

COMPUTING SUBJECT: Machine Learning

TYPE: WORK ASSIGNMENT

IDENTIFICATION: Training models

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DEGREE OF DIFFICULTY: Medium

TIME CONSUMPTION: 1-2 hours

EXTENT: < 150 lines

OBJECTIVE: Basic understanding of the cost function

COMMANDS:

IDENTIFICATION: Training Models/MICL

The Mission

To understand the idea behind training models using a cost function.

Precondition

You must have done the exercises on Linear Regression in chapter 2

The problem

What are the algorithms behind (linear) regression to find the model's parameter vector.

Equation 4-3. MSE cost function for a Linear Regression model

$$\text{MSE}(\mathbf{X}, h_{\theta}) = \frac{1}{m} \sum_{i=1}^m (\theta^T \mathbf{x}^{(i)} - y^{(i)})^2$$

As cost function we will use Mean Square Error (MSE) measure for the linear regression, we will apply and evaluate this to several different solutions:

Closed Form
Batch Gradient Descent
Stochastic Gradient Descent
Mini-Batch Gradient Descent

Useful links

<https://matplotlib.org/3.1.0/tutorials/introductory/pyplot.html>

Assignment 1: Download program

You have already in a previous exercise downloaded datasets and programs from the following GitHub - <https://github.com/ageron/handson-ml2>, to your PC.

The program is in the repository you made when you downloaded from GitHub.

Navigate to the folder “*handson-ml2-master*” holding the downloaded GitHub repository on your PC. Notice the subfolder “*04_training_linear-models*”.

This project we need to access so upload the *project “04_training_linear-models”* to your solutions-folder and save it in your folder for solutions (Machine Learning/Solutions)

Assignment 2: Application program, running the project

Run the cells more or less one by one and on the way discuss the topics and write down the answers to the following questions:

- a. What is a normal equation?
- b. How to compute normal equation (show the code)?
- c. What are the disadvantages of closed-form-solution ?
- d. What is the principle behind Batch Gradient Descent ?
How is it done in the code ?