Computer Vision Tasks

Semantic Segmentation

Classification + Localization

Object Detection

Instance Segmentation

- **GRASS, CAT, TREE, SKY**
  - No objects, just pixels

- **CAT**
  - Single Object

- **DOG, DOG, CAT**
  - Multiple Object

Image Credit: CS231 course
Image Classification

ImageNet

- 1,000 object classes (categories).
- Images:
  - 1.2 M train
  - 100k test.

Image Classification

Based on SIFT + Fisher Vectors

Convolutional Neural Networks

AlexNet

Deep Neural Networks
Convolutional Neural Networks

Filters at different levels of a CNN

Lee, H. et al. (2011). Unsupervised learning of hierarchical representations with convolutional deep belief network

Hierarchy of patterns learned by a CNN

Image Credit: Deep Learning with Python
Image Segmentation

Semantic Segmentation

Classification + Localization

Object Detection

Instance Segmentation

No objects, just pixels

Single Object

Multiple Object

Image Credit: CS231 course
Typical object detection/segmentation pipelines

Object proposal network

Refinement and Classification

Dog 0.85
Cat 0.80
Dog 0.75
Cat 0.90
Typical object detection/segmentation pipelines

Object proposal network

Refinement and Classification

Dog 0.85
Cat 0.80
Dog 0.75
Cat 0.90
Our goal is to produce less candidates, removing any post-processing step:
Our proposal is to output regions sequentially.
Recurrent Neural Networks

Image Credit: Colah's Blog
Recurrent Semantic Instance Segmentation

Recurrent Semantic Instance Segmentation

Recurrent Semantic Instance Segmentation

Recurrent Semantic Instance Segmentation

Object Discovery Patterns

Contributions

- **First end-to-end recurrent model for semantic instance segmentation:** previous approaches produced class agnostic masks.

- **Competitive performance** against previous sequential methods on three instance segmentation benchmarks: Pascal VOC, CVPPP and Cityscapes

- We analyze its behavior in terms of the **object discovery patterns** it follows.
The End!

Questions?

@miriambellver

Download our paper, code and pretrained models at: imatge-upc.github.io/rsis/