

# Boosting

## *Seminar: Foundations of Data Science*

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December 28, 2020  
winter term 2020/21

### Abstract

A short summary of about two to three sentences that briefly and concisely outline the content ...

## 1 Introduction

This article deals with the fundamentals of data science. We are covering the topic XYZ in particular, which is very interesting and besides the theoretical depth has many practical applications.

We start with a definition, which plays a central role in this work.

**Definition 1.** (*Euclidean norm*) Let  $x \in \mathbb{R}^d$ . We denote by

$$\|x\| = \sqrt{\sum_{i=1}^d x_i^2}$$

the Euclidean norm of  $x$ .

## 2 Weak Learnability

This and that...

### 14 3 AdaBoost

15 Here we work with the above definitions and notations and derive important  
16 results such as the following Theorem on the least-squares solution

17 **Theorem 1.** (*useful theorem*) Let  $X \in \mathbb{R}^{n \times d}, Y \in \mathbb{R}^n$ . Further define  $\beta^* =$   
18  $\operatorname{argmin}_{\beta \in \mathbb{R}^d} \|X\beta - Y\|^2$ . Then

$$19 \quad \|Y\|^2 = \|X\beta^*\|^2 + \|X\beta^* - Y\|^2.$$

20 *Proof.* The proof is left as an exercise. □

21 Sometimes figures help to illustrate a formalism. This is completely un-  
22 related to Theorem 1.

### 23 4 Conclusion

24 Even after centuries of research in the field of data science, there is nothing  
25 more versatile than the useful theorem of chapter 3. It is used everywhere  
26 and has led to the greatest and most intriguing results, cf. [2]. By the way,  
27 the book for the seminar [1] is a great reference and should be cited. Further  
28 literature can be found in the respective *Bibliographic Remarks* sections and  
29 of course you are welcome to search and add your own references.

30 **Note:** BibTeX entries can often be found in the DBLP collection. Google  
31 Scholar also offers BibTeX entries, which can be copied into the .bib file and  
32 may need some minor adjustments.

## References

- [1] S. Shalev-Shwartz and S. Ben-David. *Understanding Machine Learning - From Theory to Algorithms*. Cambridge University Press, 2014.
- [2] J. Someone and J. Someoneelse. Useful theorems, 2003.