Applied AI

brought you by:
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This Course: Learnings

This Week: Computer Vision

- Five Problems:
  - Classification +
  - Localization +
  - Segmentation +
  - Object Detection +
  - Image Generation

- Four model types:
  - Dense (Fully-Connected) Networks +
  - Convolutional Neural Networks +
  - Autoencoders
  - Generative Adversarial Networks

- Four Frameworks
  - Tensorflow 2 +
  - Keras Functional +
  - Keras Sequential +
  - Pytorch & torchvision +

- Six Datasets:
  - MNIST +
  - CIFAR-10 +
  - Kaggle Face Keypoint Detection +
  - Segmentation +
  - COCO for Object Detection +
  - Occlusion Dataset

Today's Schedule

- Introduction   11.00 - 11.15
- MNIST Classification with Dense Nets on Tensorflow 2   11.15 - 11.45
- MNIST Classification with Conv Nets on Keras Functional   11.45 - 12.15
- **Lunch Break**   **12.15 - 13.00**
- CIFAR-10 Classification and Transfer Learning with Conv Nets on Keras Sequential   13.00 - 13.40
- Kaggle Facial Keypoints Detection with Conv Nets on PyTorch   13.40 - 14.20
- **Break**   **14.20 - 14.35**
- Segmentation with a Pre-Trained model from Torchvision   14.35 - 14.55
- Object Detection with a Pre-Trained model from Torchvision and model inspection   14.55 - 15.30
- Homework Description   15.30 - 16.00

Classification

Tensorflow 2

- API Cleanup
- Eager execution
  - TF1 requires manually construction of an abstract syntax tree by making API calls.
  - TF2 more Python-like.
- No more Globals
  - TF1 relies heavily on implicitly global namespaces.
  - Can lose track of variables.
  - TF2 controls every variable, garbage collector removes if you lose track!
- Functions, not sessions
  - TF1 requires of session.run() to execute functions.
  - TF2 more like Python calls -> f(input), etc.

Keras Functional

- Create more flexible models than Keras Sequential!
    - Functional API can handle models with non-linear topology, shared layers, and multiple inputs & outputs.
- DL models -> Directed Acyclic Graphs (DAG). Functional is a way to build graphs of layers.
- Training, evaluation, inference, and saving models are exactly same for both Functional and Sequential API.
- Can use same layers for multiple models!
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Keras Sequential

- Use when a model is appropriate for **a plain stack of layers** where each layer has **exactly one input tensor and one output tensor**.
- Once a Sequential model is built, it behaves like Functional API model.
    - Each layer has input and output.
    - Can create a new model to observe the output of each layer, etc.

Localization

PyTorch

Segmentation

Object Detection

Torchvision