COMPUTER VISION

TRANSFER LEARNING

AGENDA

This video lecture focuses on understanding:

- Concept of transfer learning
- Applications of transfer learning

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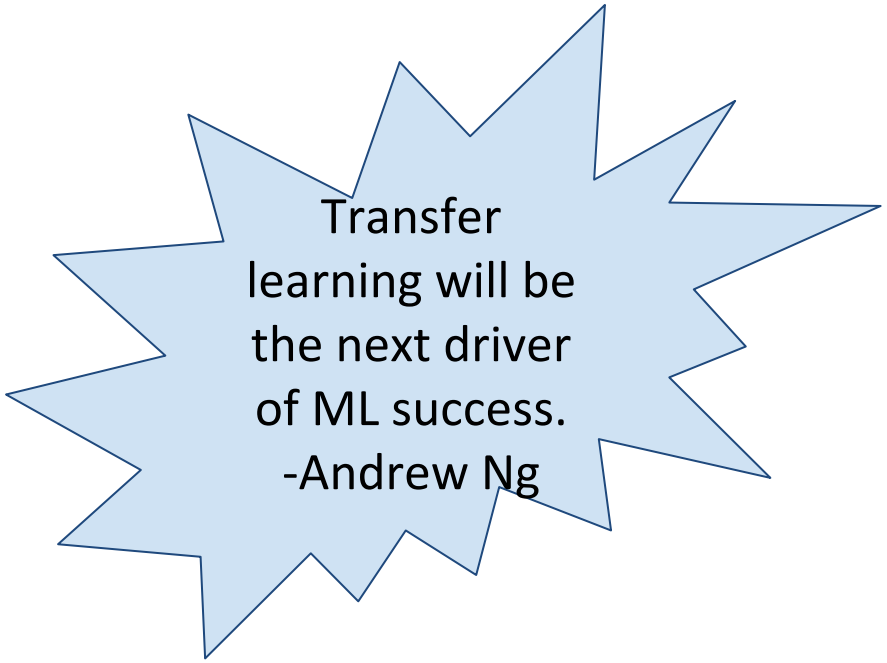
- What is transfer learning?
- How transfer learning works?
- Why transfer learning?
- When to use transfer learning?
- Applications of transfer learning?

WHAT IS TRANSFER LEARNING?

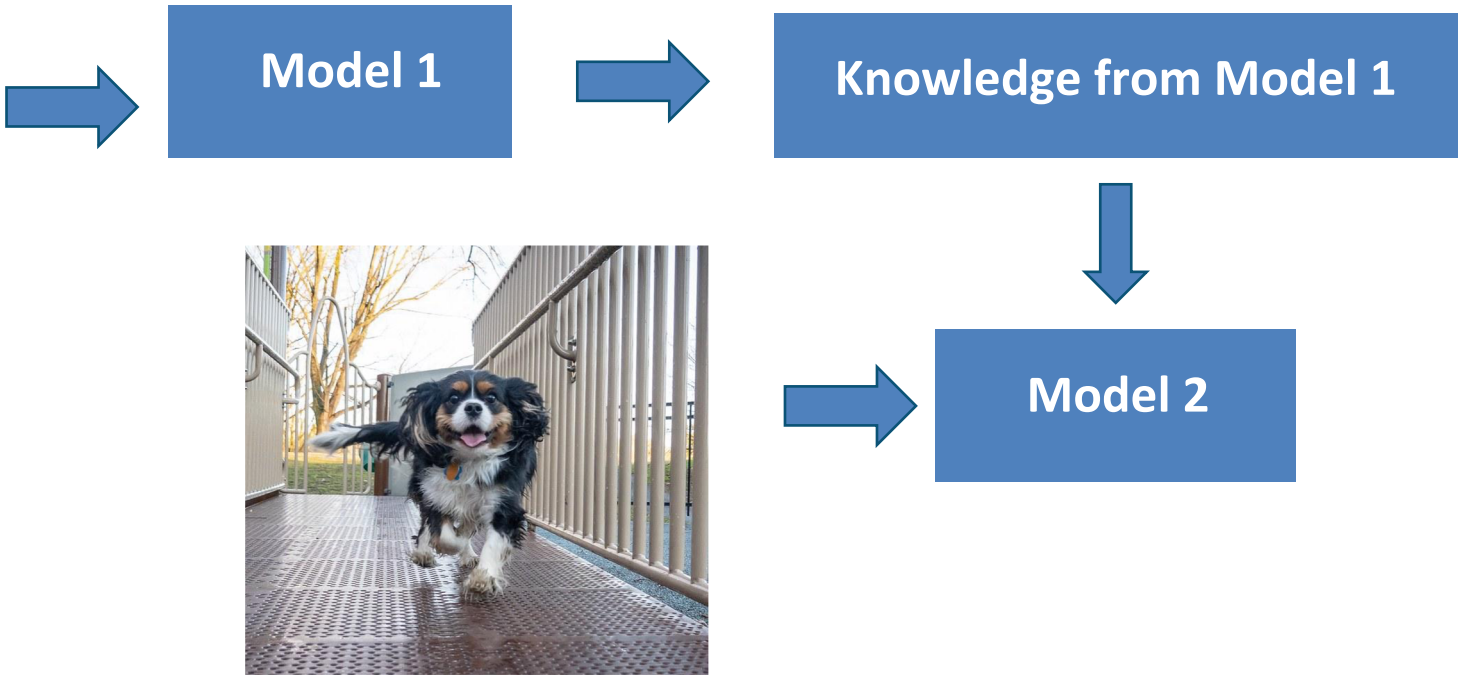
- Transfer learning aims to leverage the learned knowledge from a previous task to help learning a new similar task.
- In CNN, instead of learning new weights from scratch, we try to utilize the learned weights from the previously trained architectures.
- This is a way to transfer knowledge from a pre-trained architectures to make prediction on a new dataset.



HOW TRANSFER LEARNING WORKS?

Model 1 is trained on dataset 1 and has learned important features. Transfer learning will utilize the features learned by Model 1 to build the Model 2 which will be used to make prediction on dataset-2.

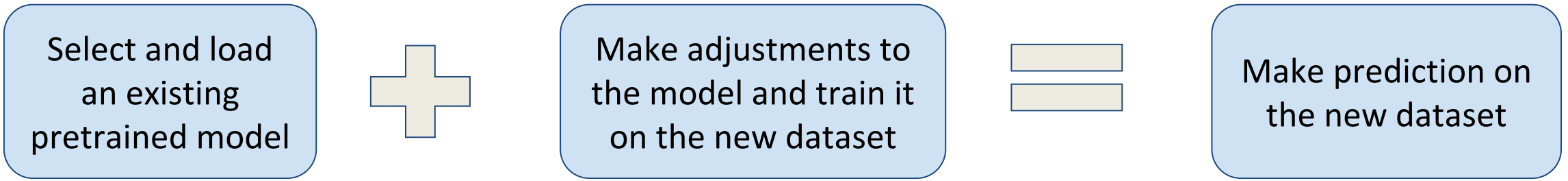
Dataset 1



Dataset 2

HOW TRANSFER LEARNING WORKS?

1. Load the pre-trained model architecture and its weights and adjust the input and output layer. No new learning involved. (Weights for all the layers are frozen)
2. Load the pre-trained model architecture and its weights but train a few layers on the new dataset based on the data similarity. (Weights for a few layers are frozen)
3. Load the pre-trained model architecture and train the entire model on the new dataset. (Use weights for initialization)



WHY TRANSFER LEARNING WORKS IN CNN AND WHY TO USE IT?

- In CNN, generally, initial layers try to detect edges, middle layer try to learn shapes and the later layers learn some task-specific features.
- When we use the pre trained models, we can utilise the features learned by early and middle layers.

1. Easy to train
2. Saves training time
3. Deal with scarcity of data
4. Generally, better performance with less data

WHEN TO USE TRANSFER LEARNING IN PRACTICE?

1. When training data is not sufficient.
2. There is already a good pre-trained model on a similar task.

Example in CNN - pre-trained architectures like VGG, GoogleNet, ResNet trained on ImageNet data are used to build image classifiers for common images having less number of training data

Example in NLP - Usage of embedding like Google's word2vec, Stanford's GloVe Model, etc.

SUMMARY

- Transfer learning is a where machines utilize the knowledge acquired from one task to solve other similar tasks.
- It is popularly used in CNN and NLP domain.