Transfer Learning

Leveraging pretrained models and adapting them to your problem

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Outline

- Learning Goals

- Idea Behind Transfer Learning

- Step-by-step transfer learning procedure

- Summary

Learning Goals

- Understand the motivation behind transfer learning approaches

- Understand the general transfer learning procedure
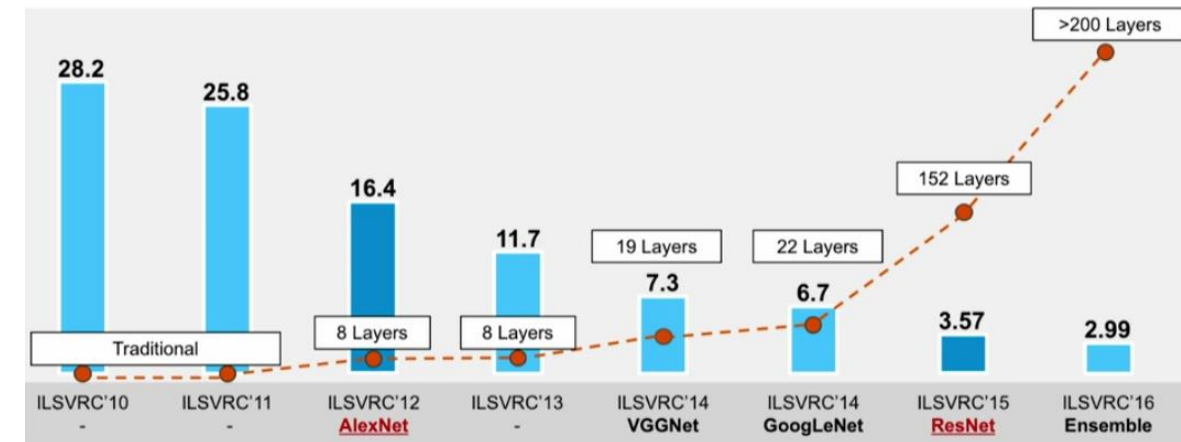
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Transfer Learning

- **Transfer learning** is the process of adapting a representation learned while solving one problem and adapting this representation to a different but related problem.

- It is very useful when you do not have large amounts of data to train your model from scratch.

- This Keras tutorial is highly recommended: https://keras.io/guides/transfer_learning/

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ImageNet Challenge

- In 2012 teams started using graphics processing units (GPUs)

- ImageNet is a large scale object classification challenge
- >14,000,000 annotated images
- >20,000 classes
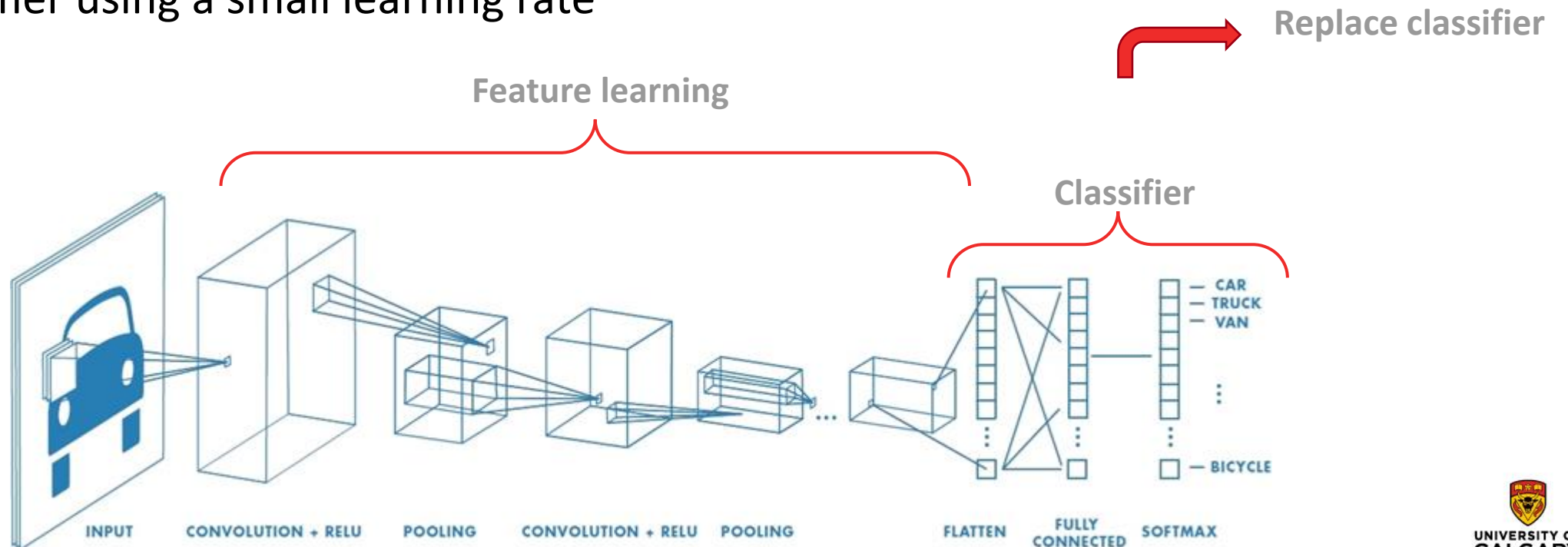
Lasagna or endocarditis?

Transfer Learning

- Use a model pre-trained for a different task and:
  - Freeze the feature learning layers and re-train the classifier on new data
  - Then, unfreeze the feature learning layers and retrain them along with the classifier using a small learning rate

Replace classifier

Feature learning

Classifier

INPUT   CONVOLUTION + RELU   POOLING   CONVOLUTION + RELU   POOLING   FLATTEN   FULLY CONNECTED   SOFTMAX

CAR
TRUCK
VAN

BICYCLE

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Summary

- Transfer learning is a powerful technique for situations where your dataset has too little data to train a full-scale model from scratch

- It relies on the assumption that the representation that you learned for one problem will be useful for a separate but related problem

Thank you!

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