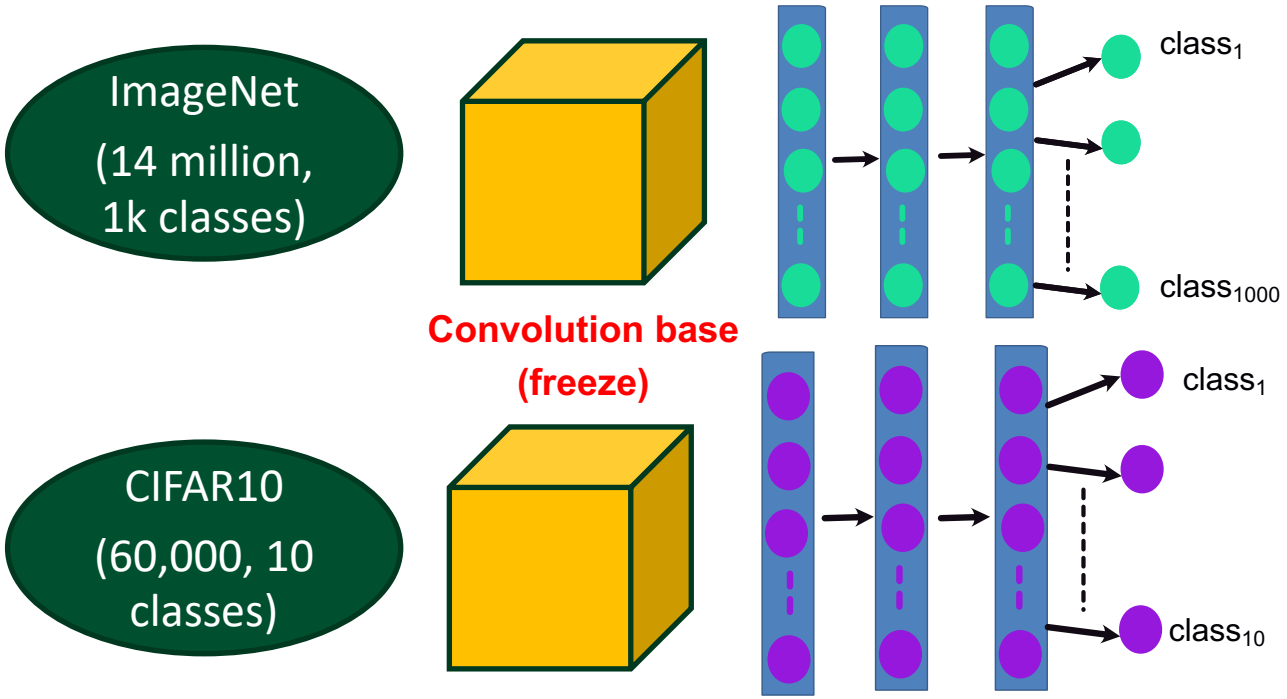
Case I: Let's change last two layers of **AlexNet** that is trained on ImageNet and retrain entire network



Accuracy of the network on the test images: 87 % only at 10 epochs vs 79% w/o TL

Transfer learning: Fine tuning

Case II: Let's change **fix some blocks in convolution base network** and some on fully connected layers



Understanding Transfer Learning via fine tuning

Try on medical dataset (different domain) and very small size. **What things you need to keep in mind?**