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Mini project, Road Crack Detection

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Abstract

This reports includes specific details about how to prepare the RDD2022 datasett, which packages to install and how to train the model.

1. Preprocessing

Download the datasets using *wget*, fix the zipped files using the command *!zip -FFvfr* and unzip the datasets. Convert the *xml* annotation to *yolo* annotation using the script *xml2yolo.py* . Merge image and label folders for all countries except for Norway and split the datasets into train and val using the script *split_datasets.py* .

To prepare the Norwegian dataset use the script called *cropping.py* and run the script 4 times using the parameters given in the following table:

px_min	px_max	py_min	py_max
0.3	1	0.6	1
0	0.6	0.5	1
0	0.6	0	0.6
0.3	1	0	0.6

Table 1: Proportional values used in cropping the Norwegian images. The values result in images displaying, lower right, lower left, upper left and upper right part of the image.

Balance the amount of backgrounds in the Norwegian dataset using the script *balance.py* and setting the percentage constant equal to 0.4. Finaly split the norwegian datasett into train and val using the script *split_dataset.py*.

The scripts called *xml2yolo* and *split_datasets* were created by author Ng Wai Fong, and collected from an article called *Convert PASCAL VOC XML to YOLO for Object Detection* on the webpage *Towardsdatascience*.

2. Parameters

The parameters used in the pretraining and finetuning of the final model are given in the file called *baseline.yaml*. The hyperparameters used in the 4 different hyperparameter sets are fount in the folder called *hyperparameters*. The datafiles used in the training of yolov5s6 are found in the folder *data*.

3. Training

The notebook called *Mini_project* includes all the steps neccesary to reproduce the results from the project. Here is a quick overview of the steps.

1. Clone the git Repository
2. Change directories into the yolov5 folder
3. Install the requirements in the requirements.txt
4. Download weights using bash
5. Train the model configuration *yolov5s6.yaml* on the merged dataset of all the countries using the downloaded pretrained weights called *yolov5s6.pt*. Use the script called train.py and the hyperparameters in the file called *baseline.yaml*. Also set the following parameters as follows:

Parameter	value
image-weights	True
imgz	1280
batch-size	8
cache	True
epochs	30

Table 2: Training parameters used in pretraining.

6. Finetune the pretrained weights on the norwegian dataset, by running the script *train.py* with hyperparameters given in *baseline.yaml* and the data given by *RDD2023_06.yaml* and the parameters set as follows:

4. Model architecture

The model architecture chosen is yolov5s6 and can be found in the folder *models/hub*.

Parameter	value
image-weights	True
imgz	1280
batch-size	8
cache	True
epochs	80
freeze	[1 - 20]

Table 3: Training parameters used in the finetuning.

5. Inference

At inference, use the script *detect* and use the parameter *augment*.