

Automatic melanoma detection method using XGBoost

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ÉPITA/IMAGE

Abstract

We propose an automated melanoma detection method based on machine learning. Our *classifier* uses the **XGBoost model** and is able to successfully detect up to 70% of the melanomas of our dataset.

The features we consider are:

- mole's area
- symmetry
- outermost skin color
- innermost skin color
- average color (through histograms of each RGB channel)

Introduction

Melanoma (see figure 1) is the most dangerous type of skin cancer. Globally, in 2012, it newly occurred in 232,000 people. In 2015 there were 3.1 million with active disease which resulted in 59,800 deaths. Therefore, having an automated detection method can help physicians detect melanomas quicker, for more people and hopefully save more lives.

We present in section 1 our feature extraction pipeline and in section 2 we present our classification approach using XGBoost.

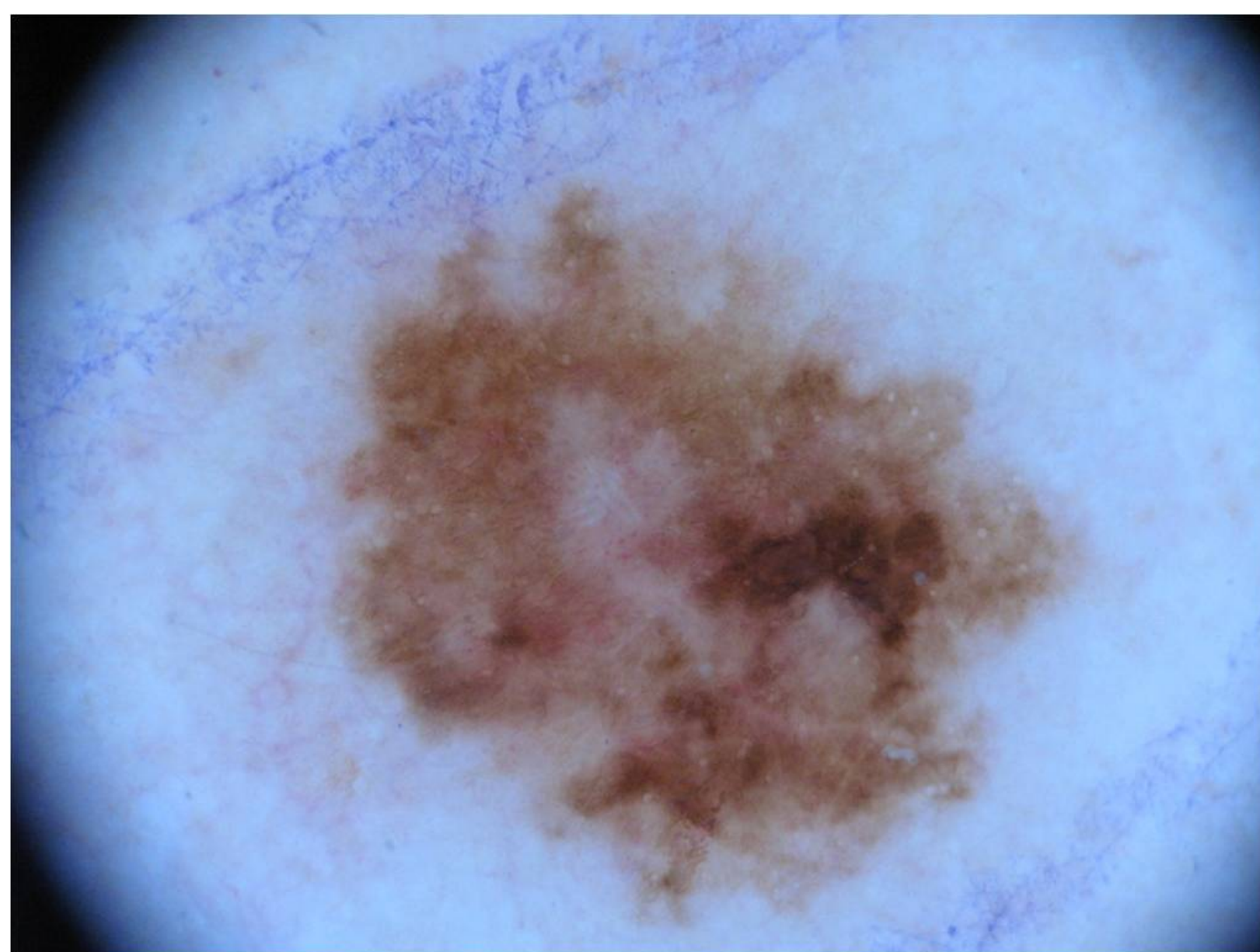


Figure 1: Melanoma

Feature extraction

Figure 2 summarizes the feature extraction process we describe in this section.

- 1 Some images are enclosed inside a circle and have black corners (see figure 1). We need to compute, for these images, the mask that approximates the image content in order to extract meaningful information.
- 2 Some images can have a black (or white) thin border. They are cropped by 5 pixels.
- 3 The image is then converted to grayscale in order to segment the mole.
- 4 An Otsu threshold is applied to extract the biggest region.
- 5 The mole's centroid is approximated in order to detect symmetrical regions (central symmetry).
- 6 We finally compute the red, green and blue histograms of each RGB pixel within the symmetric mask.

XGBoost learning model

XGBoost is a machine learning model based on random forests which can sometimes outperform traditional, CNN-based deep learning models. We optimize our learning process using a *stratified K-Fold validator* with 10 folds. We obtain an average F1-score of approximately 0.6. Table 1 shows more details about the performance of our classifier.

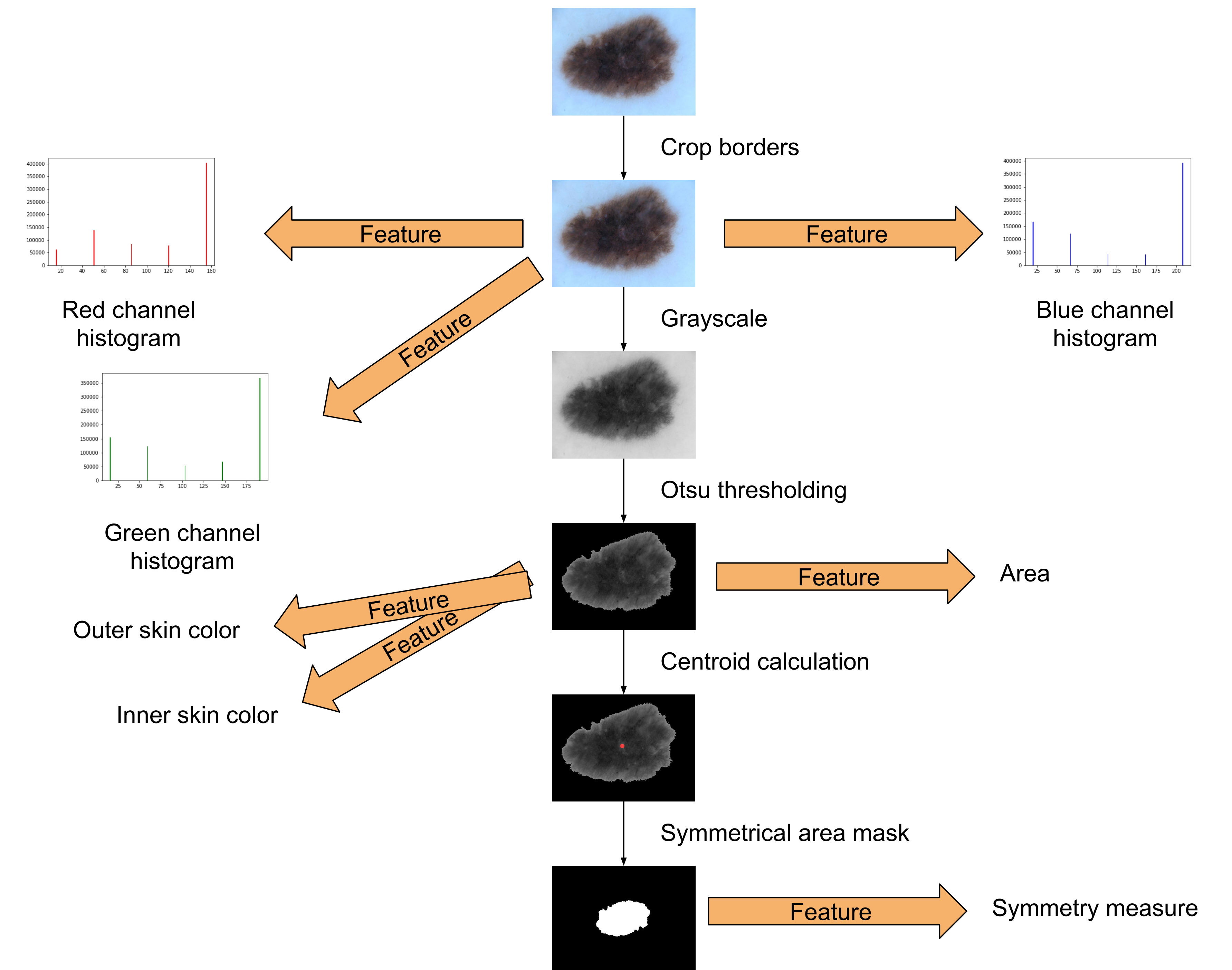
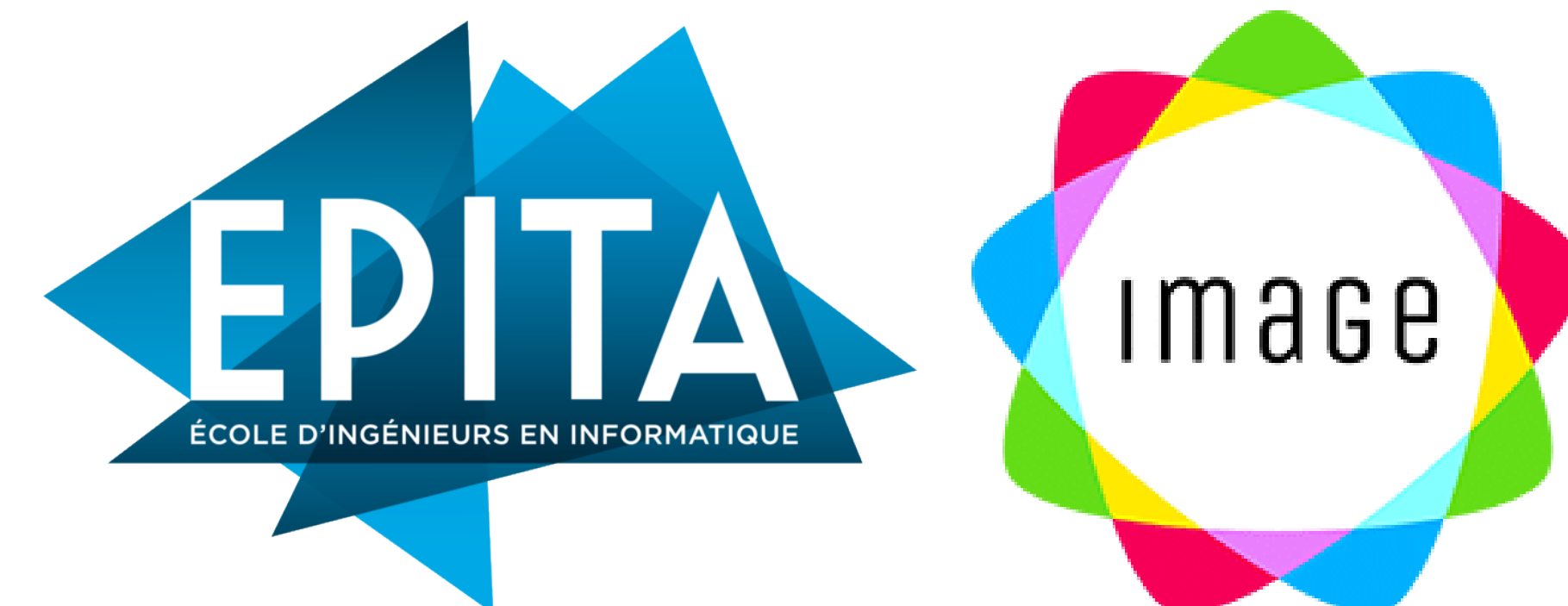


Figure 2: Feature extraction pipeline

	Precision	Recall	F1-score	support
0.0	0.86	0.85	0.85	52
1.0	0.67	0.70	0.68	23
accuracy			0.80	75
macro avg	0.76	0.77	0.77	75
weighted avg	0.80	0.80	0.80	75

Table 1: Model score details (overall score is 0.8)