Validierung und Verbesserung einer Verkehrsschildererkennung – DeepSafety Report

Training

CUDA, Zeit, Ergebnisse (Test/Traininng)

Model: "https://tfhub.dev/google/tf2-preview/inception\_v3/feature\_vector/4"

Datensatz: dataset/Train von GTRSB -> 4-9 & 39-42 nicht enthalten!!!!

Datensatz

Bias (Histogramm über klassen)

Inhalt (Helligkeit, Drehung, Kippung, Verdeckt, Verschmutzt, Farbe

Validierungsüumfänge

Metriken? (Accuracy, MAP)

Zeitabhängigkeit: Wenn Bild für ein Frame falsch erkannt o.k. -> Interpretation im Kontext Fahren – Wie kann ich das rausfinden?

Wrong detects

Confusion matrix

* Darauf basierend Validation Batch, data augumentation

Abschließend: Neues Training -> DropOut Layerk, Normalisierung mehr

Lit:

Paper LeYun

Tds page

Requirements

Jb notebook

Val batch

DeepSafety Report – Validation and Improvement of a traffic sign recogntion (TSR)

# Introduction

The main goal of this report is to implementand validate a working TSR based on the GTSRB traffic sign dataset and the inception feature extractor 1 as base network. While it is relatively simple to train the feature extractor on a given dataset, the validation and performance evaluation on new data, especially real world scenarios is not as easy as it seems: To ensure all safety aspects of a detection system based on deep learning, a variety of cosiderations must be made -including the significance of the train set, reflection of the training procedure, comprehensive validation with a real world representing validation batch and edge case relativation. As a round-off in a secod training iteration the derived improvements should be validated.

# First training iteration

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Automatisch generierte Beschreibung

## The train dataset

The feature extractor is trained on the GTSRB train (sub)dataset which contains 39.000 images of the 42 most important german traffic signs. In a first step the representation of each class is analysed by plotting the quantity distribution over all available classes:

Ein Bild, das Screenshot, Design enthält.

Automatisch generierte Beschreibung

As shown above, the dataset is significantly biased and does not represent all classes with the same quantity. While that may correspond to the occurence of each sign in the real world, a TSR musst detect all possible classes with a sufficient certainty – especially the underrepresented.

By taking a deeper look into the dataset it gets clear that every 30 images are showing one sign, recorded in different sizes and angles, while the collecting vehicle is approaching it. That may have both, advantages and disadvanteges:

* Reduces data set to 1.300 recorded sings, which increases the data bias (i.e. for malformed signs)
* Adaption to real world scenatios: As the vehicle approaches a sign, in a temporal context single-frame-detection-errors (SFDE) can be neglected, because the sign is still deteced in most frames
* …

The variety of environmental conditions in which the signs are captured also need to be mentioned: There are really bright or dark images, signs being partial hidden, dirty signs, signs with stickers on it, as well as rotated or tipped ones. Here are some examples:

5 BILDER besondere Schilder

It can be said that this variety enforces robustness on a big scale dataset, but may also lead to biasing? With smaller datasets!

## Training results

Tensorboard

Overfitting

# Validation

The process of validation… metrics…tools…safetyBatch…test data set…

## Metrics

To validate the results of the trained model, two metrics, the metrics accuracy and map are introduced. These are definde by:

While accuracy gives a good … , the MAP metric indicates … and … .

## Tools

safetybatch & augumentation is derived from here!

Wrong detects

Confusion matrix

## The test dataset

For validation a second subdataset, the test dataset, provided by GTSRB, is used. It contains 12.500 unsorted images (or 420 signs) with corresponding lables and is the biggest give source of new images.

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Automatisch generierte Beschreibung

In prior lectures five safety batches were evaluated on their significance:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| SafetyBatch | Size (# images) | Contained classes | Accuracy | MAP | features | conclusion |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |

Based on the made experience above, a new safety batch is designed. The batch sould contain a representative amount of signs, including all classes, a variety of edge cases, augumented data and different environmental conditions.

The second iteration

More data

Drop out layer