

Transfer Learning in Computer Vision

Agenda

- Intro to Transfer Learning
- Different Computer Vision (CV) Tasks
- Demo of Multi class Classification
- Some of the astonishing results that are achieved in CV tasks
- Converting other tasks into CV tasks

Intro to Transfer Learning

What?

- Attached Clip is synonymous to indicate how Transfer learning works.
- Training Deep Neural Networks requires large data and resource intensive, very few of us will have the necessary resources to be able to train the complete network
- Transfer comes to our rescue where It helps us to harness the learning of a Neural Network used for one task to be used for another domain.

When?

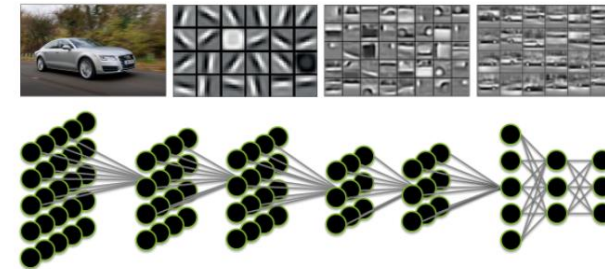
- 2 main reasons where we can utilize Transfer Learning size of dataset, and its similarity to the original dataset.
- Transfer does not apply only to Image data alone Language Models and Speech Recognition are new other areas it has proved to excel.

How?

- We take existing CNN architectures and remove the last layer used for prediction and replace it with the one which is suitable for an existing prediction task.
- Some of the most important scenarios where it is helpful are Feature Extraction, Fine-Tuning existing Networks and Pre-trained models.
- Both Pytorch and Tensorflow frameworks have "Model Zoo" with a collection of pretrained networks for specific tasks across several domains.

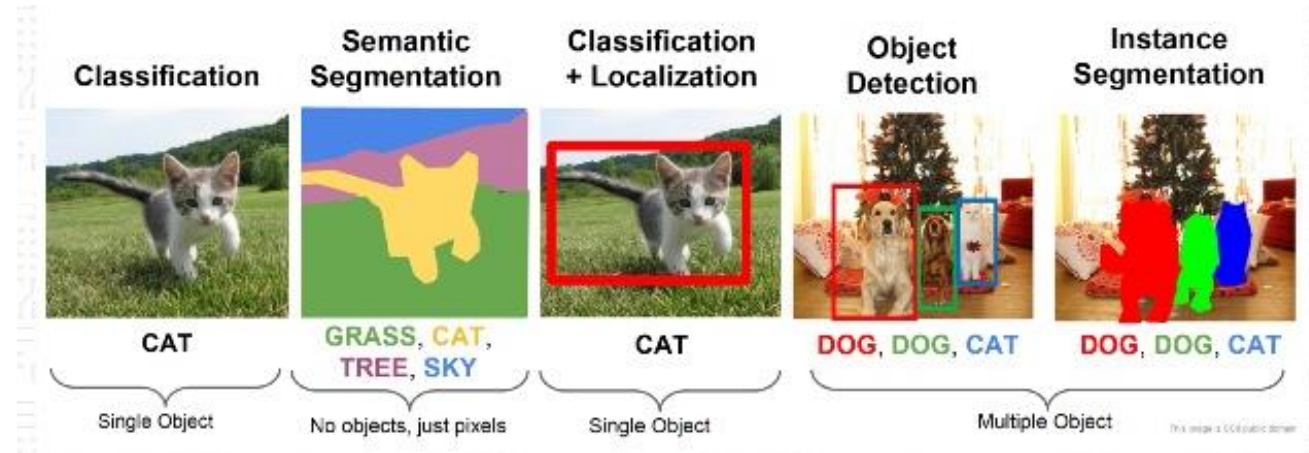


HOW A DEEP NEURAL NETWORK SEES



Computer Vision (CV) Task Types

- Classification -
 - Class A or B
- Classification and Localization -
 - Class A or B and Locate
- Semantic Segmentation -
 - Which pixel belongs to what
- Object Detection:
 - Identify different objects
- Instance Segmentation:
 - Identify instance of same or different objects



Multi-Class Classification

- Classifying Images is one of the most common Computer Vision tasks across several domains.
- I guess we can all identify an image and classify one among the 4 different dog breeds but how about identifying among 37 types of pets !! or 100 !!!



v/s



- Everything in fast.ai
- fast.ai's course Deep learning for Coders* is a powerful learning tool for several starters in Deep learning.

* Intention here is not for promotion.

Results using Transfer Learning

Steps Involved -

- Load Data and applying basic Image Augmentation
- Define Learner, architecture (resnet34), metrics and initiate training
- Interpret the Classifier
- Unfreeze all layers, identify appropriate learning rate and train again
- We get an accuracy of 94%
- Try bigger architecture, k-fold and much more..

Converting other tasks into CV tasks

- There are several tasks that can leverage this accuracy from Computer Vision Tasks.
- We @ Idexcel used a representation of a PDF text layout to classify PDF template types for Information Retrieval
- Other use-cases?
 - Multiple Inventory scanning using Computer Vision (Instance Segmentation) in large DC's
 - Web-page mouse movement tracking (human vs bot)
 - Convert sound to Spectrogram images
 - Converting sensor data to image
 - Converting Time series to Images

References

- <http://cs231n.github.io/transfer-learning/>
- <https://course.fast.ai/>

Thank You