

# MDSAA

Mestrado em  
**Data Science and Advanced Analytics**

**Full Title of the Thesis**

An optional subtitle can be added

Student's Full Name

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data Science and Advanced Analytics

**NOVA Information Management School**  
**Instituto Superior de Estatística e Gestão de Informação**  
Universidade Nova de Lisboa

**Full Title of the Thesis**

An optional subtitle can be added

by

Student's Full Name

Master Thesis presented as partial requirement for obtaining the Master's degree in Data Science and Advanced Analytics, with a specialization in Business Analytics

**Supervised by**

Supervisor's name, academic title (PhD; etc), Academic institution or School affiliation of the supervisor

March, 2025

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## DEDICATION

Just if you want to dedicate your work to someone dear to you or to someone that inspired you in your life. Here is not the place for acknowledge, it is a distinct honour to someone, although it is optional.

## **ACKNOWLEDGEMENTS**

This is an optional page, however it is always very important to acknowledge those who made this possible, like family, friends, colleagues, professors, staff, University, and those who anonymously participated in the data collection phase, for example.

## ABSTRACT

The abstract should be between 150 and 400 words and include no bibliographical references.

The abstract should be one paragraph only. If the document is in Portuguese, please provide a Portuguese language abstract first, and the abstract in English on the following page. Abstract

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## KEYWORDS

Information Management; Research Methods; Data Analysis; Methodology

### Sustainable Development Goals (SDG):



## TABLE OF CONTENTS

Statement of Integrity . . . . .	iii
Dedication . . . . .	iv
Acknowledgements . . . . .	v
Abstract . . . . .	vi
List of Figures . . . . .	vii
List of Tables . . . . .	viii
List of Abbreviations and Acronyms . . . . .	x
1. Introduction . . . . .	1
1.1. Section 1 . . . . .	2
1.2. Section 2 . . . . .	2
1.2.1. Sub-Section 2-1: Examples of abbreviations . . . . .	3
2. Literature Review . . . . .	4
3. Methodology . . . . .	5
Bibliography . . . . .	6
Appendix A . . . . .	7

## LIST OF FIGURES

1.1. This is the logo of the university. . . . .	2
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## LIST OF TABLES

1.1.	Example of a basic LaTeX table. Note the caption is on top. . . . .	2
A1.	Example of a table in the Appendix. . . . .	7

## LIST OF ABBREVIATIONS AND ACRONYMS

IR	Information Retrieval
LLM	Large Language Model
RS	Recommender System

# 1. INTRODUCTION

## Introduction

Example of a citation in parentheses (Hastie et al., 2009).

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Example of an inline citation Einstein, 1905. This is in a second bib file.

You can also add equations such as Equation 1.1, some algorithms (1).

$$E = mc^2 \tag{1.1}$$

---

**Algorithm 1** Bubble Sort Algorithm

---

```
1: Input: An array  $A$  of length  $n$ 
2: Output: Sorted array  $A$ 
3: for  $i = 1$  to  $n - 1$  do
4:   for  $j = 1$  to  $n - i$  do
5:     if  $A[j] > A[j + 1]$  then
6:       Swap  $A[j]$  and  $A[j + 1]$ 
7:     end if
8:   end for
9: end for
10: return  $A$ 
```

---

You can also have some code listings: (See [https://www.overleaf.com/learn/latex/Code\\_listing](https://www.overleaf.com/learn/latex/Code_listing) for documentation).

Listing 1.1: Example Listing

```
1 # This is a simple Python function
2 def greet(name):
3     print("Hello, " + name + "!")
4
5 # Call the function
6 greet("Alice")
```

## 1.1. Section 1

Here is an image of Figure 1.1. There is also a basic table here, Table 1.1

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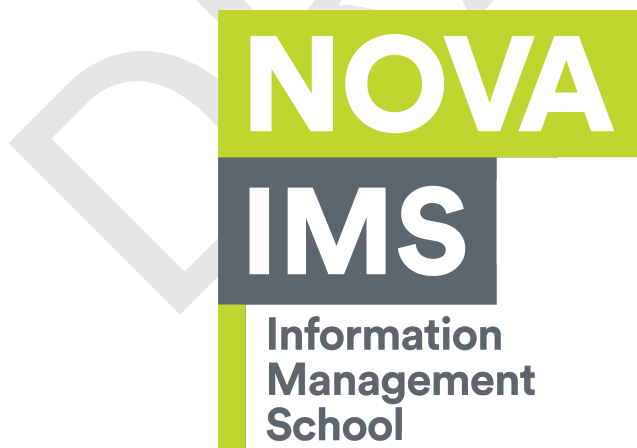


Figure 1.1.: This is the logo of the university.

Table 1.1.: Example of a basic LaTeX table. Note the caption is on top.

Column 1	Column 2	Column 3	Column 4	Column 5
A1	B1	C1	D1	E1
A2	B2	C2	D2	E2
A3	B3	C3	D3	E3
A4	B4	C4	D4	E4
A5	B5	C5	D5	E5
A6	B6	C6	D6	E6
A7	B7	C7	D7	E7
A8	B8	C8	D8	E8

## 1.2. Section 2

And now some lists!

An unnumbered list:

- Apples
- Bananas
- Cherries

And a numbered list:

1. First item
2. Second item
3. Third item

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### **1.2.1. Sub-Section 2-1: Examples of abbreviations**

Information Retrieval (IR) plays a crucial role in many modern applications, including search engines and digital libraries. With the rise of Large Language Models (LLMs), the efficiency and accuracy of IR systems have significantly improved. Similarly, Recommender Systems (RSs) have benefited from advancements in deep learning, providing personalized recommendations based on user preferences.

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## 2. LITERATURE REVIEW

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### 3. METHODOLOGY

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## BIBLIOGRAPHY

Einstein, Albert (1905). "Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]". In: *Annalen der Physik* 322.10, pp. 891–921. DOI: 10.1002/andp.19053221004.

Hastie, T., R. Tibshirani and J.H. Friedman (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*. Springer series in statistics. Springer. ISBN: 9780387848846.



## APPENDIX A

Here's Table A1 in the Appendix. Note that the numbering is different from Table 1.1.

Table A1.: Example of a table in the Appendix.

Column 1	Column 2	Column 3	Column 4	Column 5
A1	B1	C1	D1	E1
A2	B2	C2	D2	E2
A3	B3	C3	D3	E3
A4	B4	C4	D4	E4
A5	B5	C5	D5	E5
A6	B6	C6	D6	E6
A7	B7	C7	D7	E7
A8	B8	C8	D8	E8

---

### Algorithm A1 Algorithm in the Appendix

---

```
1: Input: An array  $A$  of length  $n$ 
2: Output: Sorted array  $A$ 
3: for  $i = 1$  to  $n - 1$  do
4:   for  $j = 1$  to  $n - i$  do
5:     if  $A[j] > A[j + 1]$  then
6:       Swap  $A[j]$  and  $A[j + 1]$ 
7:     end if
8:   end for
9: end for
10: return  $A$ 
```

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