“Vehicle” Classification

Northrop Grumman

Team members

- Amari Hoogland - Architectural Lead
- Justin Davis - Communications Lead
- Kamen Shah -Deployment Lead
- Lei Teng -Testing/Analysis Lead
- Paris Dinh - Implementation Lead
- Sofie Lange - Documentation Lead
- Valliappan Chidambaram - Requirements Lead
- Zhengwu Yuan - Source Code Control Lead

Sponsor Information

Northrop Grumman

- “Northrop Grumman is a leading global security company providing innovative systems, products and solutions in autonomous systems, cyber, C4ISR, space, strike, and logistics and modernization to customers worldwide.”

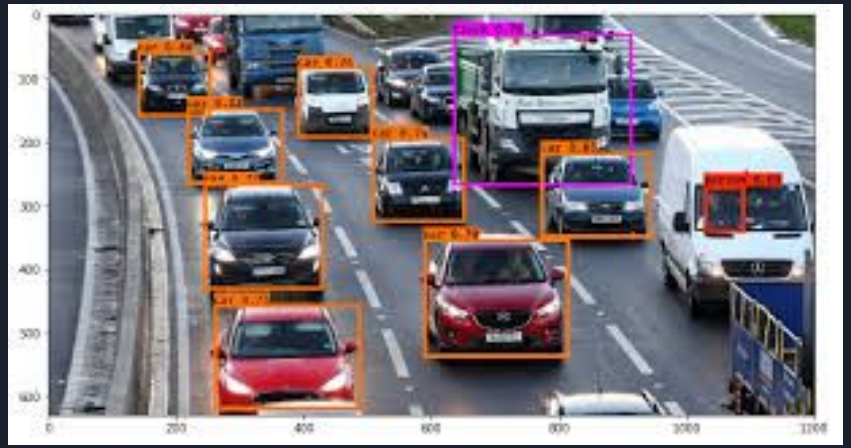
Mission

- Mission statement: “Our vision is to be the most trusted provider of systems and technologies that ensure the security and freedom of our nation and its allies. As the technology leader, we will define the future of defense - from undersea to outer space, and in cyberspace.”

Contact: David Motta, Sr. Principal Engineer Systems, Mission Systems Sector

Project Overview

- Create a real-time model to track and classify vehicles (objects)
- Model should have time-dependency
- We should compare time-dependent models to base models with no time-dependence
  - Sponsors interested in accuracy gain provided by time dependence, not the actual models
- Investigate at least Attention, LSTM, RNN, and TCNN
  - Other models if time allows and they seem useful



Dataset

YouTube Bounding Boxes - possibly taking extra bounding boxes from TrackingNet

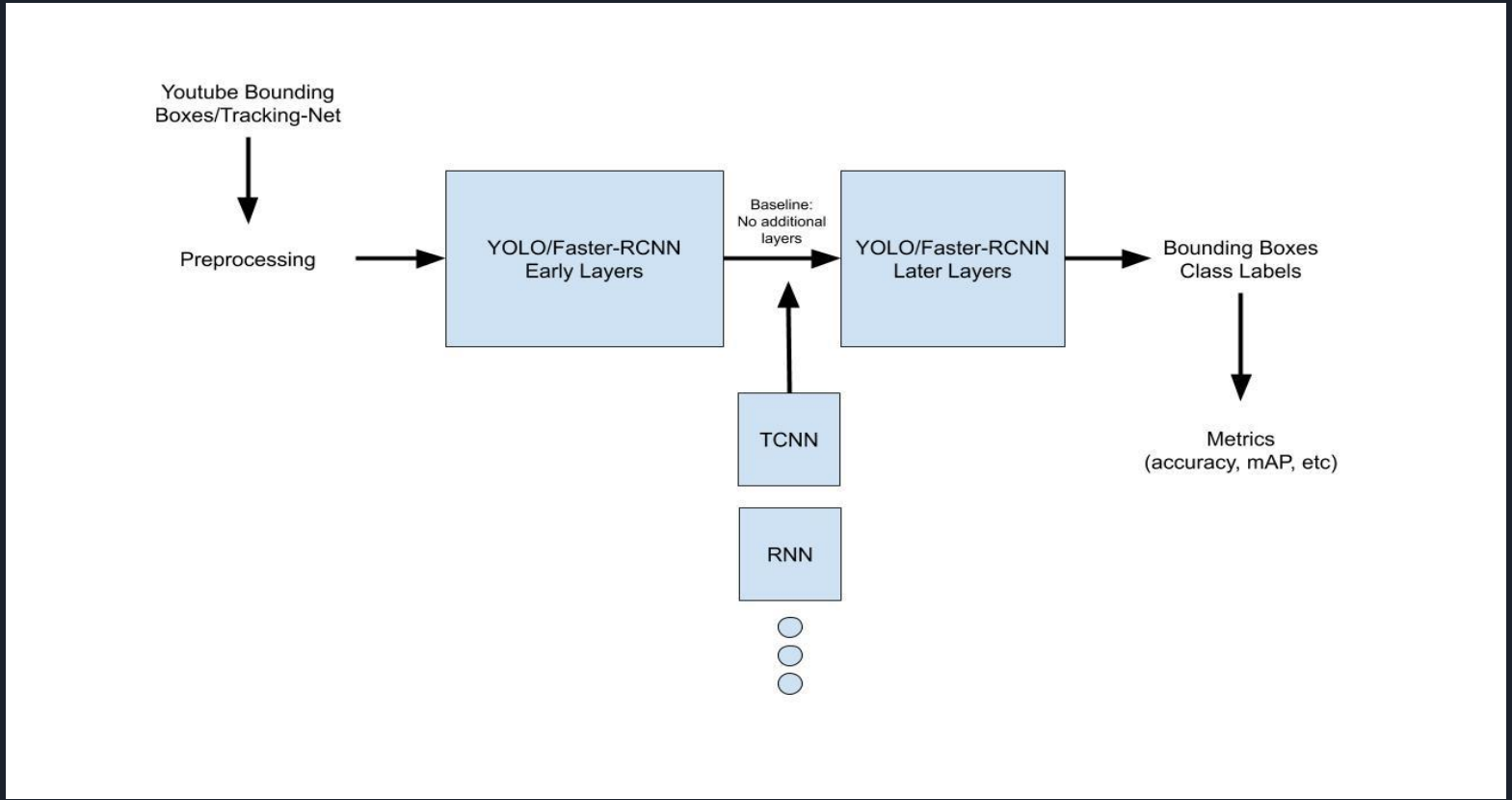
Class labels include - bicycle, bus, motorcycle, skateboard, truck, car, train

“The data set consists of approximately 380,000 15-20s video segments extracted from 240,000 different publicly visible YouTube videos, automatically selected to feature objects in natural settings without editing or post-processing, with a recording quality often akin to that of a hand-held cell phone camera.”
~ YouTube BB

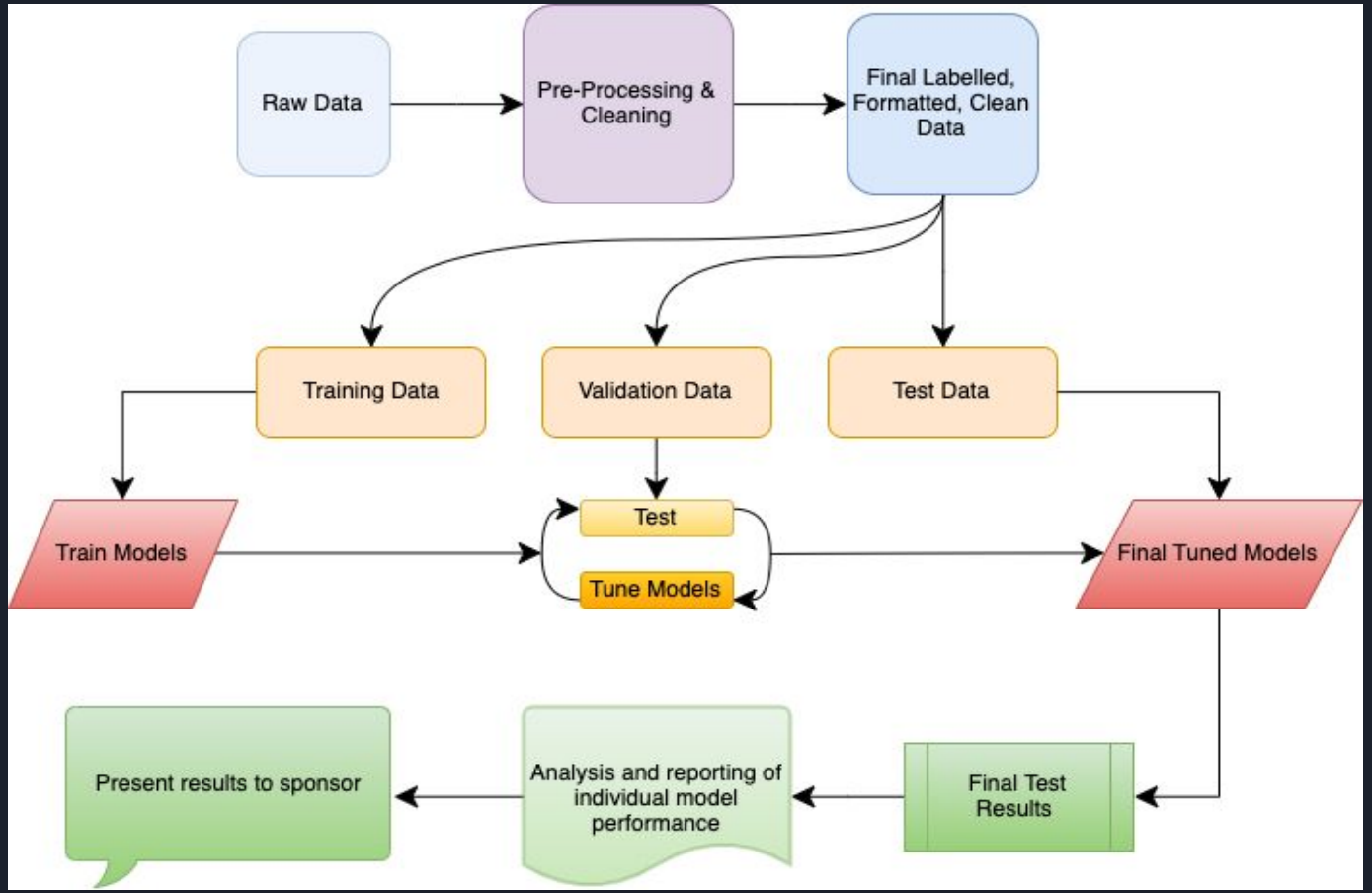
Dataset Graveyard

- NuScenes
- CityCam
- ApolloScapeAuto
- Lionbridge AI
- GRAPH@FIT
- Kaggle
- BDD, Berkeley
- Udacity Self Driving Car
- FLIR
- Springer
- Just to name a few...

Architecture Diagram



System Design



Overall Project Plan

Task	Start date	End date	Timeline
Northrup Grumman Project	9/30/2019	4/26/2020	
Project Charter	9/30/2019	10/14/2019	
Decide technologies	10/14/2019	10/21/2019	
Go over previous team's models and datasets	10/14/2019	10/28/2019	
Find better datasets	10/21/2019	11/4/2019	
Data cleaning	11/4/19	11/25/2019	
Find candidate algorithms	10/21/2019	11/11/2019	
Research Attention, LSTMs, RNNs, and TCNNs	10/21/2019	11/11/2019	
Analyze and select algorithms	11/11/2019	11/25/2019	
Fall Break	11/25/2019	12/2/2019	
Setup cloud service/Northrop machine	10/21/2019	12/19/2019	
Data Preprocessing	12/2/2019	12/19/2019	
Winter Break	12/19/2019	1/13/2020	
Implement YOLO	12/2/2019	1/20/2020	
Train/Tune/Test YOLO	12/27/2019	1/24/2020	
Implement Time Dependent Algorithms	1/8/2020	2/10/2020	
Train/Tune/Test Time Dependent Algorithms	1/20/2020	2/17/2020	
Data Analysis and Computation of Additional Metrics	2/10/2020	3/23/2020	
Spring Break	3/23/2020	3/30/2020	
Compile data and create presentations	3/30/2020	4/26/2020	
Burndown			

Work Completed

- Reviewed last year's team's results and methods
- Found suitable dataset to use
- Researched candidate algorithms for given task
- Settled on candidate algorithms
  - Faster R-CNN, Attention, LSTM, TCNN, RNN, YOLO, Mask Scoring R-CNN
- Set up machine and environment provided by Northrop Grumman

Major challenges

- Finding a dataset which matches the sponsors requirements but contains enough quality video data
- Understanding the algorithms
- Miscommunications and lack of clarity with sponsor

Rate your progress

Team: since we didn't get the implementation done and spend most of our time on finding dataset and what algorithms to use this semester.

Sponsors: lack of communication. Did not specify the datasets.