Conv Layers

Deeper CNNs

Learning

Object Detection

Segmentation

Cancula Nata

Machine Vision

Slides available at jonkrohn.com/talks

March 2nd, 2022

Convolutional Layers

Conv Layers

Deeper CNNs

Transfer Learning

Object Detectior

Image Segmentation

- - 3

1 Convolutional Layers

2 Convolutional Neural Networks

3 Much Deeper CNNs

4 Transfer Learning

Object Detection

6 Image Segmentation

7 Capsule Networks

Convolutional Layers

2 Convolutional Neural Networks

3 Much Deeper CNNs

Convolutional Layers

2 Convolutional Neural Networks

3 Much Deeper CNNs

4 Transfer Learning

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6 Image Segmentation

Capsule Networks

Jon Krohn

Object Detection

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Segmentation

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2 Convolutional Neural Networks

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3 Much Deeper CNNs

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6 Object Detection

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3 Much Deeper CNNs

4 Transfer Learning

5 Object Detection

Image Segmentation

Capsule Networks

Conv Layers

Convolutional Layers

3 Much Deeper CNNs

Conv Layers

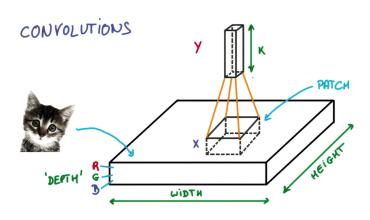
Deeper CNNs

Transfer Learning

Object Detection

Image Segmentation

Capsule Nets



DeepVis

Conv Layers

ConvNet

Deeper CNN

Transfer Learning

Object Detection

Detection

Segmentation

Capsule Nets

[deepvis]

Convolution Demo

Conv Layers

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leeper CNN:

Transfer Learning

Object Detection

Image

Capsule Nets

from the illustrious [Andrej Karpathy]

Conv Layers

Danner CNIA

Deeper Oivi

Learning

Object Detectior

Image Segmentation

Cancula Nat

Activation map = $\frac{D-F+2P}{S} + 1$

- D is the size of the image (either width or height, depending on whether you're calculating the width or height of the activation map)
- F is the size of the filter
- P is the amount of padding, and
- and S is the stride length.

Conv Layers

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Deeper ON

Learning

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Capsule Nets

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Cansule Net

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ConvNets

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Learning

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4 Transfer Learning

3 Much Deeper CNNs

2 Convolutional Neural Networks

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6 Image Segmentation

7 Capsule Networks

LeNet-5

Conv Layers

ConvNets

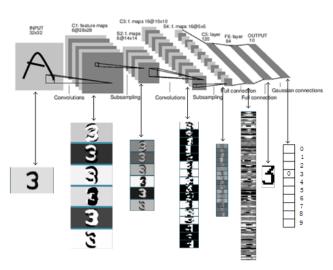
Jooper CNN

Transfer

Object Detection

Image Segmentation

Capsule Net



Jon Krohn

let's make our [deep net] convolutional!

Deeper CNNs

3 Much Deeper CNNs

Conv Layers

OUTIVIVELS

Deeper CNNs

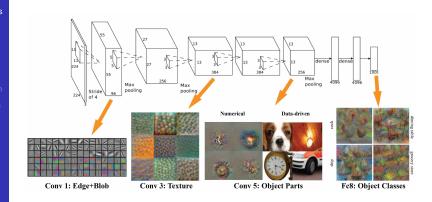
Transfer Learning

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Segmentation

Capsule Net

AlexNet Conv-Pool Blocks



[AlexNet] from scratch

Conv Layers

ConvNets

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VGGNet (Simonyan & Zisserman, 2014)

Exercise III

- build VGGNet from AlexNet notebook
- be able to verbalize all Arsenal (Theory I-IV) items

Conv Layers

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Transfei Learnin

Object Detectio

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Capsule Net

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Conv Lavers

Deeper CNNs

Transfer Learning

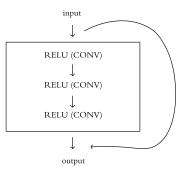
Object Detection

Sogmontation

Cansule Nets

Residual Networks

Hardt & Ma, 2018



Conv Lavers

Conv Layers

Deeper CNNs

Transfer Learning

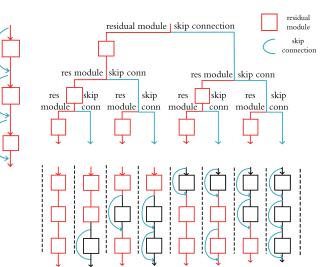
Object Detectior

Image Segmentation

Capsule Net

Residual Networks

Hardt & Ma, 2018





3 Much Deeper CNNs

4 Transfer Learning

Ion Krohn

Learning

Transfer

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oog...o...a..o.

Capsule Nets

[transfer learning Jupyter notebook]

Other examples:

- [toy-sized]
- [pre-trained model weights in Keras]
- [beefy bottleneck features example]

Conv Layers

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Deeper CNNs

Transfer Learning

Object Detection

Seamentation

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Capsule Nets

[transfer learning Jupyter notebook]

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Conv Layers

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Capsule Nets

[transfer learning Jupyter notebook]

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Object Detection

3 Much Deeper CNNs

6 Object Detection

Machine Vision Applications

Conv Layers

Conv Layors

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Segmentation

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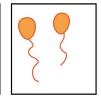


"BALLOONS"

OBJECT DETECTION



SEMANTIC SEGMENTATION



INSTANCE SEGMENTATION



Object Detection

Artificial intelligence is changing every aspect of war

A new type of arms race could be on the cards



Print edition | Science and technology Sep 7th 2019





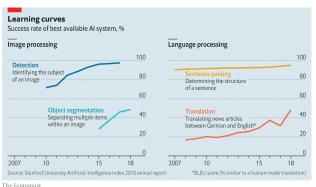








Object Detection



Object Detection

Conv Lavers

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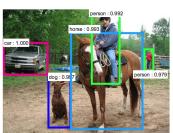
Deeper CNN

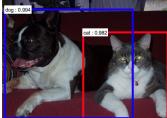
Transfer Learning

Object Detection

Image Segmentation

Capsule Nets









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Typical Process

Object Detection

- Identify region of interest (ROI)

Typical Process

Object Detection

- Identify region of interest (ROI)
- Perform automatic feature extraction on ROI

Typical Process

Object Detection

- Identify region of interest (ROI)
- Perform automatic feature extraction on ROI
- 3 Classify ROI

Seminal Architectures

Conv Layers

ConvNets

Deeper CNNs

Transfer Learning

Object Detection

Image Segmentation

Segmentatio

R-CNN (Girshick et al., 2013)

- Fast R-CNN (Girshick et al., 2015)
- Faster R-CNN (Ren et al., 2015)
- YOLO, YOLO9000 & YOLOv3 (Redmon et al., 2015-8)

Seminal Architectures

Object Detection

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Ion Krohn

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[YOLOv3 Jupyter notebook]

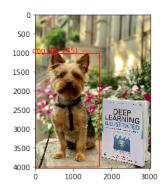
Conv Layers

Transfer Learning

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GitHub repositories:

- [Mask R-CNN]
- [RetinaNet]
- [YOLOv3]

[YOLOv3 Jupyter notebook]

Conv Layers

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Capsule Net



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Conv Layer

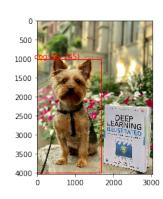
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Transfer Learning

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Capsule Net



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Outline

Conv Layers

Convolutional Layers

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2 Convolutional Neural Networks

Object

3 Much Deeper CNNs

Image

4 Transfer Learning

Segmentation

6 Object Detection

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6 Image Segmentation

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Capsule Networks

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Transfer Learning

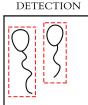
Object Detection

Image Segmentation



CLASSIFICATION

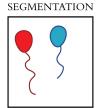
"BALLOONS"



OBJECT

SEGMENTATION

SEMANTIC



INSTANCE

Conv Layers

Conv Layers

Deeper CNNs

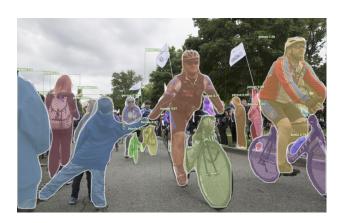
Transfe Learnin

Object Detection

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Image Segmentation



Seminal architectures:

- Mask R-CNN
- U-Net

Conv Lavers

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Seminal architectures:

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Cansule Net

Mask R-CNN (He et FAIR, 2017)

- Taster R-CNN model proposes ROIs
- 2 ROI classifier predicts class of object in ROI and refines bounding box
- 3 extract CNN's feature maps from within bounding box
- fully CNN model outputs object-specific mask

Conv Layers

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Conv Layers

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Object

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Conv Layers

Deeper CNN

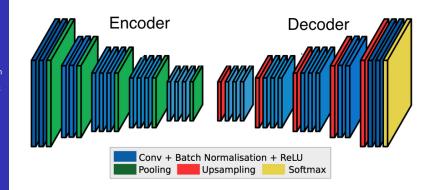
Transfer Learning

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Contracting Path + Expanding Path

U-Net Transfer Learning

Conv Layers

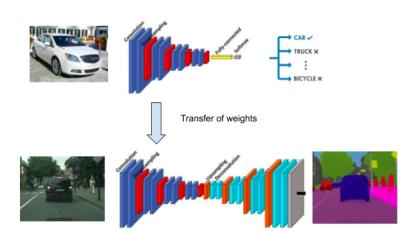
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Transfer

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Conv Layers

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Degmentation

VGGNet U-Net

Validation output after 1 & 9 epochs







[Jupyter notebook]

ResNet U-Net

VGG after 9 epochs & ResNet after 4

Conv Layers

Deeper CNNs

Transfer Learnin

Detection

Image Segmentation

Segmentatic







[Jupyter notebook]

Outline

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Sabour & Hinton, 2017

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