

Exercise 1

21. November 2018

Task 1: Network Design

- b) The module *training.py* contains the training loop for the network. Read and understand its function *train*. Why is it necessary to divide the data into batches? What is an epoch? What do lines 43 to 48 do? Please answer shortly and precisely.

Solution: It is necessary to divide your data into batches for 2 reasons. First there is less memory used to train the network and second the network learns faster with smaller batch sizes. A lot papers propagate a batch size of 64 as Optimal learning.

An epoch is is one forward and one backward pass of all training data.

We take the batch of our training data, calculate the prediction of the network, compare them to the target values using the cross-entropy-loss-function. Then the loss is used to propagate the error back to the network to adapt the weights in the network.

- c) Define the set of action-classes you want to use and complete the class-methods actions to classes and scores to action in *network.py*

Solution: The provided data of the expert imitations comes as a set of free:

$$(steer, gas, brake)$$

with

$$steer \in \{-1, 0, 1\}$$
$$gas \in \{0, 0.5\}$$
$$break \in \{0, 0.8\}$$

We want to use following classes:

{steer_left}

{steer_right}

{steer_left and brake}

{steer_right and brake}

{brake}

{gas}

{}

Accelerating and steering makes no sense to us, because it would conclude in a donut.

- c) Can you achieve better results when changing the hyper-parameters? Can you explain this?

Solution: Yes, it can be archived. As you change the Hyperparameter, you change the behaviour or the calculation of the network. Therefore it is possible, that you can optimize by changing them.

Low learningrate with few epochs results in a bad learning.

d) (I) What is 'good' training data?

Solution: Good training data is data which contains every possible situation or situations with actions which are very close the reality. therefore trainingdata should

(II) Is there any problem with only perfect imitations?

Solution: Perfect imitations are bad because the network can't adapt to situations which are not in the training data. Therefore the reaction is far from the expected reaction for a new situation.

Task 2: Network Improvements

a) What does it do?

Solution: These enables you to