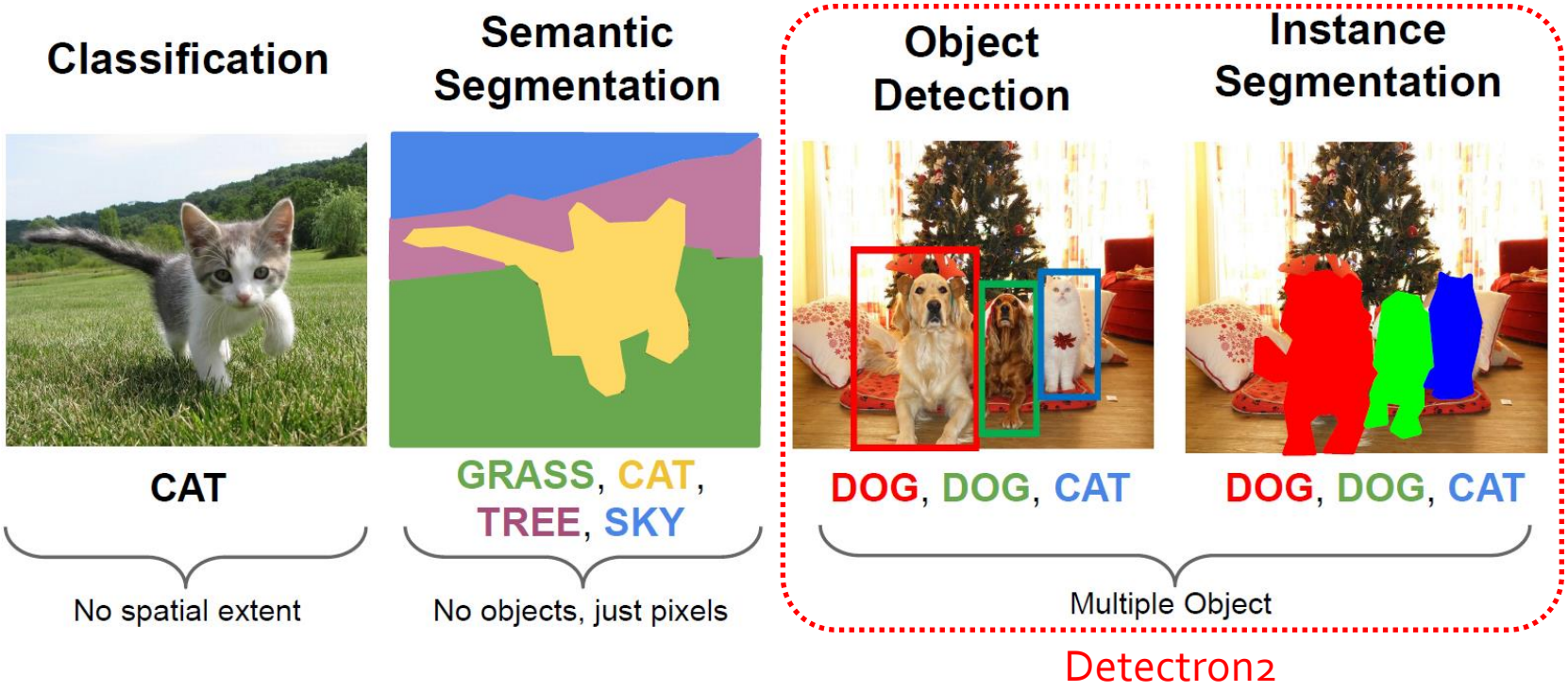
Detectron2

- Computer vision tasks



Detectron2

- Task comparison
  - image classification

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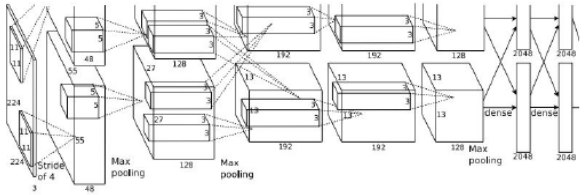


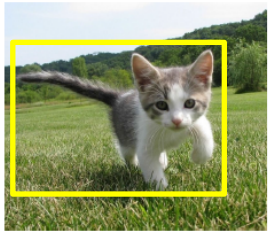
Figure copyright Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton, 2012. Reproduced with permission.

Vector: 4096

Fully-Connected: 4096 to 1000

Class Scores
Cat: 0.9
Dog: 0.05
Car: 0.01
...

  - object detection



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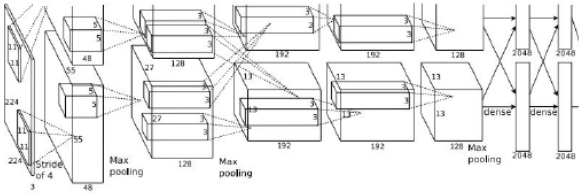


Vector: 4096

Fully Connected: 4096 to 1000

Class Scores
Cat: 0.9
Dog: 0.05
Car: 0.01
...

Fully Connected: 4096 to 4

Box Coordinates
(x, y, w, h)

Detectron2

- Detectron2: a PyTorch-based modular object detection library
  - Facebook AI Research (FAIR)'s open source projects
    - will continue to accelerate progress in the area of object detection
    - able to rapidly move research ideas into production models
      - e.g., AI camera system in Facebook's Portal video-calling devices
  - next-generation platform for object detection and segmentation
    - Detectron: release in 2018 (https://github.com/facebookresearch/Detectron)
    - Detectron2: release in 2019, Oct. (https://github.com/facebookresearch/detectron2)
  - implementation
    - implemented in PyTorch (Detectron: Caffe2)
    - modular, extensible design (more flexible)
    - fast training on single or multiple GPU servers
      - much simpler to scale training to very large data sets
    - including state-of-the-art object detection algorithms (high-quality reference)
      - e.g., DensePose, panoptic feature pyramid networks, and variants of Mask R-CNN model family

Detectron2

- Different types of object detection tasks done with Detectron2

  - object detection
  - human pose estimation (prediction)
  - segmentation
    - instance segmentation / semantic segmentation
    - panoptic segmentation: simultaneously recognition distinct foreground objects (instance segmentation) and background (semantic segmentation)

Detectron2

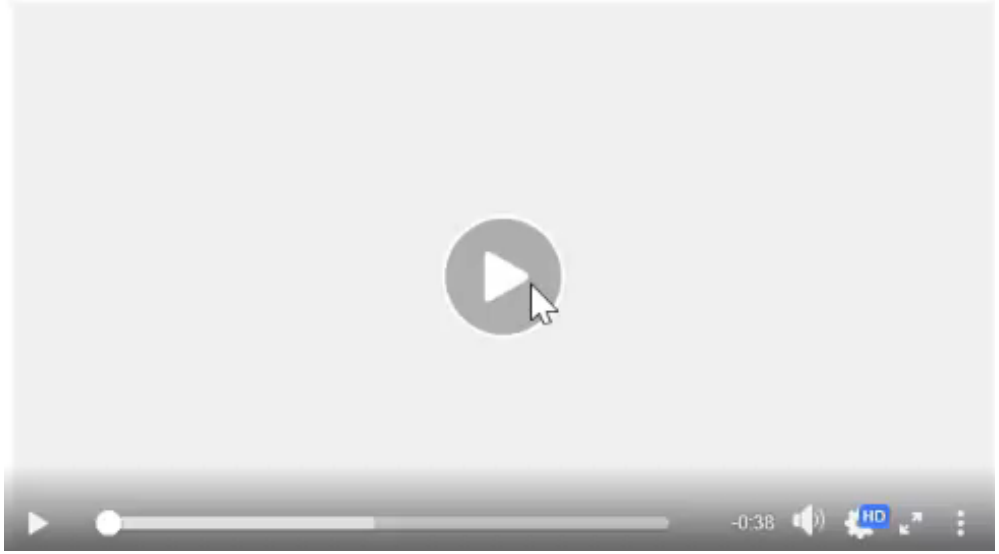
- Detectron2's modular design

```
detectron2
├─checkpoint  <- checkpointer and model catalog handlers
├─config      <- default configs and handlers
├─data        <- dataset handlers and data loaders
├─engine      <- predictor and trainer engines
├─evaluation  <- evaluator for each dataset
├─export      <- converter of detectron2 models to caffe2 (ONNX)
├─layers      <- custom layers e.g. deformable conv.
├─model_zoo   <- pre-trained model links and handler
├─modeling
│   ├─meta_arch <- meta architecture e.g. R-CNN, RetinaNet
│   ├─backbone  <- backbone network e.g. ResNet, FPN
│   ├─proposal_generator <- region proposal network
│   └─roi_heads <- head networks for pooled ROIs e.g. box, mask heads
├─solver       <- optimizer and scheduler builders
├─structures   <- structure classes e.g. Boxes, Instances, etc
└─utils        <- utility modules e.g. visualizer, logger, etc
```

  - includes
    - Models
      - Faster R-CNN, Mask R-CNN, RetinaNet, and DensePose (Detectron)
      - + Cascade R-CNN, Panoptic FPN, and TensorMask (Detectron2)
      - + continue to add more models
    - Others
      - synchronous Batch Norm
      - LVIS: A Dataset for Large Vocabulary Instance Segmentation
      - Detectron2go: make it easier to deploy advanced new models to production

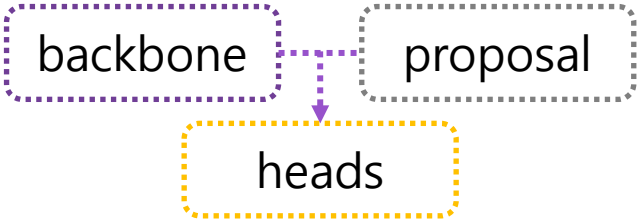
Detectron2

- Overview of Detectron2

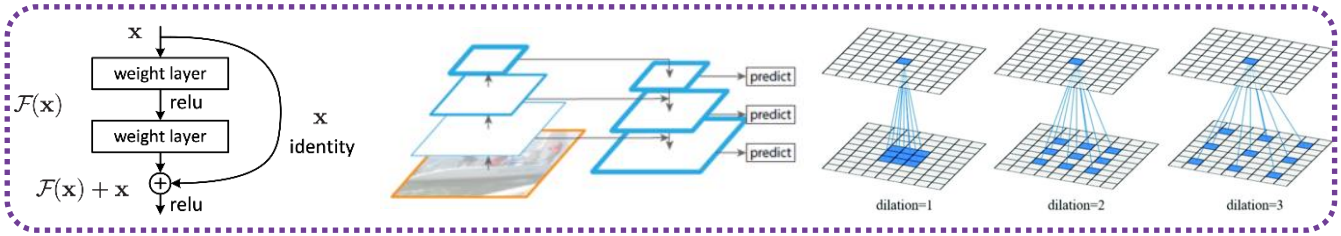


Detectron2

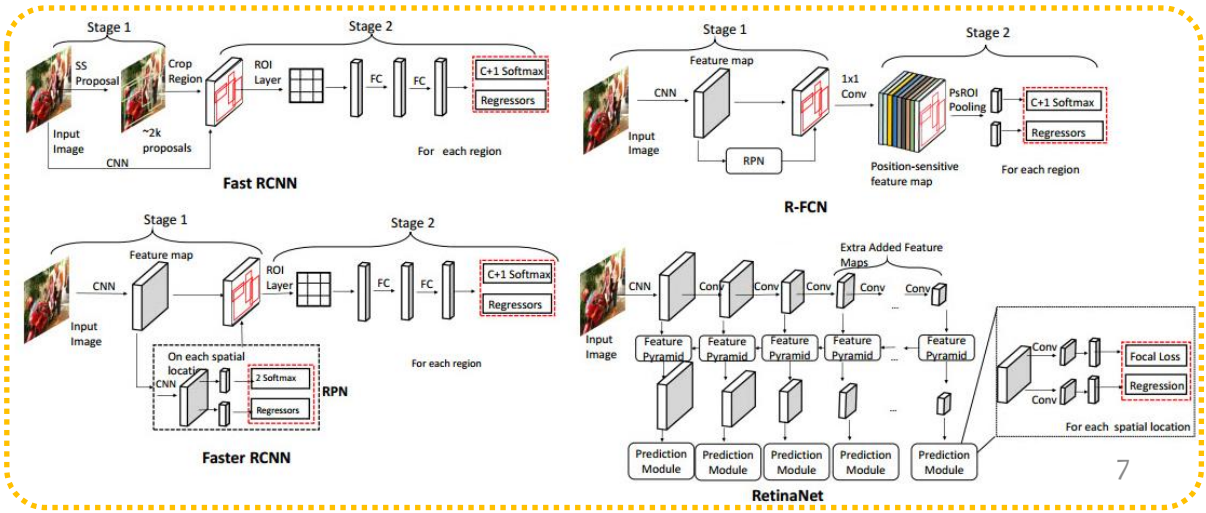
- Architecture of Detectron2



  - backbone
    - ResNet+FPN (Feature Pyramid Network): base
    - C4: non-FPN (ResNet conv4 backbone with conv5 head)
    - DC5 (Dilated-C5): Use a ResNet conv5 backbone with dilations in conv5

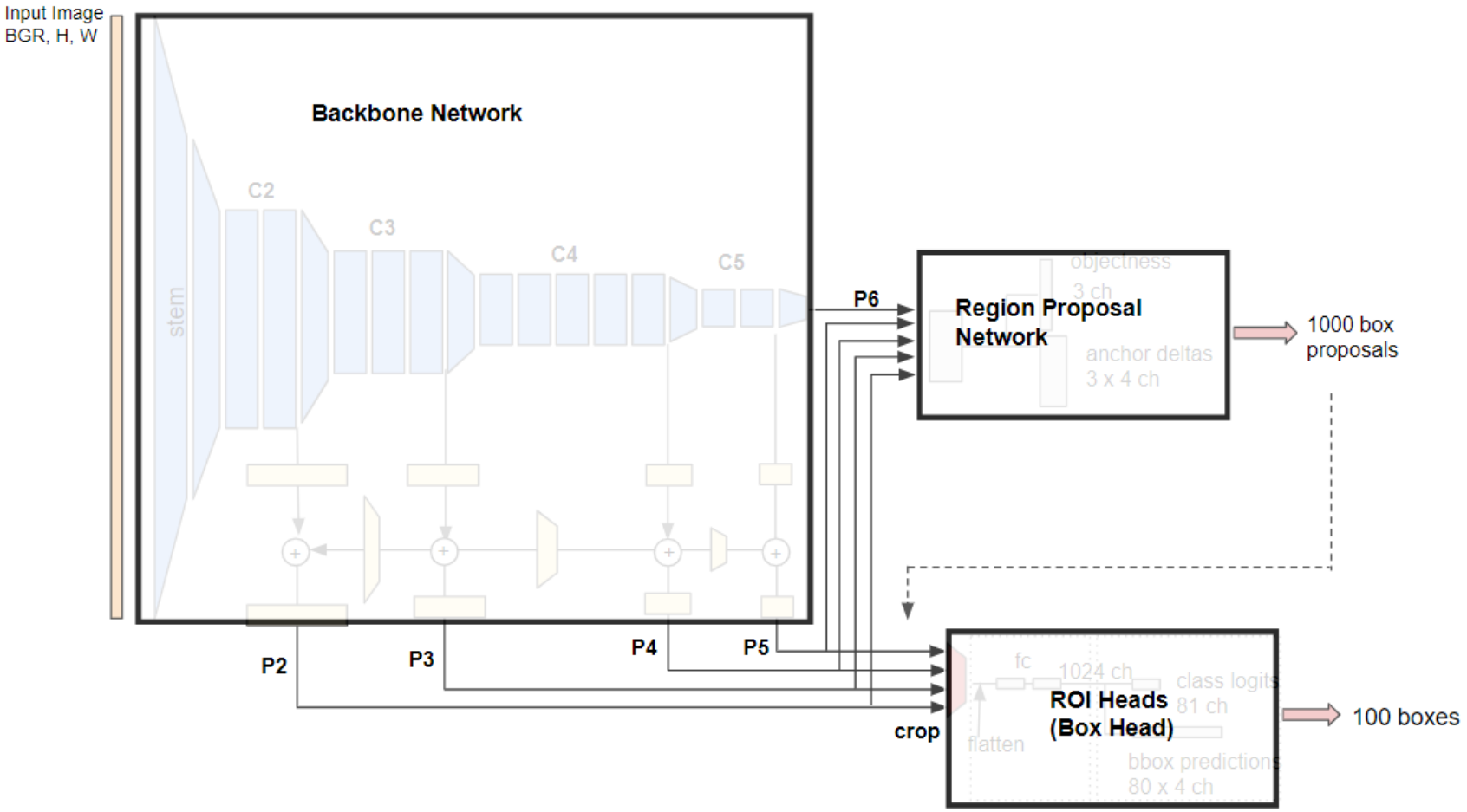


  - + heads (meta architectures)
    - object detection:
      - Faster R-CNN
      - RetinaNet
      - RPN & Fast R-CNN
    - Instance segmentation:
      - Mask R-CNN
    - Person pose detection
      - Keypoint R-CNN
    - Panoptic segmentation
      - Panoptic FPN

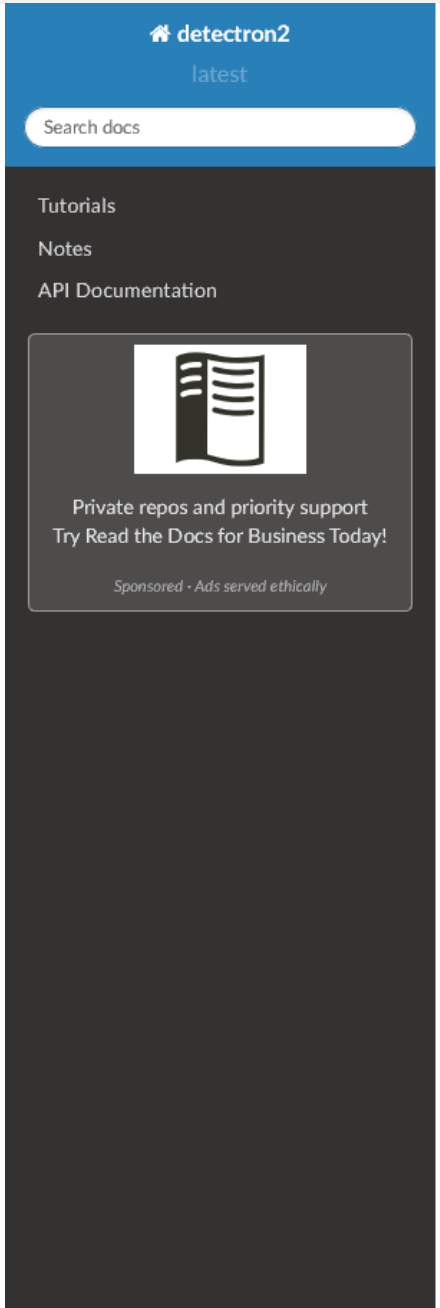


Detectron2

- Example of ResNet+FPN (backbone) with Fast R-CNN (heads)



Detectron2



Docs » Welcome to detectron2's documentation! Edit on GitHub

Welcome to detectron2's documentation!

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  - Installation
  - Getting Started with Detectron2
  - Setup Builtin Datasets
  - Extend Detectron2's Defaults
  - Use Custom Datasets
  - Use Custom Dataloaders
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  - detectron2.utils package
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https://detectron2.readthedocs.io/index.html