



**Valutazione della Tesi di Dottorato**

**Evaluation of the PhD Thesis**

Al Coordinatore del Corso di Dottorato  
*To the PhD Course Coordinator*  
Prof. Michele Marchesi

Nome e cognome del Valutatore

*Name and surname of the Reviewer*

*Giovanni Maria Farinella*

Università di appartenenza

*Professor/ researcher/ lecturer affiliation*

*Dipartimento di Matematica e Informatica  
Università degli Studi di Catania*

Indirizzo dell'Università

*University full postal address*

*Viale A. Doria 6, 95125, Catania*

Aree di ricerca/competenza

*Areas of research /expertise*

*Computer Vision and Machine Learning*

Nome e cognome del dottorando

*Name and surname of the PhD student*

*Andrea Loddo*

Titolo della tesi

*Title of the Thesis*

*Microscopic Blood Images Analysis by Computer Vision Techniques*

**A) VALUTAZIONE TESI**

(the following comments will be sent to both the PhD student and the committee of the final defense)

**A) THESIS EVALUATION**

(the following comments will be sent to both the PhD student and the committee of the final defense)

1. Commenti generali sulla tesi:

1. *General remarks on the thesis:*

This thesis proposes an in-depth analysis of challenges in Computer-Aided Diagnosis from digital microscopy images by considering contributions on three main areas:

- White Blood Cells analysis with leukaemia correlation;
- Red Blood Cells analysis with malaria parasites correlation;
- histological tissues analysis.

The challenges and case studies discussed in this thesis are of broad interest for the Medical Image Analysis community and more in general for Computer Vision and Machine Learning fields.

The thesis is composed by two main parts. Part I gives to the reader the background about a CAD system for digital microscope images. The main phases of a CAD are detailed in order to prepare the

reader in understanding the chapters dedicated to the experiments.

The second part of this thesis can be considered the most important part, where the contributions are given on the aforementioned areas. Specifically, in Part II the thesis proposes different solutions for segmentation, a method for leukocyte count and an approach for erythrocyte segmentation. It is worth to note that, both segmentation and counting “objects” in images are a very challenging and hot problems in computer vision and machine learning.

The proposed approaches have been detailed and properly validated. The rationale, evaluation of the approach and the description of the experimental procedures are rigorous. Results are original and of interest for the research community, as indicated by the number of publications produced as outcome of this PhD thesis. The Appendix A is useful to support the reader to better understand details about the different medical topics covered in this thesis.

On the basis of what is stated above I recommend to accept the thesis as it is, and to grant the permission for a public defence of the dissertation to Mr. Andrea Loddo.

	Giudizi/ Scores				
	Ottimo Excellent/	Molto buono Very Good/	Buono Good/	Suff. Average/	Insuff. Poor/
<b><u>Qualità scientifica/ Scientific quality</u></b>					
Originalità dei risultati ottenuti <i>Originality of thesis results</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rilevanza dei risultati nel contesto scientifico <i>Relevance of results in the scientific context</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rigore metodologico <i>Methodological accuracy</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Descrizione delle procedure sperimentali <i>Description of the experimental procedures</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><u>Chiarezza e sintesi della tesi / Clearness and synthesis of the thesis</u></b>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chiarezza complessiva della tesi <i>Overall thesis clearness</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chiarezza nella presentazione dei risultati, inclusa la completezza dei dati presentati <i>Clearness of results presentation including completeness of figures presented</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Completezza delle fonti <i>Completeness of references</i>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><u>Valutazione complessiva della tesi Overall evaluation of the thesis</u></b>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**B) PROPOSTA DI AMMISSIONE DELLA TESI ALLA DISCUSSIONE PUBBLICA**  
**B) PROPOSAL FOR THE THESIS ADMISSION TO THE PUBLIC DEFENCE**

☒ Ammessa alla discussione pubblica  
*Admitted to the public defence*

☐ Non ammessa alla discussione pubblica  
*Not admitted to the public defence*

- Si richiedono le seguenti modifiche/integrazioni al lavoro di ricerca
- *The following changes/integrations in the research work are required*

Data

*Date* 18/11/2018

Firma

*Signature*





Allegato 1)

**Suggerimenti per lo studente (commenti che aiuteranno lo studente a migliorare la tesi)**

**Recommendations to the student (please report any comments that will help the student improving her/his thesis)**

Considering the recent advancements regarding Deep Learning (DL) in the context of Medical Image Analysis, I suggest to include a discussion on possible future work which consider DL to address the challenges discussed in this thesis focusing on potentials and possible limits. Have others used/considered DL to address the problems discussed in this thesis? Indeed, it is very straightforward to think use YOLO for detection and MASK R-CNN (both opportunely tuned in Medical context) to deal with your problems. A limit can be the number of samples you have in your dataset for training these networks.