UNIVERSITÄT BONN

Foundations of Machine Learning in Python

Moritz Wolter

July 6, 2022

High Performance Computing and Analytics Lab, Uni Bonn

Overview

Derivatives and Gradients

Optimization

Optimization

Traditionally, optimization means minimizing using a cost function $f(x)$. Given the cost, we must find the cheapest point x_min on the function, or in other words,

$$x_{min} = \min_x f(x) \tag{1}$$

Functions

Functions are mathematical mappings. Consider for example the quadratic funtion, $f(x) : \mathbb{R} \to \mathbb{R}$:

$$f(x) = x^2 \tag{2}$$

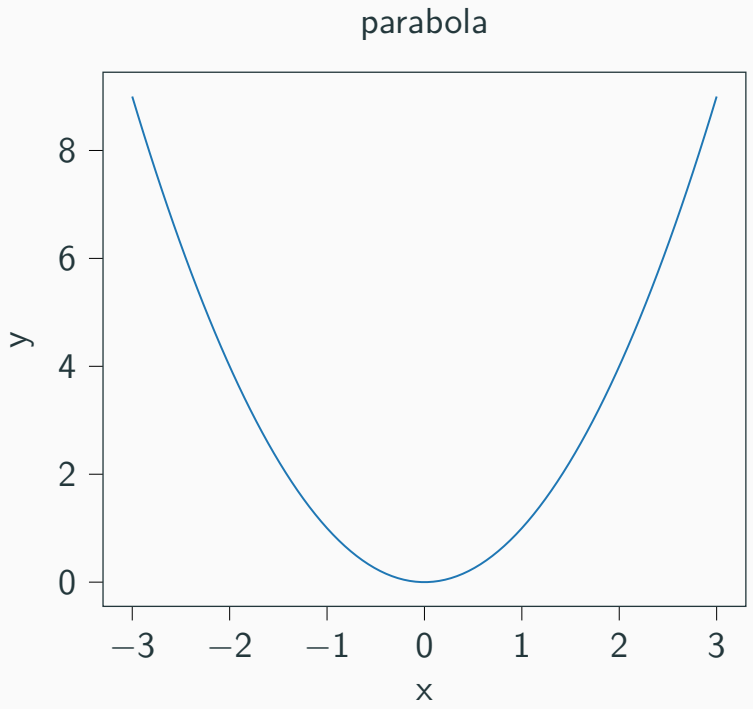

Figure: The parabola funciton

Derivatives and Gradients

The derivative

$$\frac{df(x)}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \tag{3}$$

The gradient

$$\nabla \mathbf{x} = \frac{f(x+h) - f(x)}{h} \tag{4}$$

Optimization

Frame 2

TODO