

Proseminar  
*Advanced topics in  
machine learning*

*Bagging, Boosting, and Ensemble  
Learning*

Author

*Florian Zager*

Matrikelnummer: *2489018*

Date:

Karlsruhe, December 26, 2023

## **Abstract — Zusammenfassung**

Mandatory. Short summary of the report.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Ensemble Learning</b>	<b>1</b>
2.1	Bagging . . . . .	1
2.2	Random Forest . . . . .	1
2.3	Out-of-bag . . . . .	1
2.4	Boosting . . . . .	2
2.5	Gradient Boosting . . . . .	2
2.6	Extreme Gradient Boosting . . . . .	2
<b>3</b>	<b>Examples</b>	<b>2</b>
3.1	Example 1 . . . . .	2
3.2	Example 2 . . . . .	2
<b>4</b>	<b>Summary and conclusion</b>	<b>2</b>

# 1 Introduction

Mandatory. Questions like: What is the topic of this work, what's the broader context (topic of the proseminar), why is it relevant?

- History of ensemble learning + papers of people "inventing" it
- Goal of the report
- learning more about bagging + boosting
- get to know most popular types of both methods
- learn how to practically use them
- when to use which technique
- 

## 2 Ensemble Learning

- What's ensemble learning?
- wisdom of crowds

### 2.1 Bagging

- What's the idea behind it?
- How to train bagging? (+ graphic)
- How does the prediction work? (+ graphic)
- when to use it
- advantages and challenges

### 2.2 Random Forest

- difference to bagging

### 2.3 Out-of-bag

- explain

## **2.4 Boosting**

- Whats the idea behind it?
- How to train boosting? (+ graphic)
- How does the prediction work? (+ graphic)
- when to use it
- advantages and challenges of using it

## **2.5 Gradient Boosting**

- difference to boosting

## **2.6 Extreme Gradient Boosting**

- difference to gradient boosting

## **3 Examples**

### **3.1 Example 1**

### **3.2 Example 2**

## **4 Summary and conclusion**

Mandatory. Short summary of the most important aspects of the report. If possible: What are open challenges?

- Bagging vs. Boosting - whats the difference?

## References