MAI

Deep Learning

Guided lab

Embeddings

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Set-up

- Copy the code to your account

cp /gpfs/projects/nct00/nct00001/iwann-tutorial.tar.gz ~

- Copy the pre-trained models

cp /gpfs/projects/nct00/nct00001/models/* ~/.keras/models

- Link to 3 datasets in GPFS (no need to copy)

/gpfs/projects/nct00/nct00001/datasets

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Summary

Sample codes for:

1. **Fine-tuning:** Use a pre-trained network and re-train it for a different task
2. **Feature-extraction:** Use a pre-trained network as feature descriptor for a different task
3. **Embeddings spaces:** Use a word embedding space to study and exploit regularities

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Disclaimer

Sample codes:

1. **Kind of work**
2. **May have bugs**
3. **Are inefficient** (particularly feature extraction)

Suggestion: **Don't try to fix or extend the code. Copy something if it's useful and make your own code.**

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Fine-tuning

- Training from scratch is often a bad idea [1,2]
- Many factors affect transferability
  - Similarity between tasks
  - Size and variance of source task
  - Size and variance in target task
  - Layers transferred, locked and re-trained
- To play:
  - Sources: VGG16 on ImageNet/Places
  - Targets: catsdogs, mit67, textures
  - Transferred layers
  - Frozen/retrained layers

[1] **How transferable are features in deep neural networks?** Yosinski et. Al.

[2] **Factors of Transferability for a Generic ConvNet Representation** Azizpour et. al.

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Fine-tuning

Let's take a look at the code

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Fine-tuning

- Command

python fine_tuning_main.py SOURCE TARGET

- Sources
  - "VGG16_ImageNet", "VGG16_Places"
- Targets
  - "mit67", "catsdogs", "textures"
- Try to get an interactive session
  - mnsh -g
- Hyperparameters can be tuned within the code
- As it is, 1.5 min per epoch aprox.

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Feature Extraction

- Code sample for
  - Extract neural activations for images as processed by a pre-trained network
  - Apply a postprocessing to these activations
  - Train a SVM with the resulting vector representations
  - Check classification performance
- To play:
  - Sources & Targets (same as fine-tuning)
  - 2 post-processing (L2-norm & FNE)
  - Extracted layers

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Feature Extraction

Let's take a look at the code

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Feature Extraction

- Command

python l2norm_main.py SOURCE TARGET

python fne_main.py SOURCE TARGET

- Sources
  - "VGG16_ImageNet", "VGG16_Places"
- Targets
  - "mit67", "catsdogs", "textures"
- Layers extracted can be tuned within the code
  - For the guided lab, try not to use both fc's
- As it is, less than 5 minutes in total

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Embedding Spaces

- Let's play around in a word embedding space
- Command
  - python word_embeddings.py

1. Find pairwise distances
2. Find the most similar word
3. Compute analogy (aka regularities) and find closest result
4. ToDo: Clustering on the embedding space

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