Machine Learning - Homework 1

Spring 2019

Exercise 1 (3 pts)

Read the open article about the dangers of autonomous weapons `https://futureoflife.org/open-letter-autonomous-weapons/` and give a short recap of these dangers. Furthermore, find another example of dangers with machine learning/artificial intelligence and explain this in your own words.
(ca. 5-10 sentences)

Exercise 2 (3 pts)

Recall or read the definitions of *linear equation in two variables* and *quadratic function* (on Wikipedia or a basic math book). Note that in a linear equation in two variables we can replace the second variable y by $f(x)$ to get a function in only one variable x. We call this a *function given by a linear equation.*

Decide for each of the following equations, if they are a function given by a linear equation, a quadratic function or none of the two:

1. $f(x) = 5x^2 + 5.3$
2. $f(x) = x - \frac{5}{7}$
3. $f(x) = \sqrt{x} + 2$
4. $f(x) = \sqrt{2}\, x^2 + 5x - 2$
5. $f(x) = 2^x - 4x - 1$
6. $f(x) = -x$

Exercise 3 (4 pts)

For this exercise use the MASS library with the Boston data set in R.

1. Determine the linear regression function in the form $f(x) = mx + c$ for predicting `crim` depending on `medv` (i.e., $x =$`medv`).
2. Determine the linear regression function in the form $f(x) = mx + c$ for predicting `medv` depending on `crim` (i.e., $x =$`crim`).
3. Find the commands for mean and variance in R and compute the mean and the variance of `crim` and `medv`, respectively.

(For those who want more challenge: Use the mean and variance commands to compute (or verify) the regression function for part 1) and 2) step by step without the `lm`-command, using the formula for simple linear regression `https://en.wikipedia.org/wiki/Simple_linear_regression`.)