A Convergence of Architectures

- SSD (Single Shot Detector) encapsulates Multibox, YOLO, YOLO v2
- Faster R-CNN
- R-FCN

Feature Extractor
Proposal Generator
Box Classifier
Detection Generator

SSD
Faster R-CNN
R-FCN

What's the Best Object Detection Model?

- Deploy models anywhere
- Scalable
- For research and production
- State-of-the-art performance
- Support leading methods
  Multibox, SSD, Faster R-CNN, etc...

Our Goal:
Provide a guide for selecting a detection architecture that achieves the right speed/memory/accuracy balance for a given application and platform

Introducing the Tensorflow Object Detection API

- Highly Configurable Models
  - Meta Architectures
  - Feature Extractors
  - # Proposals
  - Image size
  - Output stride

Try it out at home!

Visit: github.com/tensorflow/models/tree/master/object_detection

What's included

- Integrate inference models based on critical points on the optimality frontier
- Models trained on the COCO dataset for each of the diverse models to be used for rapid feature inference purposes
- A model selection tool for performance of the best inference with no additional models
- Additional code allowing models to work on architectures beyond this configuration (e.g., Google Cloud)

Winning the COCO 2016 Detection Challenge

Best Single Model:
Faster R-CNN w/Inception Resnet (v2)

Diverse Ensembling

Take best K models? Or select diverse K-subset of models?

Journey to the Top

SSD always good at large objects and always horrible at small objects

Reducing # proposals is a great way to speed up Faster R-CNN without significantly hurting performance

Model Details

- Faster R-CNN w/Inception Resnet V2, 300 Proposals

Faster R-CNN w/Inception Resnet V2, 300 Proposals,Stride 8

Feature Extractor
Inception Resnet V2
Inception V3
MobileNet
Resnet 101
VGG

Speed vs Accuracy Experiments

Critical Points on the Optimality Frontier

- SSD has a small but real speed edge (and not just because of lower image resolutions)

Detection Model Zoo

- Final Model
  - R-CNN w/Inception Resnet V2, 100 Proposals

- Final Ensemble selected for challenge submission
  - Ensemble of Resnet/Inception

- Final Model
  - Faster R-CNN w/Resnet 101

Mean AP (on minival)

- SSD: 34.7
- Faster R-CNN: 32.9
- R-FCN: 35.0

Feature Extractor Accuracy

Training vs. Evaluation

- SBD w/MobileNet (Low Resolution)
- SSD w/Inception V2 (Low Resolution)
- Faster R-CNN w/Inception V2, 100 Proposals
- Faster R-CNN w/Inception V2, 300 Proposals
- Faster R-CNN w/Resnet 101, 300 Proposals

- Faster R-CNN w/Resnet 101, 300 Proposals
- SSD w/Inception V2, 100 Proposals
- SSD w/Resnet 101, 300 Proposals

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- SSD's performance less with better feature extractors
- Faster R-CNN, R-FCN improve with better feature extractors

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