Project Proposal Presentation

• Topic •

“Improving Car Image Detector”

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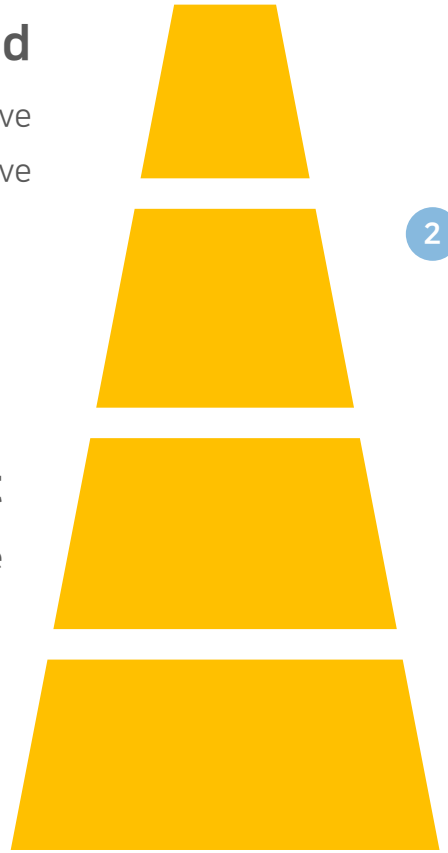
Agenda

1 Project Background

- Business Perspective
- Technical Perspective



2 Related Work

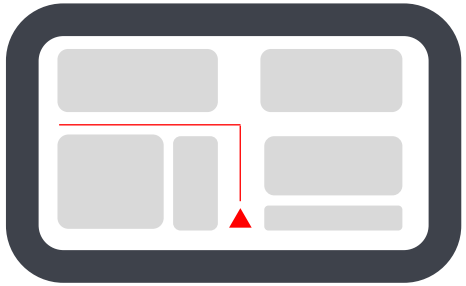
- Original Car Detection Model
- Applicable techniques for improving performance

3 Goal & New Perspective of the project

- Specific Goal & New perspective

4 Dataset & Evaluation Methods

- Dataset
- Evaluation Methods



Project Background

Perspectives

1 BUSINESS PERSPECTIVE

- It is planned based on **the lack of information on preferred cars**.
- Especially, the fact that it is difficult to remember specific information such as the year and model by looking at your preferred car suggests raises **the need for ML** in the end.
- Therefore, we implement **a detector system** that provides **more accurate vehicle information** based on the characteristics of vehicle images and use different types of techniques to **improve performance**.

2 TECHNICAL PERSPECTIVE

- Can be classified into automotive detection system and image classification model.
- Analyze existing **CNN-based classification models** in terms of classification models.
- After applying various applicable new techniques, the optimal model will be implemented by comparing them.
- For detection systems, we plan to use the **YOLO5 model**.

We've thought largely from two perspectives: business and technology.

Related Work

Works

1 ORIGNAL CAR DETECTION MODEL

- According to related paper, **R-CNN model** is used for image recognition model.
- The **YOLO model**, which processes the method as one-stage, **increases the accuracy** by performing the step of dimension cluster, which can serve as a fitting for the object image size of the training data.
- This model generates a **CNN model** by dividing it into two types and sequentially classifies it. For the first data model, it uses en tire set to create the model which will classify the type of car.

We use the dataset suitable for each model applied to the secondary model training!

2 APPLICABLE TECHNIQUES FOR IMPROVING PERFORMANCE

- Based on various studies related to image classification model improvement, we seek to find an **optimal vehicle classifier model.**
- We found that **ODE-NET and Res-NET** outperform conventio nal first-layer MLP in terms of accuracy, memory usage, time.
- Also, by using **SDE-NET**, we try to improve the performance of CNN by developing a model that can reduce the training cost and handle uncertainty.
- In summary, the purpose of this project is to select the most optimized method for car detection.

We will consider various methods like SDE-NET for improving the performance of CNN and select the optimal method for car detection!

Goal & new perspective of the project

Goal & New Perspective

1 GOAL OF OUR PROJECT

- The aim of the project is a **car recommendation system**.
- When the user provides the car photo to the service, it can provide information about what the car name is or different cars made by the same company.
- Moreover, It may give information about what is the favorite car of the users, too.

2 NEW PERSPECTIVE OF OUR PROJECT

<DATA>

- Existing research data : Focus on the front or back of a car
  Data we're going to use : Photos from different directions
  (Also, it's government data, it has a huge amount of data.)
  -> Provides more accurate automotive recognition

<TECHNUQUES>

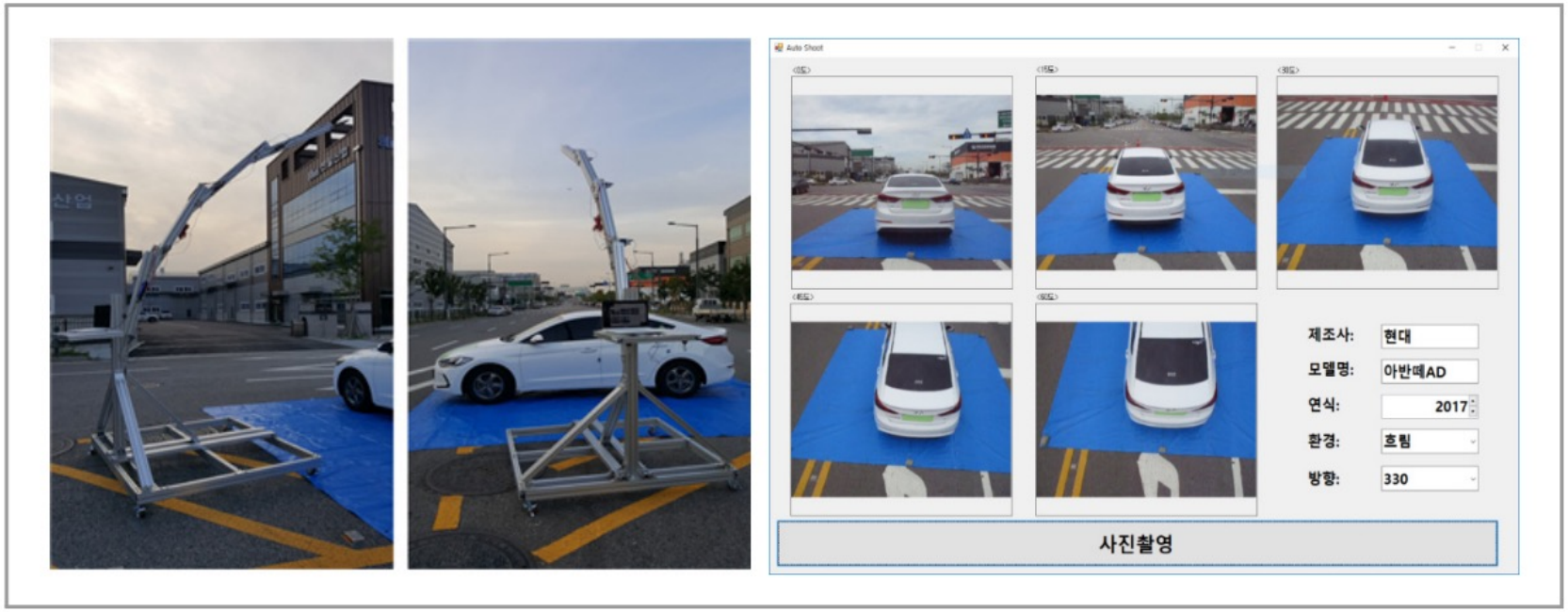
- Technically, we will use **yolo5 model + ODE**
  -> Two advantages
  1) Lower memory cost by Adjoint sensitivity method
  2) Fitting appropriate with irregular time points data

We want to improve the deficiencies of existing studies

and integrate various technologies to implement an optimal model.

Dataset & Evaluation Methods

Dataset

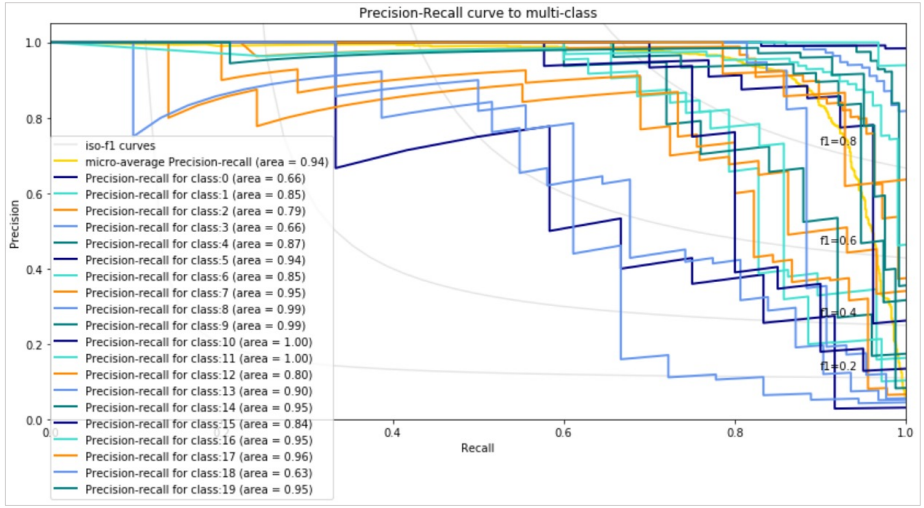


- The data set is served by the Korea government, taken in 2018, which is represented by **AIHUB**.
- All photos are taken by using a mechanical machine and taken from **different directions**.
- The dataset is about 100 different vehicles. There are an average 650 photos of each car.
- The dataset is surely validated by **Cross-Validation**.

Dataset & Evaluation Methods

Evaluation Methods

$$F_{1,macro} = 2\frac{\text{recall}_{macro} \times \text{precision}_{macro}}{\text{recall}_{macro} + \text{precision}_{macro}}$$



- Evaluation can be done in two perspectives, **accuracy and unknown class detection**.
- For accuracy, AUC area and f1 score are mainly used for classification task evaluations.
- Variances of the f1 score can be used to handle unbalanced predictions, and covariances of the vehicle model portion and the F1 score can be used for services.
- For unknown class detection, it also can be evaluated by f1 score, treating unknown class as another new class.

End of Document

Thank You ☺