Special topics: Convolutional Neural Networks Week 5: Semantic segmentation

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Slide & Code: https://github.com/chupibk/INT3414_22

Schedule

Week	Content	Class hour	Self-study hour
1	Introduction CNNs in Computer Vision	2	1
2	~~Foundations of CNNs~~ ~~Case study: Image classification problem~~ Basics of Neural networks Training with backpropagation Implementation with PyTorch	2	2-6
3	~~Training and tuning parameters~~ ~~Data augmentation - Data generator~~ Foundations of CNNs Transfer learning Mid-term assignment	2	2-6
4	Object detection	2	2-6
5	Segmentation	2	2-6
6, 7	Mid-term presentations	2	2-6
8, 9	Advanced topics using CNNs	2	2-6
10, 11, 12	Final project presentations	1	2-6
13	Class summarization	1-3	open

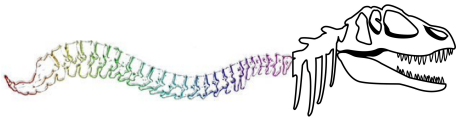
Mid-term presentation schedule

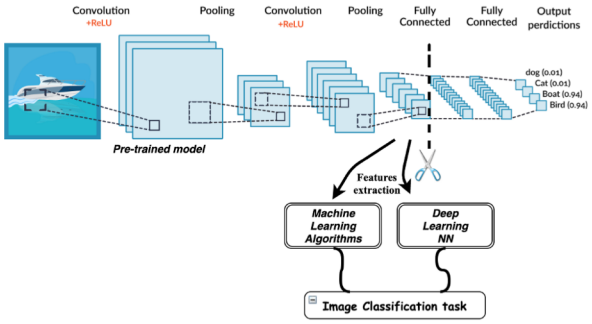
- Spreadsheet: https://docs.google.com/spreadsheets/d/1Z0uJP3UagB1jXUKZP83Zwb3iegtF0RuAmLRCpXyAku8/edit#gid=1639742176
- Form:
  - https://forms.gle/ZUZgtHL6rLq7RNjU9
- Schedule:
  - Week6: (1) VGG, (2) MobileNet, (3) ResNet, (4) ShuffleNet, (5)GoogleNet+Inception-v3 +Inception-v4
  - Week7: (1) Xception, (2) ResNext, (3) DenseNet, (4) EfficientNet

Report submission deadlines

- Presentation at week 6:
  - 14/4 23:59
- Presentation at week 7:
  - 21/4 23:59
- Submit report

Recall week 4: Transfer learning

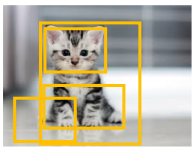




Right image credit: https://mc.ai/transfer-learning-with-deep-learning-machine-learning-techniques/

Recall week 4: Object detection

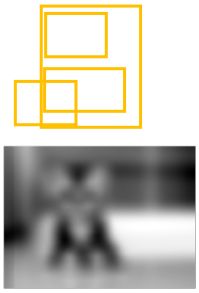
R-CNN



→ Predefined, fixed number of proposals
→ Feature extraction for each proposal
→ Classification + regression (for adjusting the bbox)

Fast R-CNN

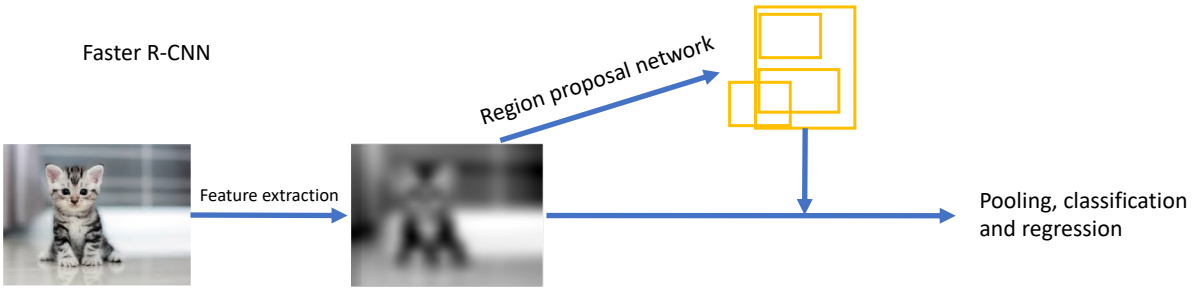
CNN to extract a feature map



→ Predefined, fixed number of proposals
→ ROI pooling for each proposal from one feature map
→ Classification + regression (for adjusting the bbox)

Recall week 4: Object detection

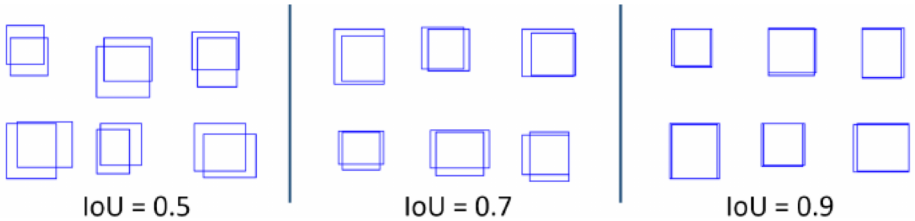
Faster R-CNN



→ Trainable network to predict proposals (from anchors)
→ ROI pooling for each proposal from one feature map
→ Classification + regression (for adjusting the bbox)

Recall week 4: IoU

$$IoU = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$



Week 5

Semantic segmentation

Outline of week 5

1. Introduce Detectron2
   - Implement License plate object detection
2. Introduce U-net for segmentation
   - How to read a paper
3. Introduce Fast.ai
   - Course: https://course.fast.ai/
     - Part 1: Practical deep learning for Coders, v3
     - Part 2: Deep learning from the Foundations
   - Implementing an image classification
   - Implementing a semantic segmentation
4. Debug time

Colab notebooks for week 5

- Object detection with Detectron2:
  - https://colab.research.google.com/drive/1rs6ucdDSwQ6eHjVxSYgJUvekZbXA8nDr
- Classification, segmentation with Fast.AI
  - https://colab.research.google.com/drive/1WW-hHXZ4lghZ6fEuY319W3mOFsh379N4