

University of Liège  
Faculty of Engineering



Master Thesis

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**A workflow for large-scale computer-aided cytology  
and its applications.**

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# Summary

# Acknowledgement

## Chapter 1

# Introduction

## Chapter 2

# Object detection in large images

### 2.1 General problem

#### 2.1.1 Formulation

Generic formulation of the object detection problem

#### 2.1.2 Implementation issues

What issues an implementor could face when trying to implement object detection in large images

#### 2.1.3 Related works

What solutions are usually presented in the litterature to solve those problems (shallow overview as this is a wide topic)

### 2.2 Cytology

#### 2.2.1 An object detection problem ?

Why it is an instance of the "object detection in large images" problem

#### 2.2.2 The thyroid case

Explanation of the Thyroid case

## Chapter 3

# A generic workflow : Segment Locate Dispatch Classify

### 3.1 Principle

#### 3.1.1 Algorithm

Describe the steps of algorithm

#### 3.1.2 Framework

Describe what we expect from a framework implementing the workflow (parallism, easy to use,...)

### 3.2 Implementation

#### 3.2.1 Technologies

Describe and justify the choice of Python and of the various dependencies

#### 3.2.2 Software architecture

Detail of the software architecture

#### 3.2.3 How to use the framework

A toy example : finding disks in an image with grey background and guessing whether they're black or white

## Chapter 4

# SLDC at work : the thyroid case

### 4.1 Cytomine

Presentation of cytomine

### 4.2 Implementation issues

Presentation of implementation issues related to the thyroid case (image size, over HTTP, image quality, human annotation vs computer annotation, presence of inclusions in patterns, dispatching ...)

### 4.3 Implementation

Actual implementation of the processing using the workflow

### 4.4 Performance analysis

#### 4.4.1 Detection

#### 4.4.2 Execution time



**Chapter 5**

**Conclusion**

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