POLITECNICO DI MILANO
Corso di Laurea Specialistica in Ingegneria Informatica
Dipartimento di Elettronica e Informazione

Mitosis detection in histological images. Algorithms based on machine learning and their performance compared to humans.

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A ...

Acknowledgements

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Abstract

Contents

Chapter 1

Introduction

"Quote 1"

Author 1

First part topics

- Detection problems in Computer Vision and in particular in biomedical imaging
- Relation between detection and classification
- Mitosis Detection as a component in breast cancer assessment
- Machine Learning used to automate the mitotic count task
- The validation problem:
  - from clinical point of view
  - from ML point of view

Second part topics

- General overview of the work: automatic Mitosis Detection in breast cancer histological images and comparison of the performances between humans and algorithms.
  - some literature
  - specificity of this work
  - achievements

  - research directions

Third part topics

- Structure of the work
  - Section 1: state of the art...
  - Section 2: approach to the problem and model
  - Section 3: design of a mitosis detection algorithm
  - Section 4: design of a user study
  - Section 5: experimental results
  - Section 6: Conclusions
  - Appendixes: implementation details

Test riferimenti [1]

Chapter 2

State of the art

"Quote 2"

Author 2

2.1 Detection Problems

General overview of the detection problems.

2.2 Feature extraction problems and classifiers

General description of the feature extraction based approach and classification

2.3 Mitosis Detection

Some biological background:

- What is a mitosis
- Why it is important in breast cancer classification
- Methods of classification of breast cancer

2.4 Benchmarks

2.4.1 Humans

Agreement between different histologists

2.4.2 Algorithms

Benchmarking of different detection algorithms and comparison with human performance.

Chapter 3

Problem Definition

"Quote 3"

Author 3

3.1 From Detection to Classification

The process of detection and classification....

3.2 Definition of Classification

Definition of classification:

- input
- output
- classes

3.3 Classification Assessment

3.3.1 Algorithms

The role of features and classifiers

3.3.2 Humans

Experience, agreement...

3.4 Performance

Definition of performance

Chapter 4

Design of a Mitosis Detection algorithm

"Quote 4"

Author 4

4.1 Structure

General structure of a Mitosis Detection algorithm.

4.2 Feature Extraction

(Qui o prima bisogna esplicitare che utilizziamo un subset di immagini)

4.3 Classifiers

Chapter 5

Design of a User Study

"Quote 5"

Author 5

5.1 Test Design

5.1.1 Dataset

(NB: il set di immagini usate deve esser giÃ stato descritto)

5.1.2 User Interface

Description of the website used to collect data from users.

5.2 Data collection

Description of the data collected by the website

Chapter 6

Experimental Results

"Quote 6"

Author 6

6.1 Accuracy of the Detection Algorithm

6.2 Accuracy of Humans

6.3 Accuracy of Algorithms

(rif. paper)

Chapter 7

Conclusions

"Quote 7"

Author 7

Bibliography

[1] S.R. Wereley, N.M. Hall. Frequency response of linear time periodic systems. *Proceedings of the 29th IEEE Conference on Decision and Control*, pages 3650–3655, 1990.

Appendix A

Documentazione del progetto logico

Documentazione del progetto logico dove si documenta il progetto logico del sistema e se è il caso si mostra la progettazione in grande del SW e dell'HW. Quest'appendice mostra l'architettura logica implementativa (nella Sezione 4 c'era la descrizione, qui ci vanno gli schemi a blocchi e i diagrammi).

Appendix B

Documentazione della programmazione

Documentazione della programmazione in piccolo dove si mostra la struttura ed eventualmente l'albero di Jackson.

Appendix C

Listings

Il listato (o solo parti rilevanti di questo, se risulta particolarmente esteso) con l'autodocumentazione relativa.

Appendix D

Website Implementation

Manuale utente per l'utilizzo del sistema

Appendix E

Use case

Un esempio di impiego del sistema realizzato.

Appendix F

Datasheet

Eventuali Datasheet di riferimento.

List of Figures

List of Tables