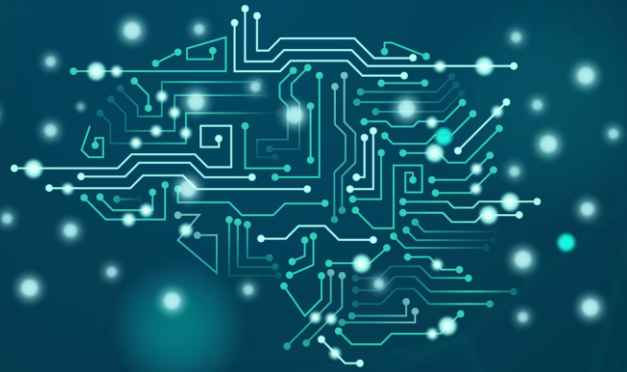
Real-time Object Detection for Autonomous Driving using Deep Learning

Duy Anh Tran, Pascal Fischer, Alen Smajic, Yujin So

01

Problem Framing

Real-time Object Detection
for Autonomous Driving



02

Initial Solution

Using current state-of-the-art
Algorithms: YOLO and faster-RCNN

03

Preliminary Result

What do we expect based on the
current experiments and knowledge

04

Project Schedule

Task Assignments and
Milestone Plan

OUR MOTIVATION

- Autonomous driving, one of the most anticipated technologies of the 21st century
- Major Challenges for Computer Vision and Machine Learning
- Huge amount of different situations and different tasks to be solved
- One of the most active research topics at the moment

WHAT DO WE DO?

The context consists of road traffic, road users, road signs and other traffic objects

Using State-of-the-art real-time Algorithms like YOLO and faster RCNN

Detect and classify road traffic objects using deep learning

Solving a major task in the long term goal of autonomous driving

OUR GOAL

- Real-time object detection of different object categories in a video
- MAP: above 45.7 on BDD100k Dataset

The BDD100K Dataset

100,000 HD video sequences of over 1,100-hour driving experience

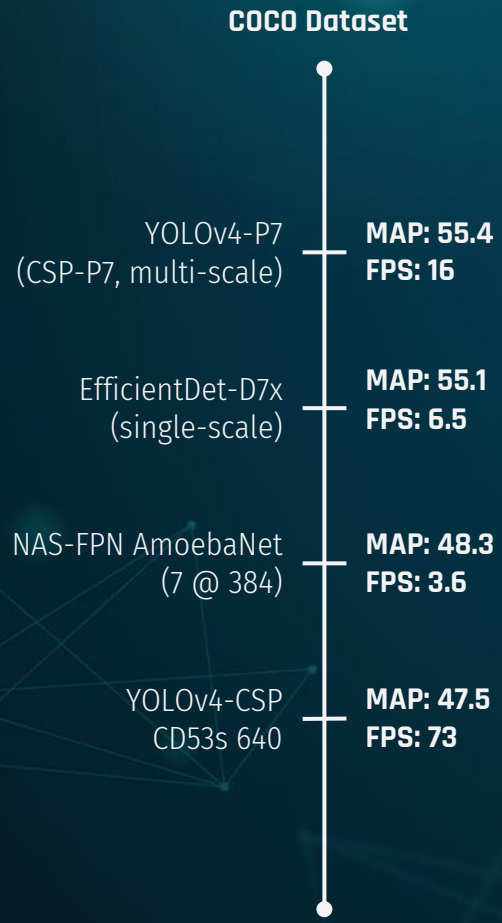
2D Bounding Boxes annotated on 100,000 images

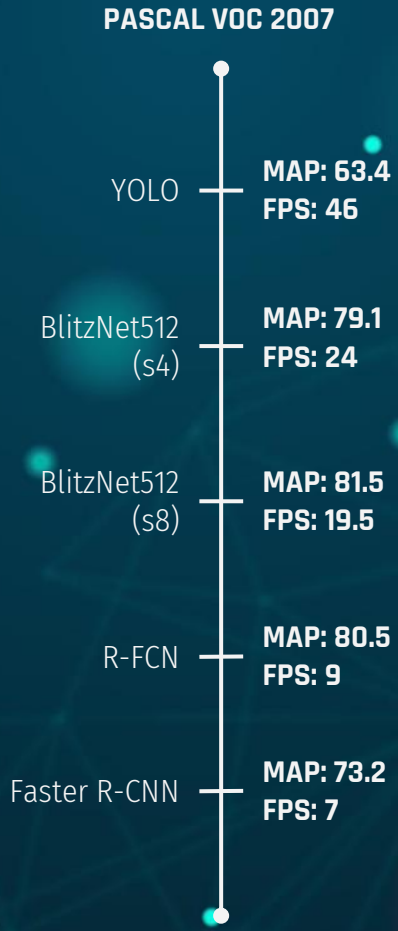
13 different object classes

geographic, environmental, and weather diversity

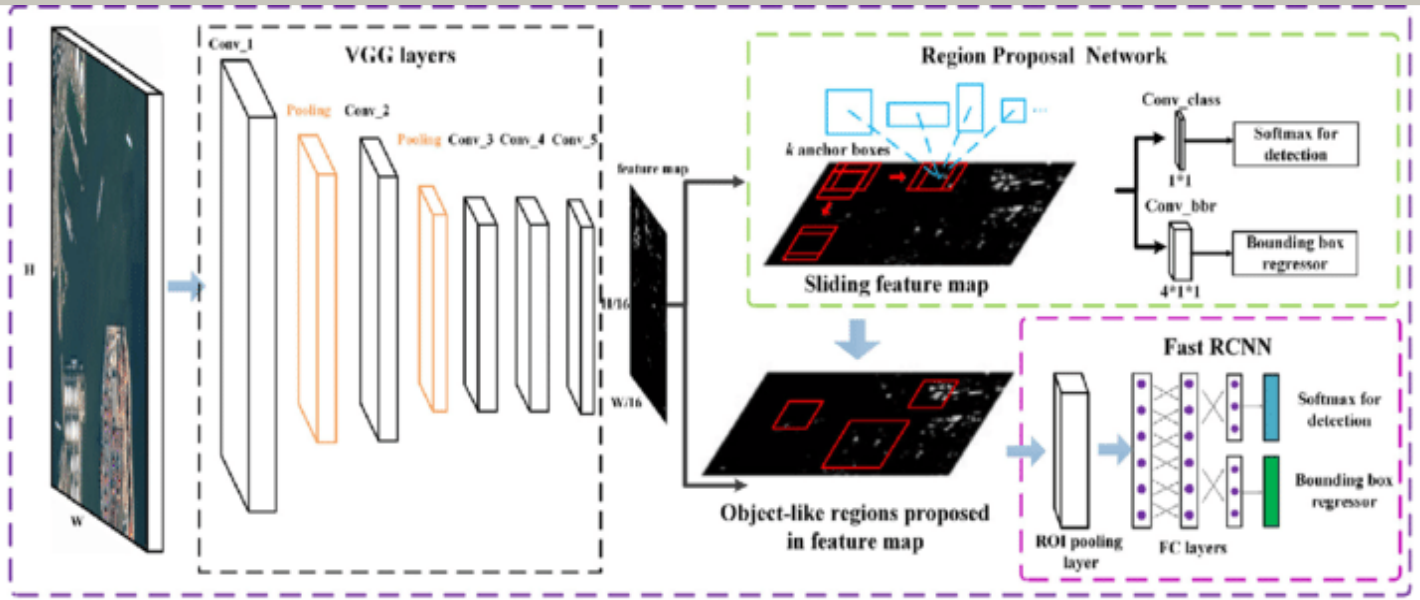
State-of-the-art: hybrid incremental net (MAP: 45.7, threshold: 0.5)

State Of The Art Real-Time Object Detection

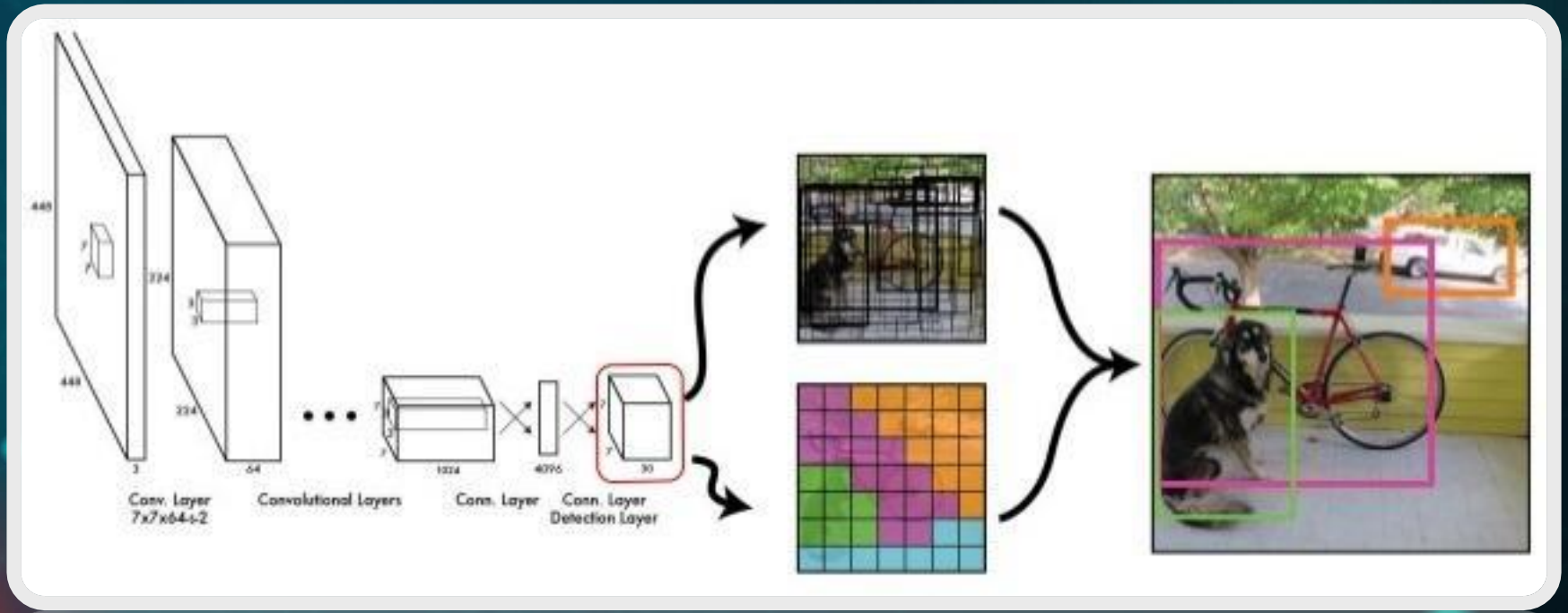




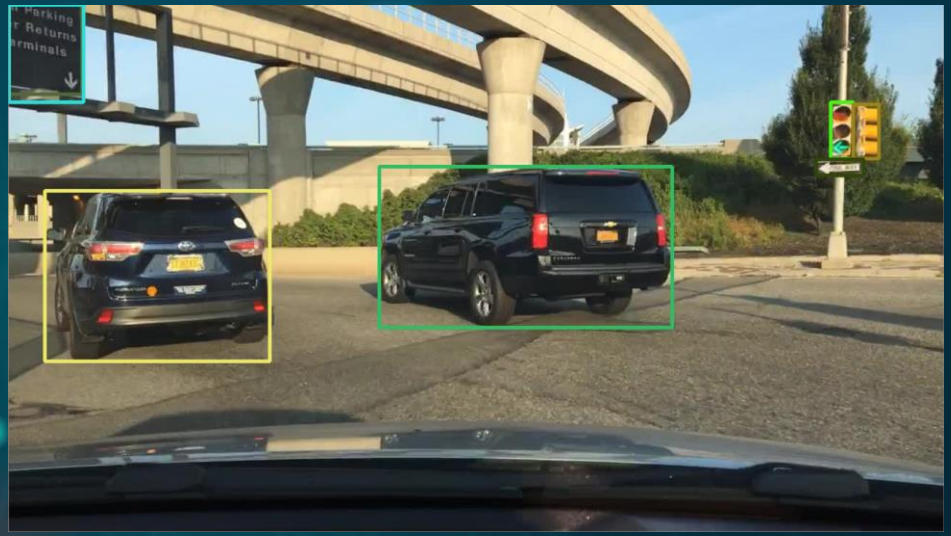
Faster RCNN


H
W
Conv_1
VGG layers
Pooling
Conv_2
Pooling
Conv_3
Conv_4
Conv_5
feature map
H/16
W/16
Region Proposal Network
k anchor boxes
Sliding feature map
Conv_class
1*1
Softmax for detection
Conv_bbr
4*1*1
Bounding box regressor
Object-like regions proposed in feature map
Fast RCNN
ROI pooling layer
FC layers
Softmax for detection
Bounding box regressor

YOLO

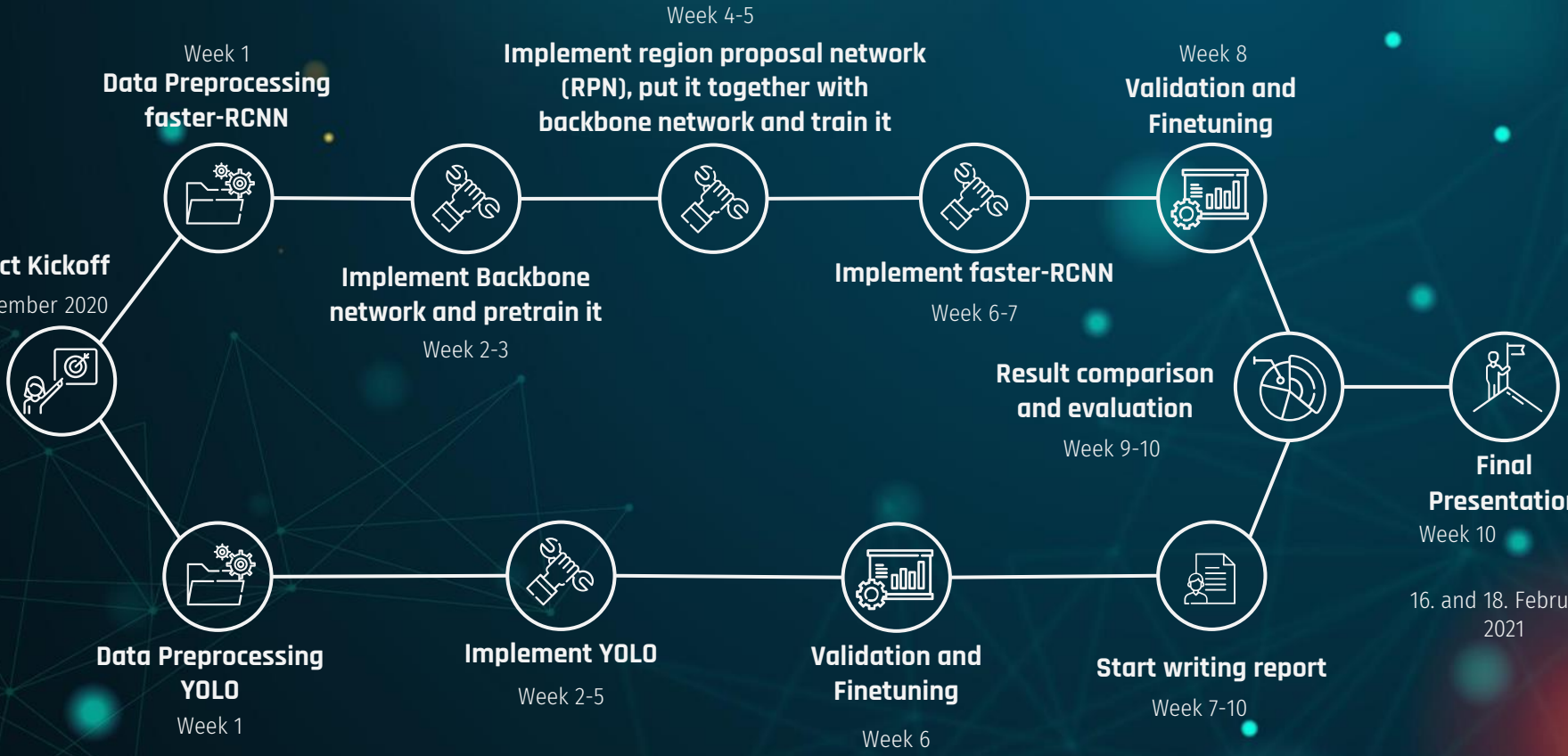

448
448
3
7x7
64
2
224
224
64
3
1
1
1024
4096
7
7
30
Conv. Layer
7x7x64-2
Convolutional Layers
Conn. Layer
Conn. Layer
Detection Layer

Preliminary Results



- Search for a suitable dataset and inspect the content
- Data preprocessing from JSON-files
- Algorithm for creating bounding boxes
- Load data into Tensors

PROJECT SCHEDULE



THANKS!

Do you have any questions?

Duy Anh Tran

Pascal Fischer

Alen Smajic

Yujin So