C2TSR: Concurrent Canada-based Traffic Signpost Recognition System

Department Of Computer Science

CS 842: Introduction to Data Science : Project

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Introduction

- A deep learning model
- Detect and classify the traffic signposts (signals and signs)
- Based on Canada traffic signs
- Motivational factors to introducing this model:
  - A prelude of fully automated driving or semi-automotive driving systems (e.g. ADAS)
  - Assist the driver
  - Help in regulating the traffic
  - Enhance the comfort and safety of the driver
  - Assist visually impaired individual
  - Less research available for Canadian traffic signs
  - Achieve zero accident

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Problem Statement (Discovery)

•Road accidents

•Human errors: detection and recognition errors

•Performance error of the drivers

•No or less dataset present to cover Canada signposts

•ADAS restricted to automatic braking, Lane detection and departure warning, Alcohol ignition interlock devices, Driver drowsiness detection, Reference[https://en.wikipedia.org/wiki/Advanced_driver-assistance_systems]

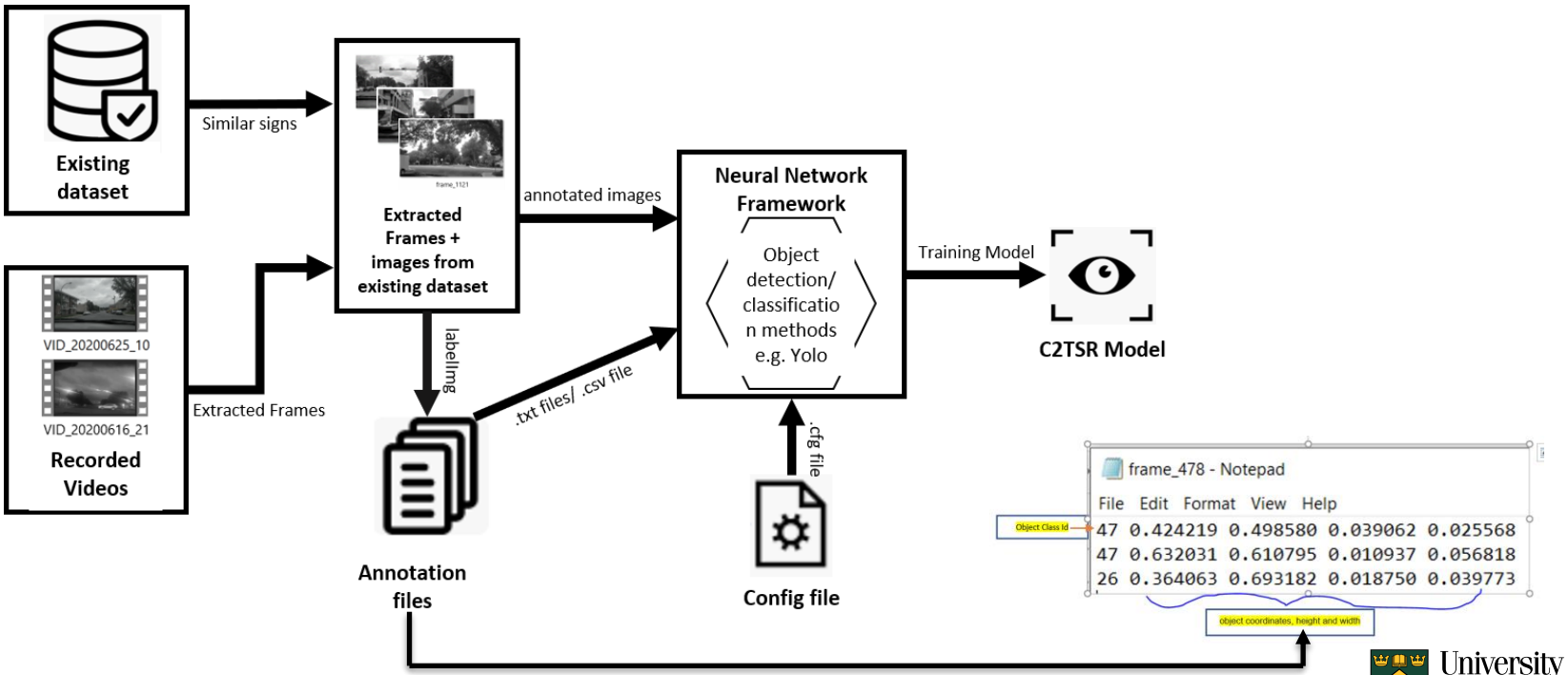
•Why Deep learning ?

Solution

•C2TSR Model:

- Deep learning method (YOLO - state-of-the-Art)
- Dataset - extracted frames from the recorded videos and annotation files
- Train the model using large dataset based on Canadian traffic signposts
- Around 60+ different classes
- Simulate this model in the real-time scenario
- Notify drivers about incoming traffic signs and warn them

C2TSR Architecture



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Data Preparation

•Record Videos

•Extract frames (1 frame per second) and remove unwanted frames

•Re-use similar signs from existing dataset such as GTSRB - German Traffic Sign Recognition Benchmark

•Create annotation files corresponding to each frame using labeling tool such as labelimg

•Customize config and data files

•Storage and access: Store dataset on Google Drive and access using Google Colab notebook

•Statistics: As of now I have created 1 GB of data images without annotation files

Risk factors while preparing dataset

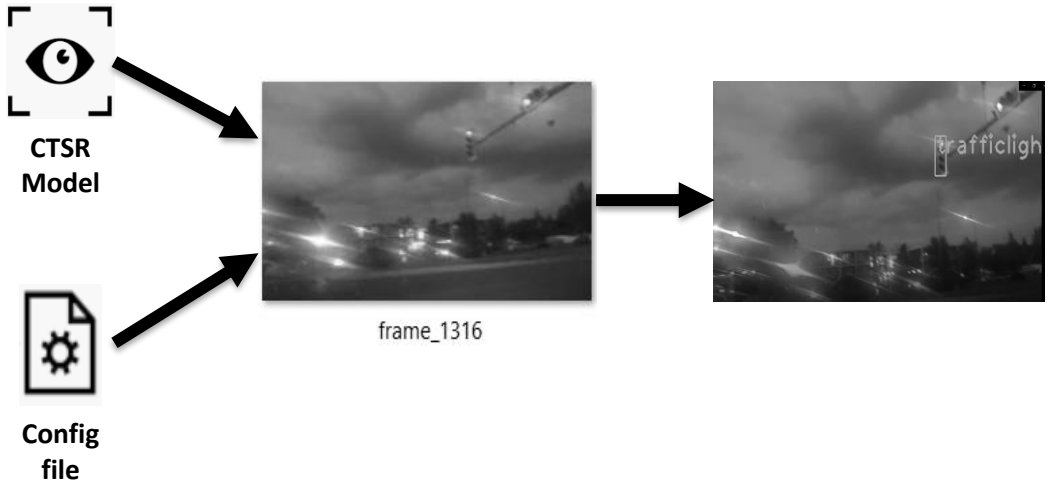
- Different lightning and climate conditions
- Poor visibility
- Camera alignment and focal point
- Motion effects while capturing video
- Different traffic colors for signs and boards
- Damaged traffic sign boards

Model Selection and Building

- R-CNN, SSD, Fast R-CNN
- Why YOLO algorithm?
- Yolo Version 3 or 4? (not decided yet)
- Testing of the model :
  - Testing on Images
  - Testing on recorded videos
  - Testing using Device Camera

Model Testing and Expected Outcome

1. On Image file



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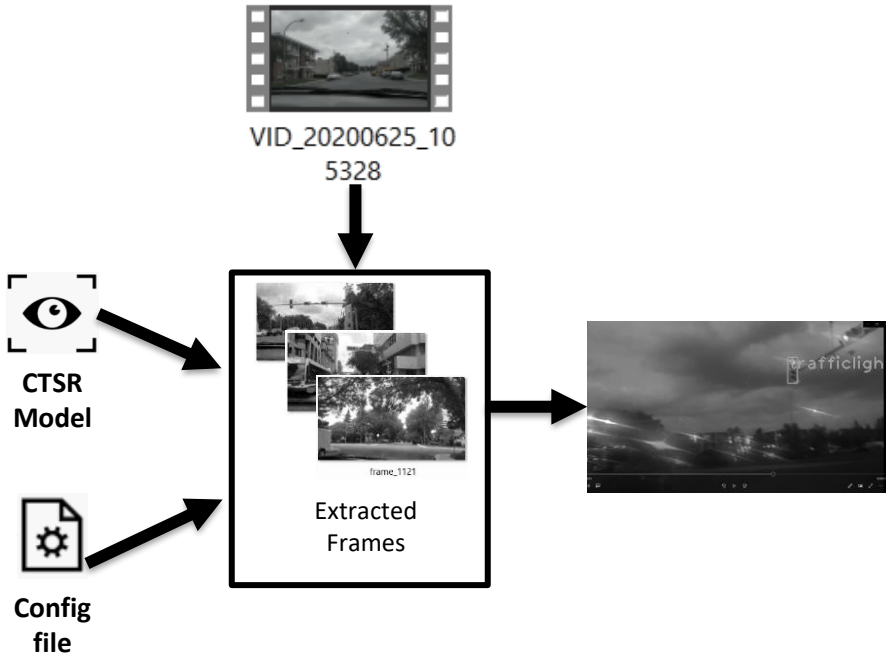
Model Testing and Expected Outcome

2. On Video file/ Camera



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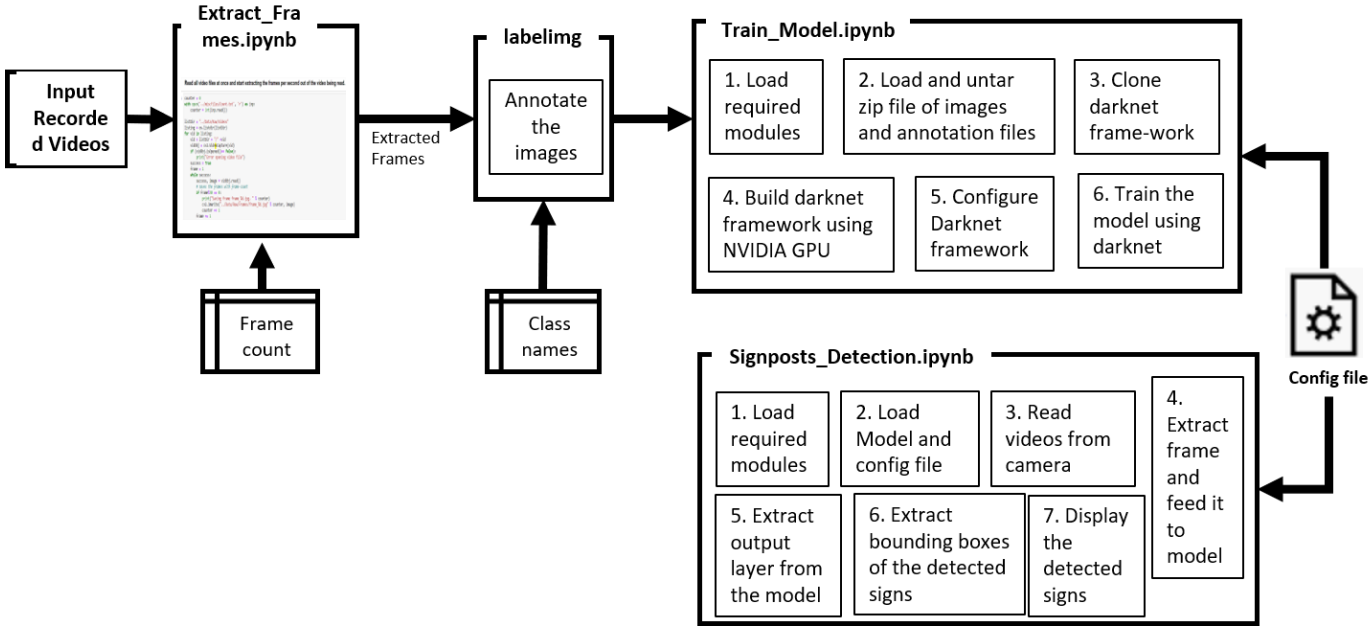
Tools

- Annotation : LabelImg
- Framework : tensorflow-gpu, darknet
- Modules : OpenCV-python, numpy, panda, lxml, os, glob, random, etc
- Platform : Jupyter lab, Google Colab; and Overleaf for writing documents
- Google Drive: to store the dataset and model

Prototype of the Proposed model



Link: https://drive.google.com/drive/folders/1vEc8Fb3din6 YdnqTbAnAH1s8V2HGw5-k?usp=sharing

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Thank you

Here is the detailed document about the proposed model and if you have any questions, please drop an email to ssz389@uregina.ca.

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