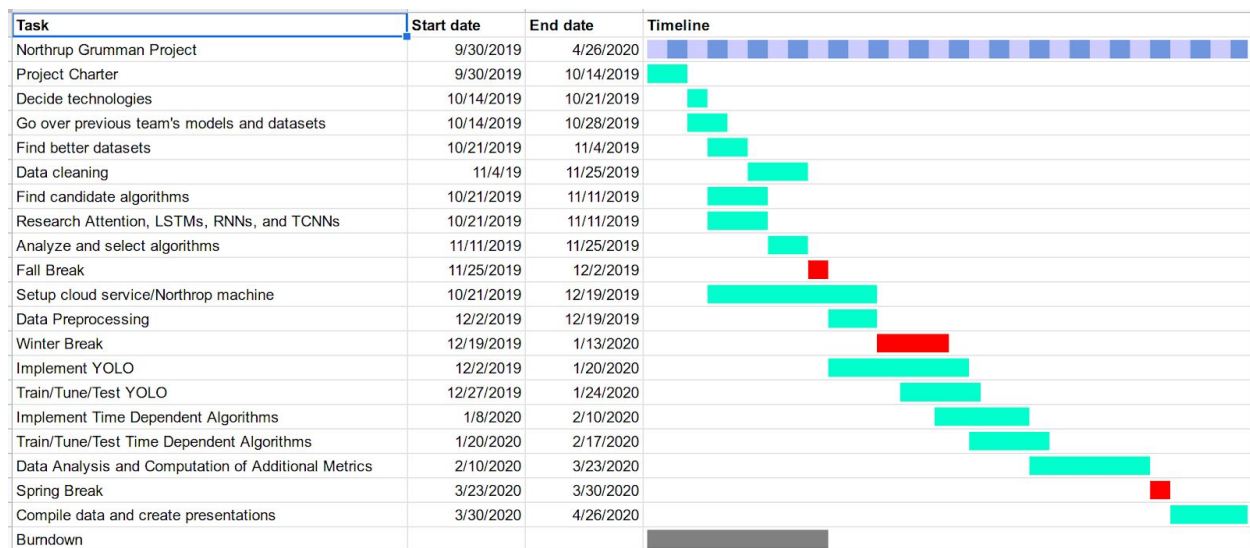# Project Plan

Project Scope

The goal of Northrop Grumman's project this year is to create a time dependent model to classify and track vehicles in video for use in real-time applications. Last year, students tested a variety of algorithms to perform this task, but the algorithms they tested treated each frame of video independently and thus had temporal instabilities in classification. This year's task is to test a variety of methods that are time dependent to see if we can improve the classification accuracy. At a minimum, Northrop Grumman would like us to investigate attention, long short-term memory (LSTM), recurrent neural networks (RNN), and temporal convolutional neural networks (TCNN), but they are also open to other methods we may find in the course of our research. Our project is primarily a research project and writing models intended for use in a production environment is out of scope.

Gantt Chart

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 Breakdown Structure

1.0 - YOLO/Faster-RCNN Baseline

      1.1 - Trained YOLO Baseline Model

      1.2 - Tuned/Optimized Baseline Model

      1.3 - Metrics on Performance and Accuracy of Baseline Model

2.0 - RNN Time-Dependent Model

      2.1 - Trained RNN Model

      2.2 - Tuned/Optimized RNN Model

      2.3 - Metrics on Performance and Accuracy of RNN Model

3.0 - LSTM Time-Dependent Model

      3.1 - Trained LSTM Model

      3.2 - Tuned/Optimized LSTM Model

      3.3 - Metrics on Performance and Accuracy of LSTM Model

4.0 - TCNN Time-Dependent Model

      4.1 - Trained TCNN Model

      4.2 - Tuned/Optimized TCNN Model

      4.3 - Metrics on Performance and Accuracy of TCNN Model

5.0 - Attention Time-Dependent Model

      5.1 - Trained Attention Model

      5.2 - Tuned/Optimized Attention Model

      5.3 - Metrics on Performance and Accuracy of Attention Model

6.0 - Additional Metrics and Reports

      6.1 - Additional metrics for time-dependent models

            6.1.1 - Accuracy after "warming up" with incorrect data

      6.2 - Research Paper on results

      6.3 - Presentation on findings for Northrop Grumman