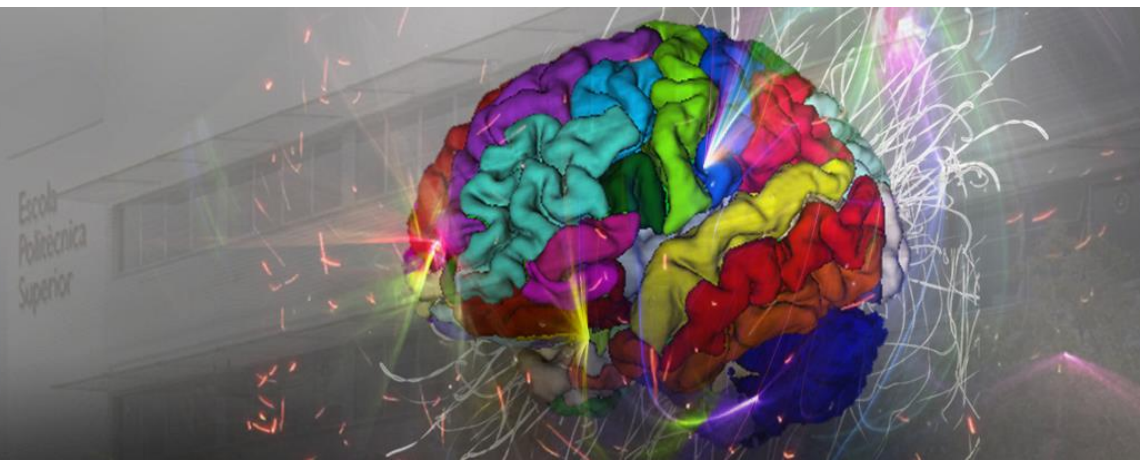




# Dermoscopic diagnosis with the classical approach

Agustin CARTAYA, Micaela RIVAS

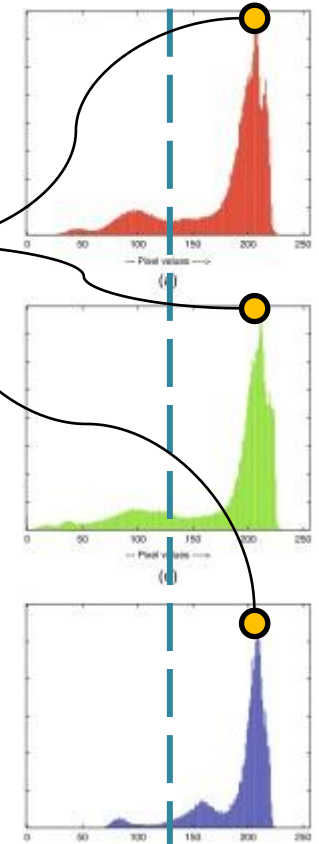
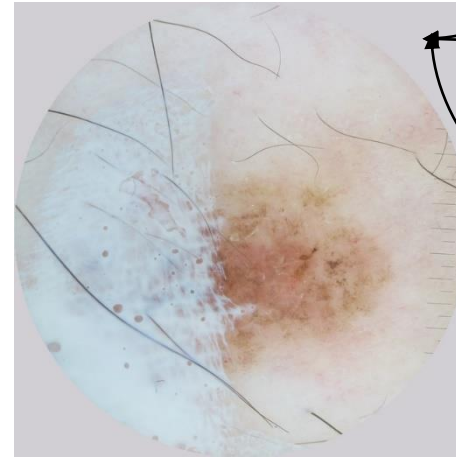
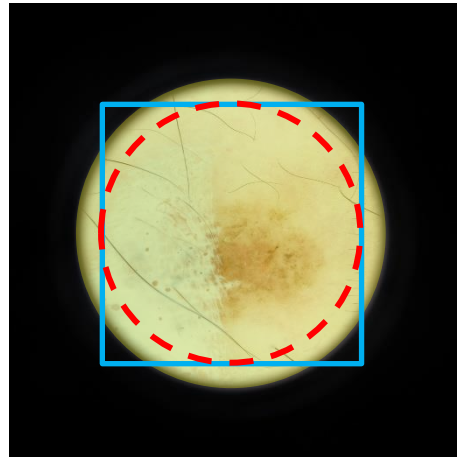
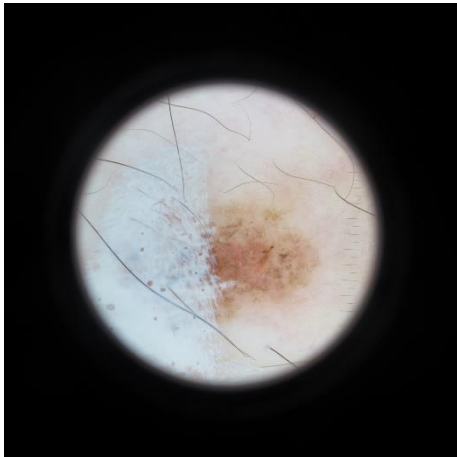


# Binary challenge



# Preprocessing

## Outer circle removal



# Masks obtention

## Preprocessing-mask (hairs removal)

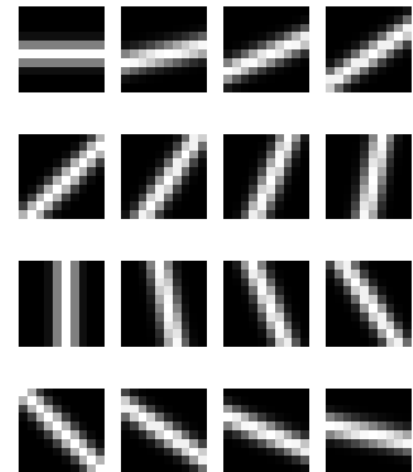


**Hair mask:** Bottom hat with different SE on the image and the inverted image

**Hair removal:** cv.inpaint



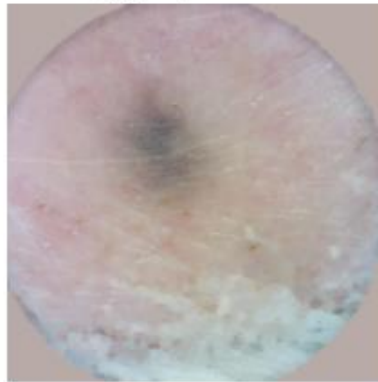
Structural Elements:



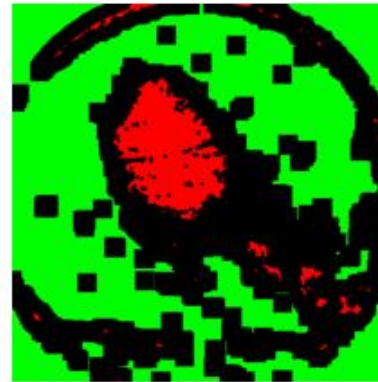
# Masks obtention

## Watershed

img preprocessed



markers



mask

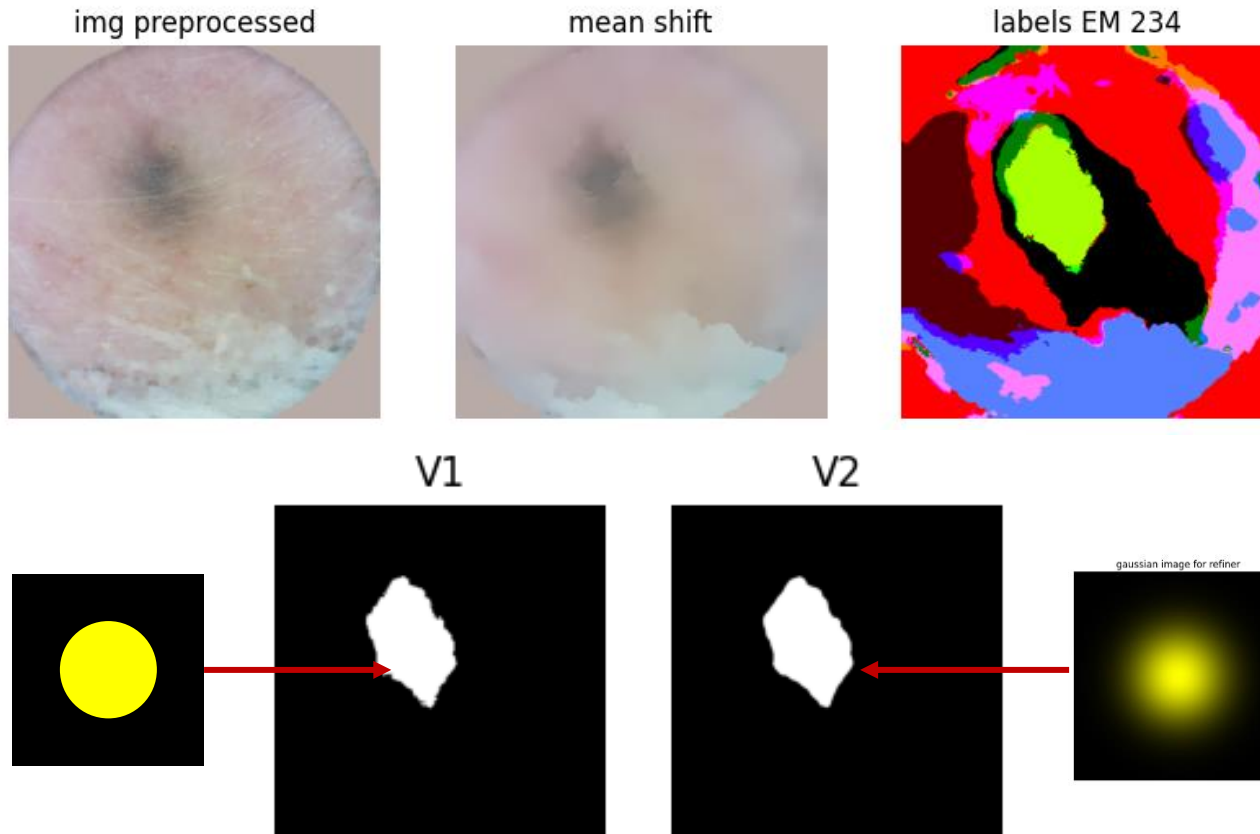


mask refined



# Masks obtention

## Probabilistic masks



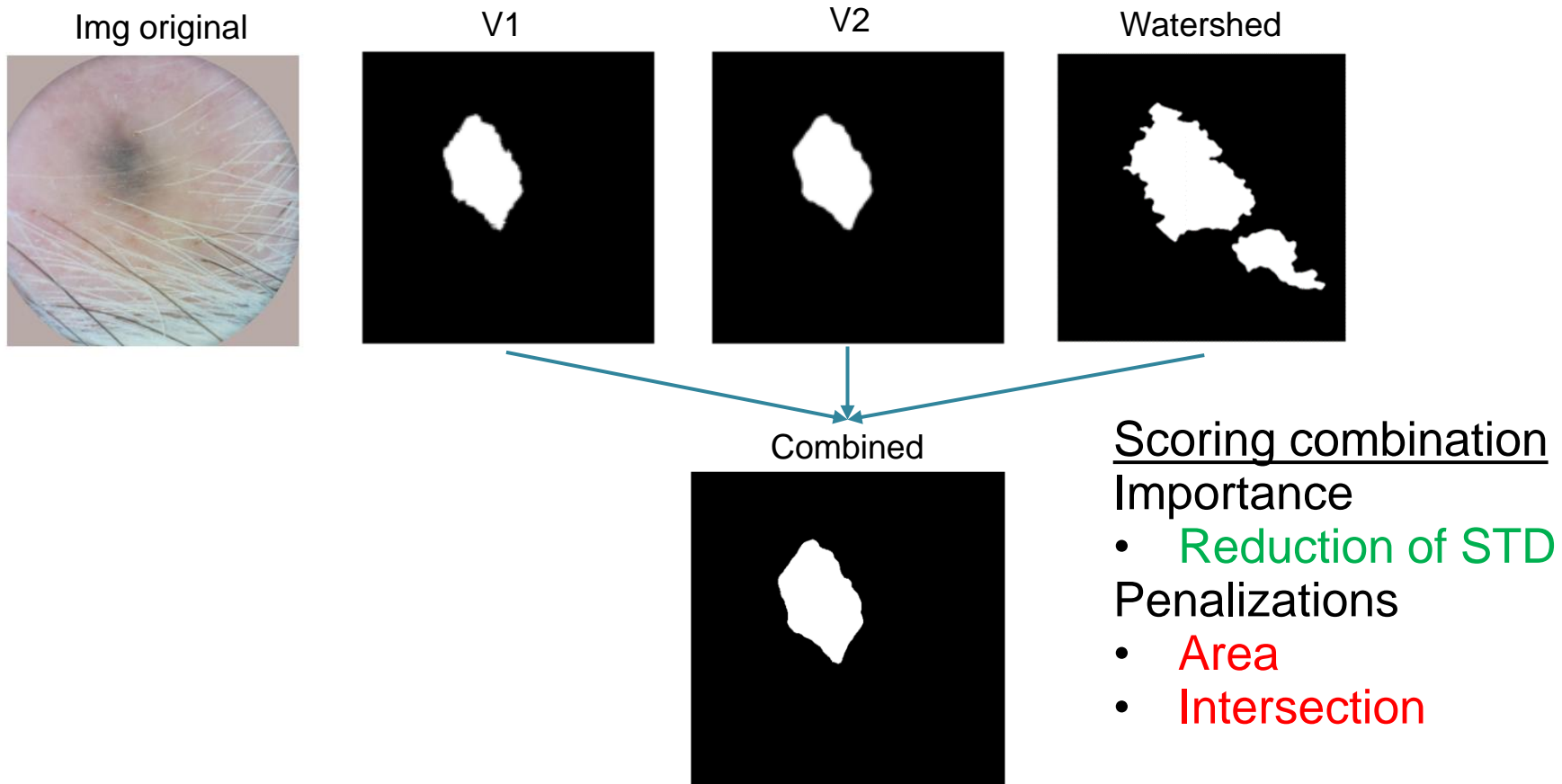
### Probabilities

- ✓ Prob outer circle
- ✓ Prob inside mask
- ✓ Prob inside mask
- ✓ Prob IoU mask
- ✓ Prob most different mean



# Masks obtention

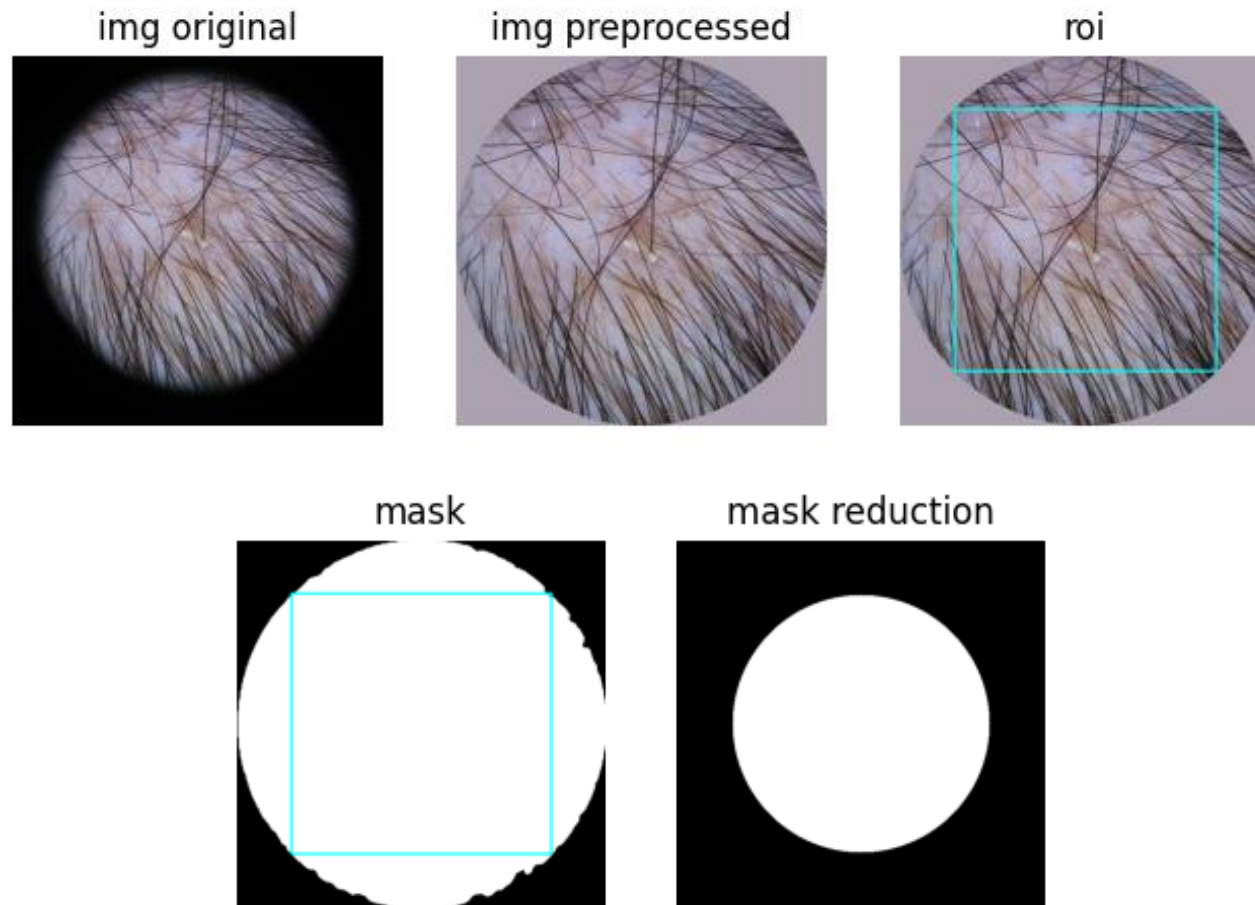
## Masks combination





# Features extraction

## Postprocessing





# Features extraction

## Extracted features

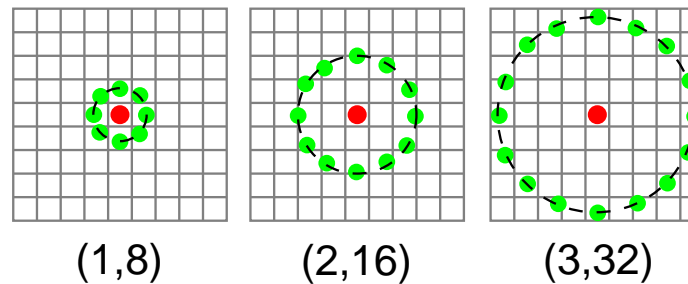
### Color

RGB HLS HSV LAB

- Mean
- STD
- Dominance
- Contrast
- Coherence

### Texture

#### LBP



#### GLCM

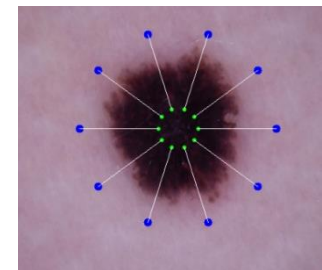
- |                 |                      |
|-----------------|----------------------|
| • Contrast      | • haralick           |
| • Dissimilarity | • Lacunarity         |
| • Homogeneity   | • Cluster_prominence |
| • Energy        | • Cluster_shade      |
| • Correlation   | • Max_probability    |
| • Asm           | • Sum_average        |

### Shape

- Irregularity
- Compacity
- Perimeter/area



- Blur



Preprocessing

Masks  
obtention

Feature  
Extraction

Classification

# Features extraction

## Used Area



Spatial information

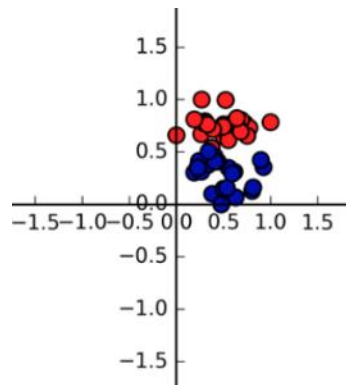


# Classification

## Feature engineering

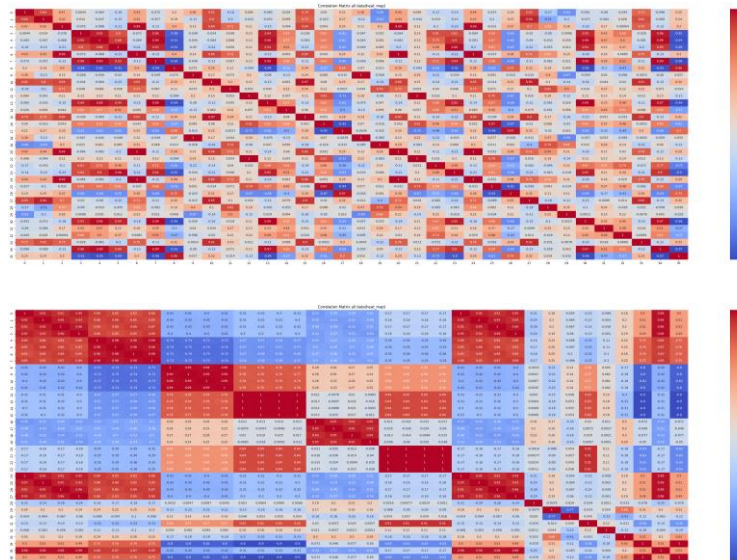
### Normalization

MinMax scaler



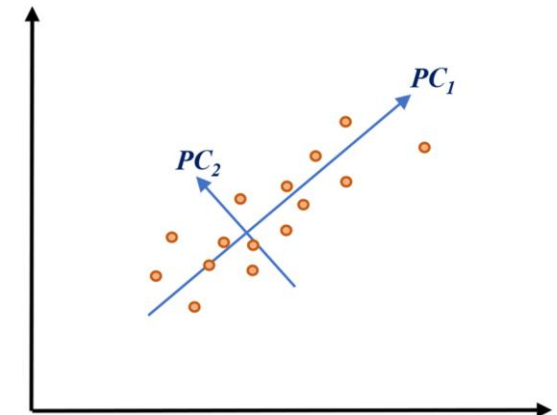
### Feature selection

Reduction by correlation



### Dimensionality reduction

PCA



Preprocessing

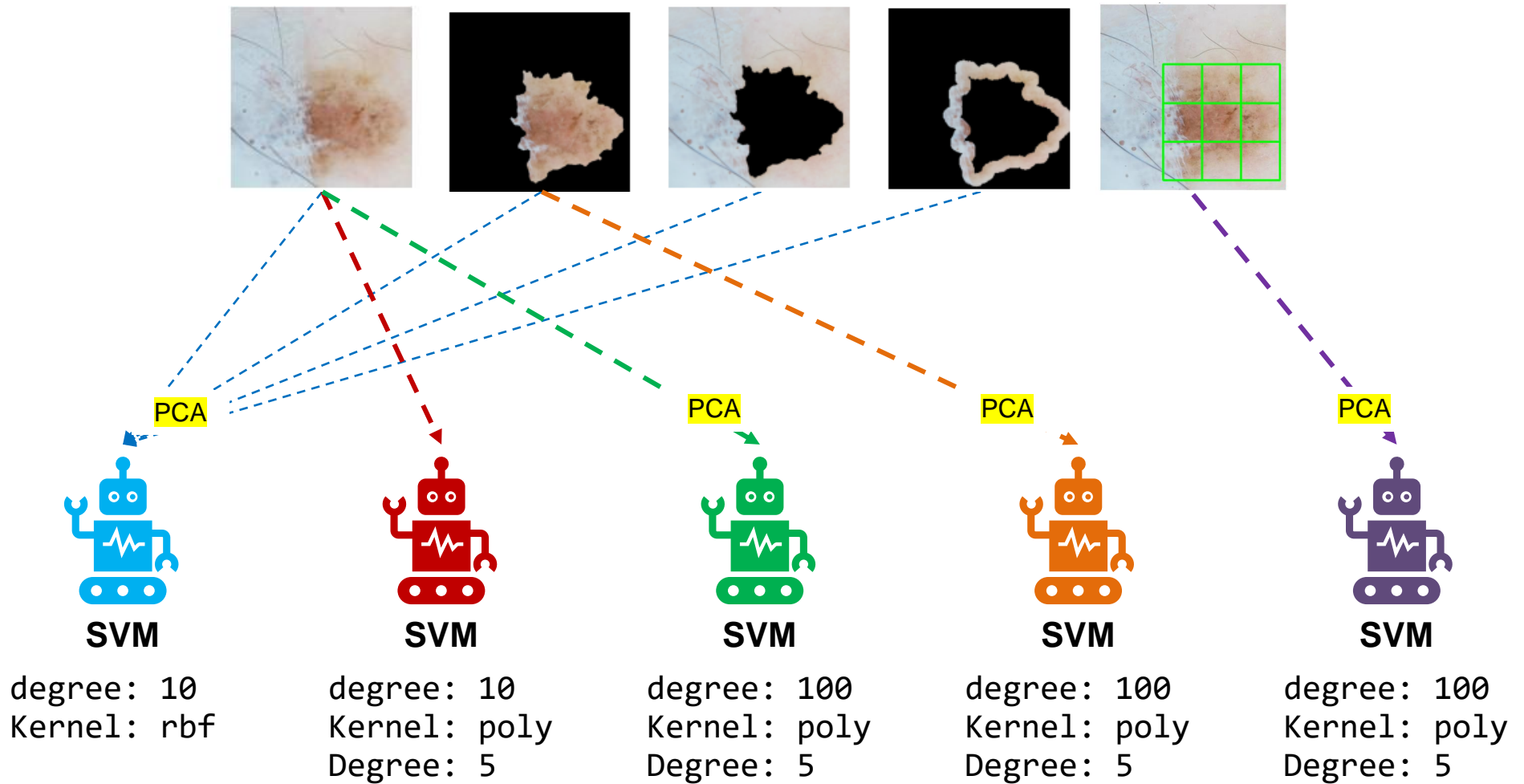
Masks  
obtention

Feature  
Extraction

Classification

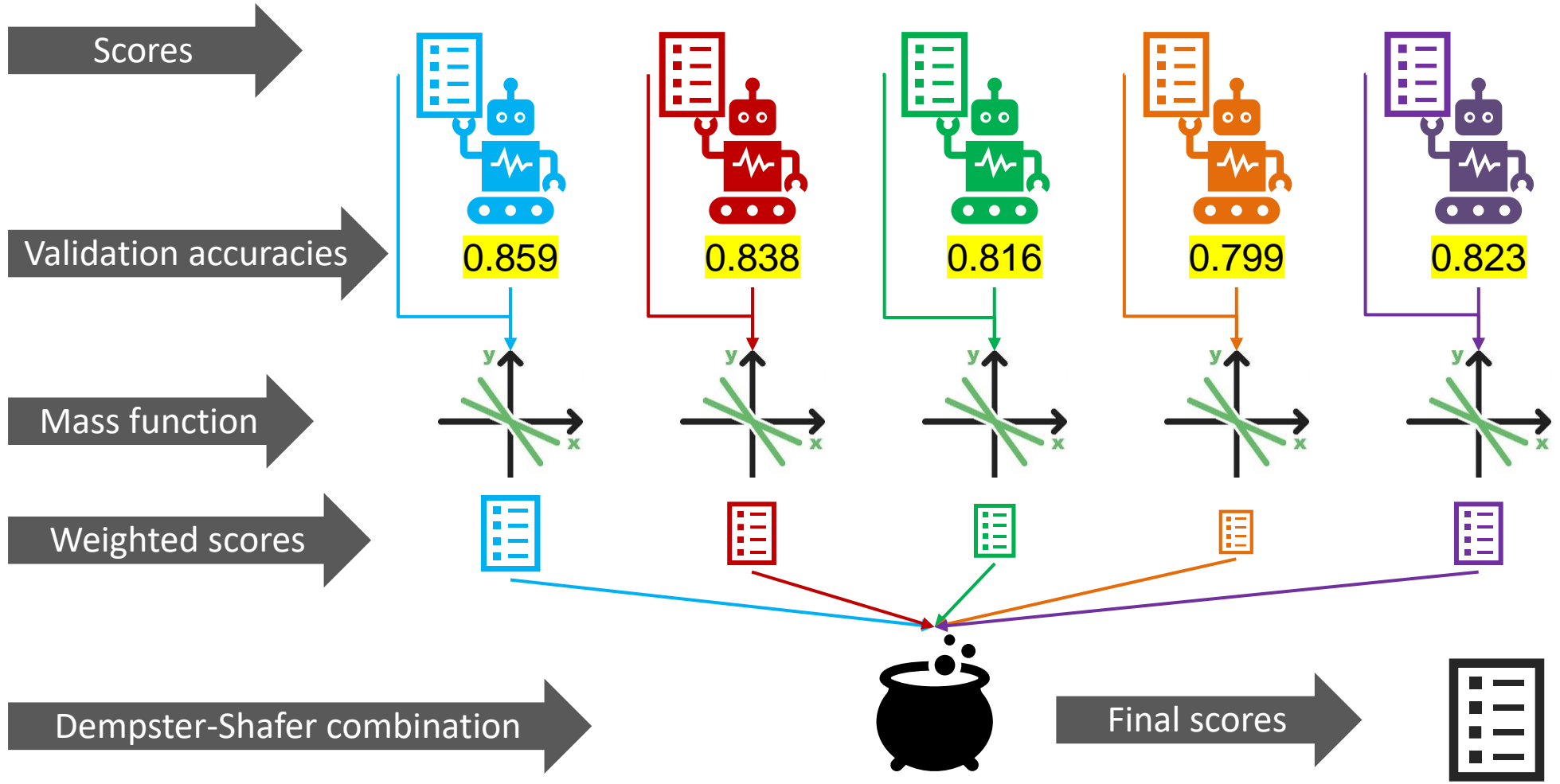
# Classification

## Weak classifiers



# Classification

## Ensembled method



## Validation results

Classification report:

	precision	recall	f1-score	support
0.0	0.88	0.87	0.88	1931
1.0	0.87	0.88	0.87	1865
accuracy			0.88	3796
macro avg	0.88	0.88	0.88	3796
weighted avg	0.88	0.88	0.88	3796

Kappa: 0.7502428439799262

Accuracy: 0.875131717597471

Confusion matrix:

```
[[1682 249]
 [ 225 1640]]
```

TN	FP
FN	TP

Preprocessing

Masks  
obtention

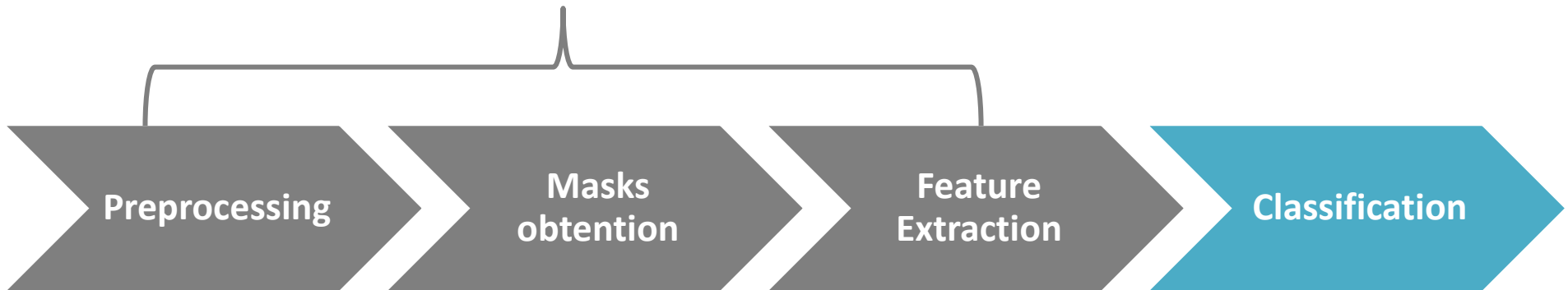
Feature  
Extraction

Classification



# Multi class challenge

**Same as Binary**



# Classification

## “One vs One” VS “One vs All”

### Kappa of the validation set

	One vs One	One vs All
Data augmentation	0.763	0.749
No data augmentation	0.768	0.759



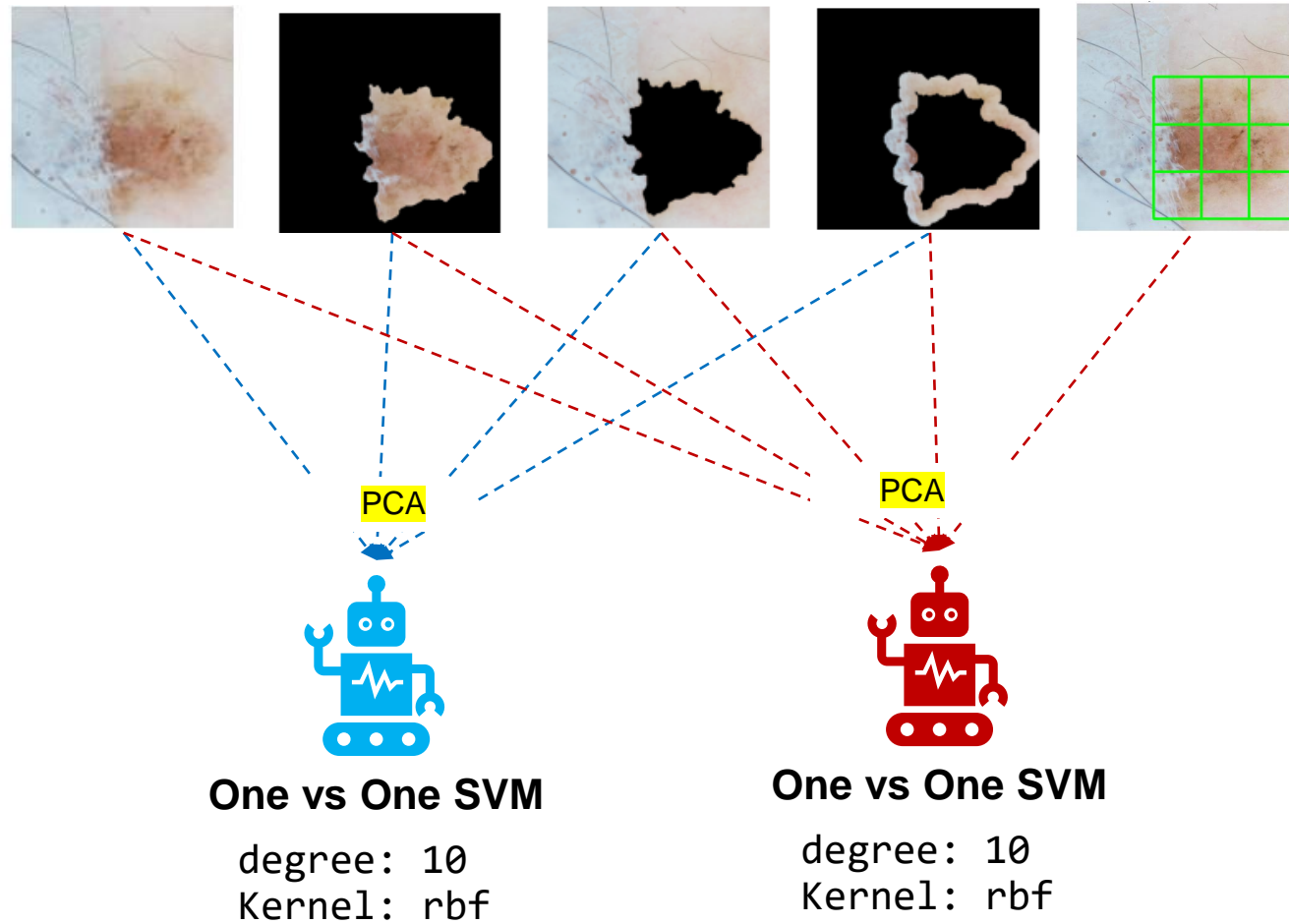
## One vs One Classifier Manual implementation

- **Need of the scores for each class** and not the final classification (for further ensembled method).
- **Class imbalance**  
More weight was given to the scores of the smallest class



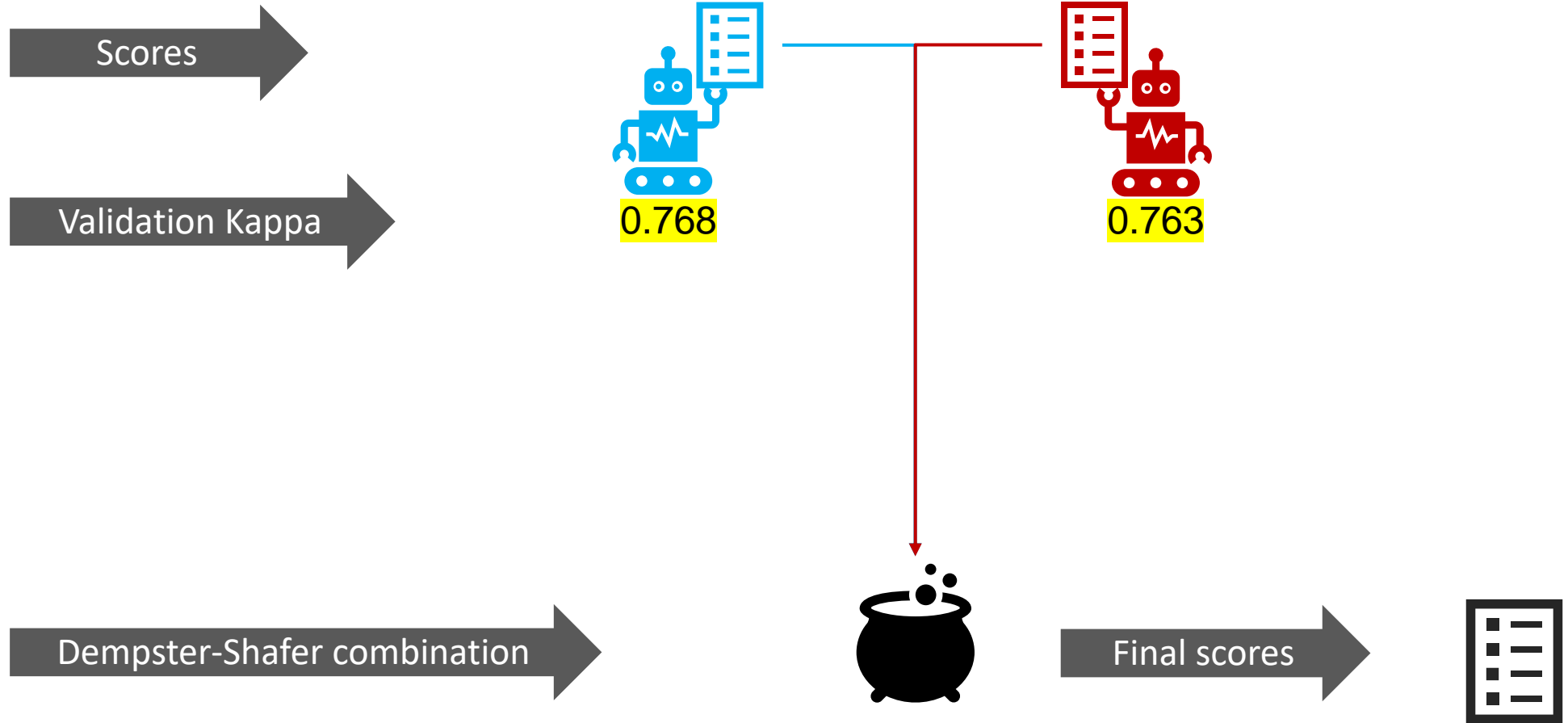
# Classification

## Weak classifiers



# Classification

## Ensembled method



# Classification

## Validation results

Classification report:

	precision	recall	f1-score	support
0.0	0.92	0.92	0.92	678
1.0	0.86	0.88	0.87	498
2.0	0.62	0.57	0.60	94
accuracy			0.88	1270
macro avg	0.80	0.79	0.80	1270
weighted avg	0.88	0.88	0.88	1270

Kappa: 0.7784556754798337

FN TP

