Subgradient Method

Chirag Mehta*

Indian Institute of Technology, Hyderabad
ai20btech11006@iith.ac.in

March 16, 2022

Abstract

Non-differentiable functions are an important class of functions which often appear in optimization problems, a gradient descent method would fail to optimize such an objective because the gradient might not exist. Methods such as interior point method work great, but it has its own limitations of being computationally inefficient. We will explore the subgradient method which is an iterative first-order method similar to gradient descent. We will also be exploring the heavy-ball method to make the subgradient method faster.

I. Motivation

In practice, many functions are non-differentiable at certain places in the domain. Take the example of a basic non-differentiable function $f(x) = |x|$ which is non-differentiable at $x = 0$. In the next section, we will introduce an algorithm to optimize on non-differentiable functions.

II. Preliminary References

- A youtube video on subgradient method
- Stanford notes
- Mathematics behind subgradients
- Subgradient method in SVM
- Subgradient method in SVM
- Heavy-ball method

*This is a preliminary report, the main report will be updated at github