



UNIVERSIDAD DE GRANADA

PhD Thesis

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PhD Thesis
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Include here funding information

*You must always have faith in people. And most importantly,
you must always have faith in yourself.*

— Elle Woods (Legally Blonde, 2001)

ACKNOWLEDGEMENTS

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ABSTRACT

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RESUMEN AMPLIO EN CASTELLANO

Motivación

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Objetivos

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Contribuciones

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Conclusiones

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ACRONYMS

AD Alzheimer's Disease

CNN Convolutional Neural Network

Part I

FUNDAMENTALS

1 | INTRODUCTION

1.1	Motivation	3
1.2	Aims and objectives	3
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1.4	Contributions	4

1.1 Motivation

This template has been created specifically for the defence of Thesis [1]. If you make use of this template or base your work on it, please provide proper attribution or reference to its original source.

1.2 Aims and objectives

This template uses the `acronym` package to manage abbreviations consistently throughout the text. Acronyms should be defined inside the `acronym` environment and referenced in the text using dedicated commands. The usage is summarised below:

- `\ac{cd}` — On first use, prints the full name followed by the acronym in parentheses: Convolutional Neural Network (CNN). Later uses show only the acronym: CNN.
- `\acs{cd}` — Prints only the short form (the acronym), even on first use: AD.
- `\acl{cd}` — Prints only the long form (the full name): Convolutional Neural Network.
- `\acf{cd}` — Always prints the full name and acronym: Alzheimer’s Disease (AD).
- `\acp{cd}` — Prints the plural form, automatically adding an “s” to the acronym and adjusting the long form if defined: CNNs.

All acronyms must be defined in the acronym environment.

1.3 Organisation of this thesis

This thesis is organised... It is divided into various topics and chapters as illustrated in Figure 1.1.

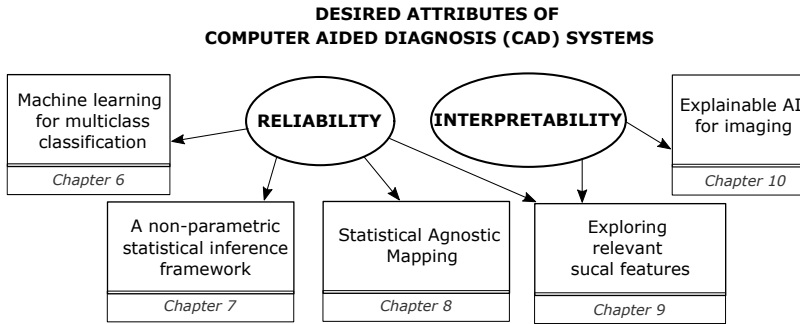


Figure 1.1: Structured scheme of the content of the contributions of this thesis.

1.4 Contributions

Part of the content of this thesis, including figures and tables, has been published in several international journal articles and conference presentations. These contributions are detailed below.

Articles

C. Jimenez-Mesa, I. A. Illan, A. Martin-Martin, D. Castillo-Barnes, F. J. Martinez-Murcia, J. Ramirez, and J. M. Gorriz, “Optimized one vs one approach in multiclass classification for early Alzheimer’s disease and Mild Cognitive Impairment diagnosis,” *IEEE Access*, vol. 8, pp. 96981–96993, 2020 (**chapter 3**)

Conferences

C. Jimenez-Mesa, I. A. Illan, A. Martin-Martin, D. Castillo-Barnes, F. J. Martinez-Murcia, J. Ramirez, and J. M. Gorriz, “Optimized one vs one approach in multiclass classification for early Alzheimer’s disease and Mild Cognitive Impairment diagnosis,” *IEEE Access*, vol. 8, pp. 96981–96993, 2020 (**chapter 3**)

2 | FUNDAMENTALS

2.1	New section	5
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In this chapter...

2.1 New section

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Part II

CONTRIBUTIONS OF THIS THESIS

3 | APPLICATION OF ...

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3.1 Introduction

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3.2 Methodology

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3.3 Results

This is a placeholder paragraph intended to demonstrate the layout and formatting of the text. The actual content will be written here once the structure of the thesis is defined and the main arguments are developed accordingly.

Figure 3.1 illustrates...

Table 3.1 summarises ...

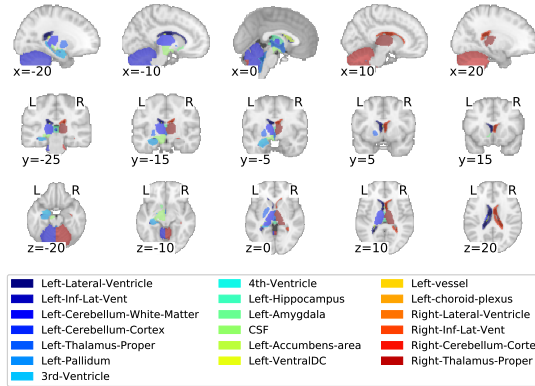


Figure 3.1: Selected regions after one-vs-one t -test feature selection.

Ensemble	Classifier	Training			Test (without dummies)		
		Accuracy	Recall	F1-score	Accuracy	Recall	F1-score
-	SVM lineal	0.48	0.47	0.47	0.67	0.52	0.66
-	SVM RBF	0.47	0.47	0.48	0.67	0.52	0.63
LogitBoost	Decision Tree	0.48	0.44	0.51	0.64	0.46	0.60
Random forest	Decision Tree	0.48	0.44	0.52	0.64	0.51	0.57
AdaBoost	Decision Tree	0.50	0.42	0.47	0.60	0.43	0.52
-	5-NN	0.52	0.43	0.44	0.60	0.44	0.46
-	1-NN	0.52	0.39	0.42	0.58	0.39	0.44
-	3-NN	0.51	0.40	0.39	0.58	0.41	0.40
-	MLP	0.56	0.57	0.56	0.60	0.60	0.59
-	CNN	0.55	0.55	0.54	0.48	0.47	0.48

NN stands for nearest neighbours.

Table 3.1: Performance results for selected features using different classifiers.

3.4 Discussion

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Part III

GENERAL DISCUSSION AND CONCLUSIONS

4 | GENERAL DISCUSSION AND CONCLUSIONS

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4.1.1	Discussion on...	13
4.2	Conclusions and Future work	13

4.1 General Discussion

The contributions presented in this thesis have already been extensively discussed in their respective chapters within Part II. In this final chapter, the focus will be on evaluating the impact of this work on ...

4.1.1 Discussion on...

4.2 Conclusions and Future work

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Part IV

APPENDIX

A | SUPPLEMENTARY MATERIAL FOR ...

...

A.1	Appendix	17
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This chapter includes supplementary material related to chapter 3. Such material includes...

A.1 Appendix

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- [1] C. Jimenez-Mesa, *Enhancing diagnostic accuracy in neuroimaging through machine learning: advancements in statistical classification and mapping*. Universidad de Granada, 2023. URI: <https://hdl.handle.net/10481/85701>.
- [2] C. Jimenez-Mesa, I. A. Illan, A. Martin-Martin, D. Castillo-Barnes, F. J. Martinez-Murcia, J. Ramirez, and J. M. Gorriz, "Optimized one vs one approach in multiclass classification for early Alzheimer's disease and Mild Cognitive Impairment diagnosis," *IEEE Access*, vol. 8, pp. 96981–96993, 2020.