

# Soutenance de Traitement Images et Vidéos

Application de reconnaissance automatique d'icônes

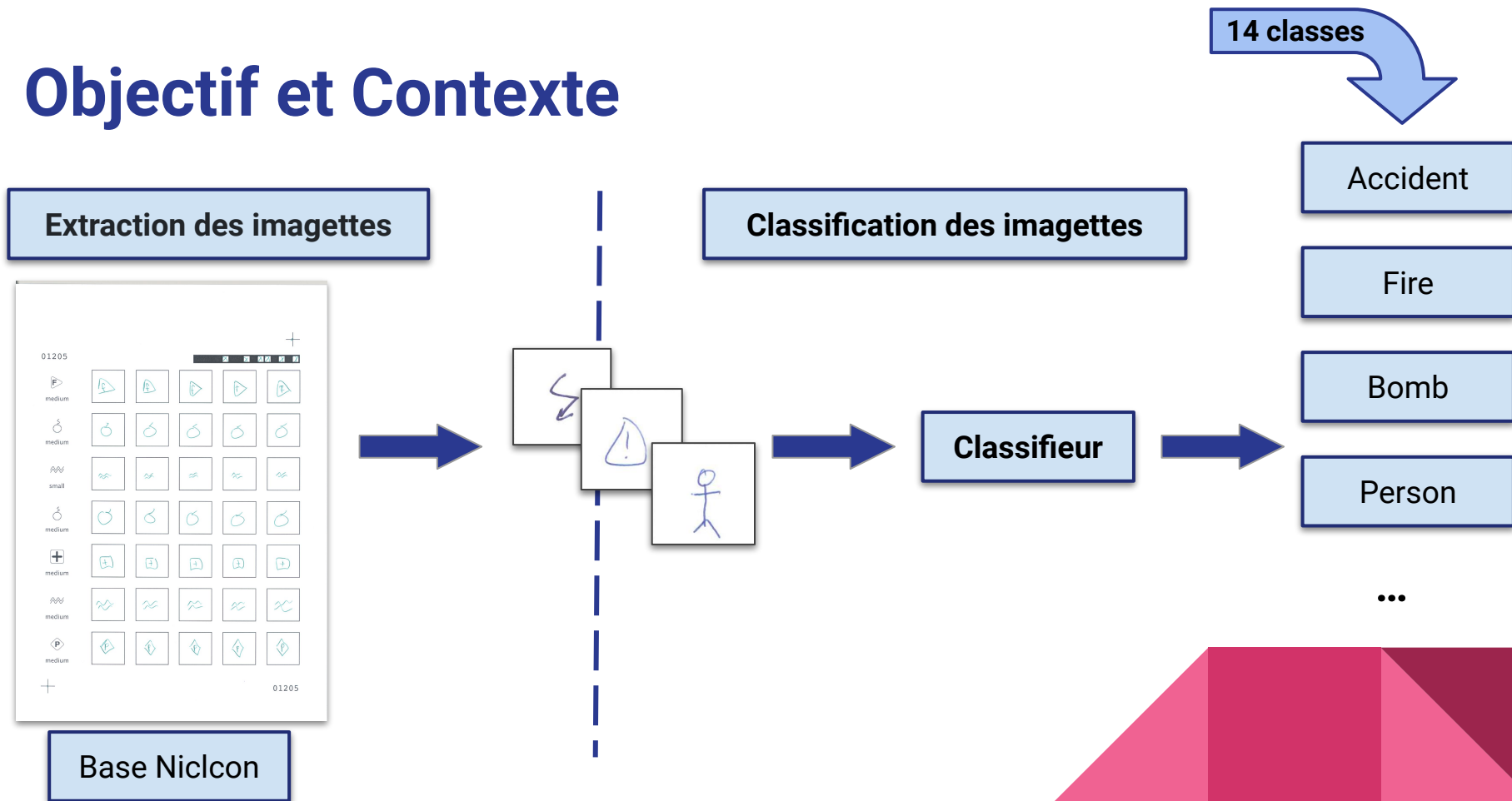
Encadrants:

**BABEL Marie**  
**PASTEAU François**  
**COÜASNON Bertrand**  
**ANQUETIL Eric**  
**RICQUEBOURG Yann**

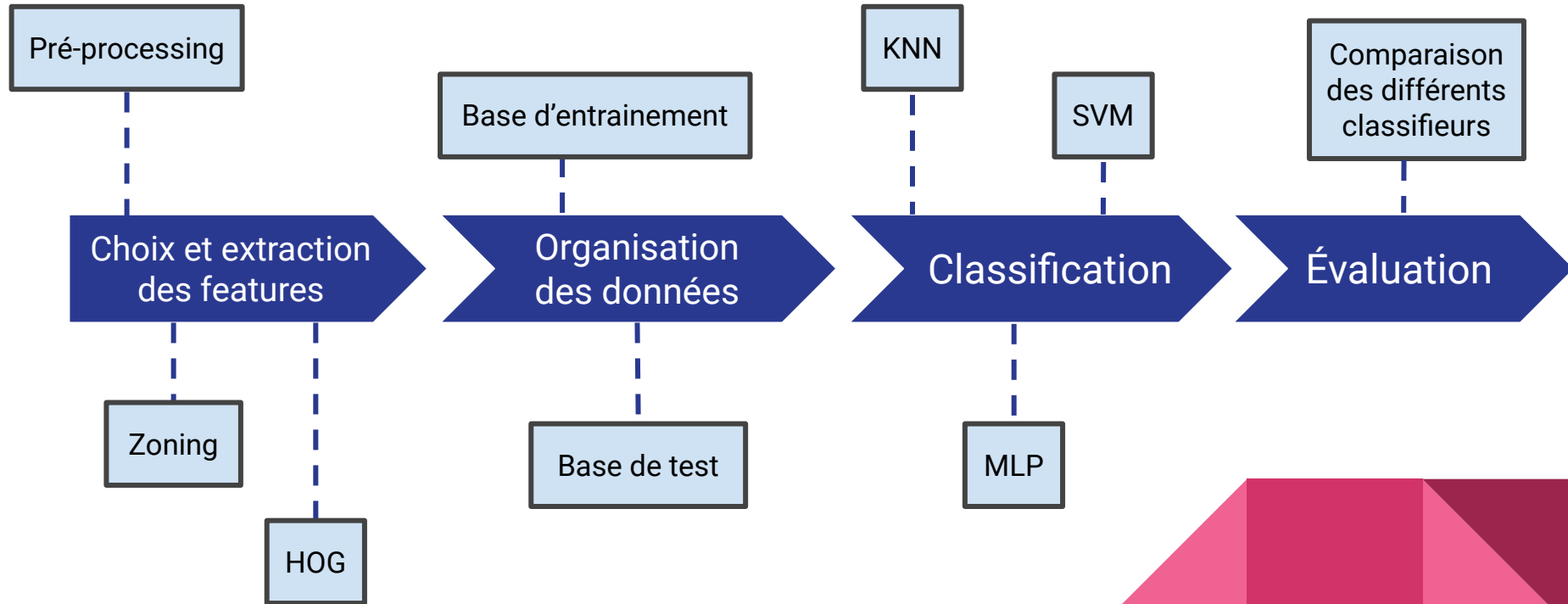
Étudiants:

**Tino Imbrogno**  
**Firmin Cadot**

# Objectif et Contexte



# Vue d'ensemble du projet



# Choix et extraction des features

Choix et extraction  
des features

Organisation  
des données

Classification

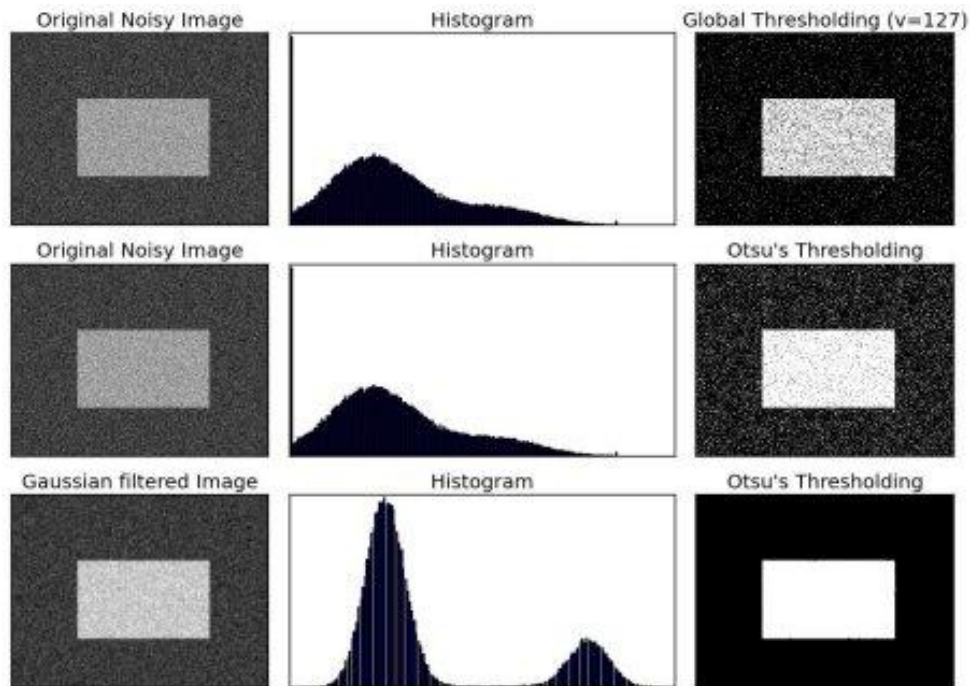
Évaluation

## Pré-processing

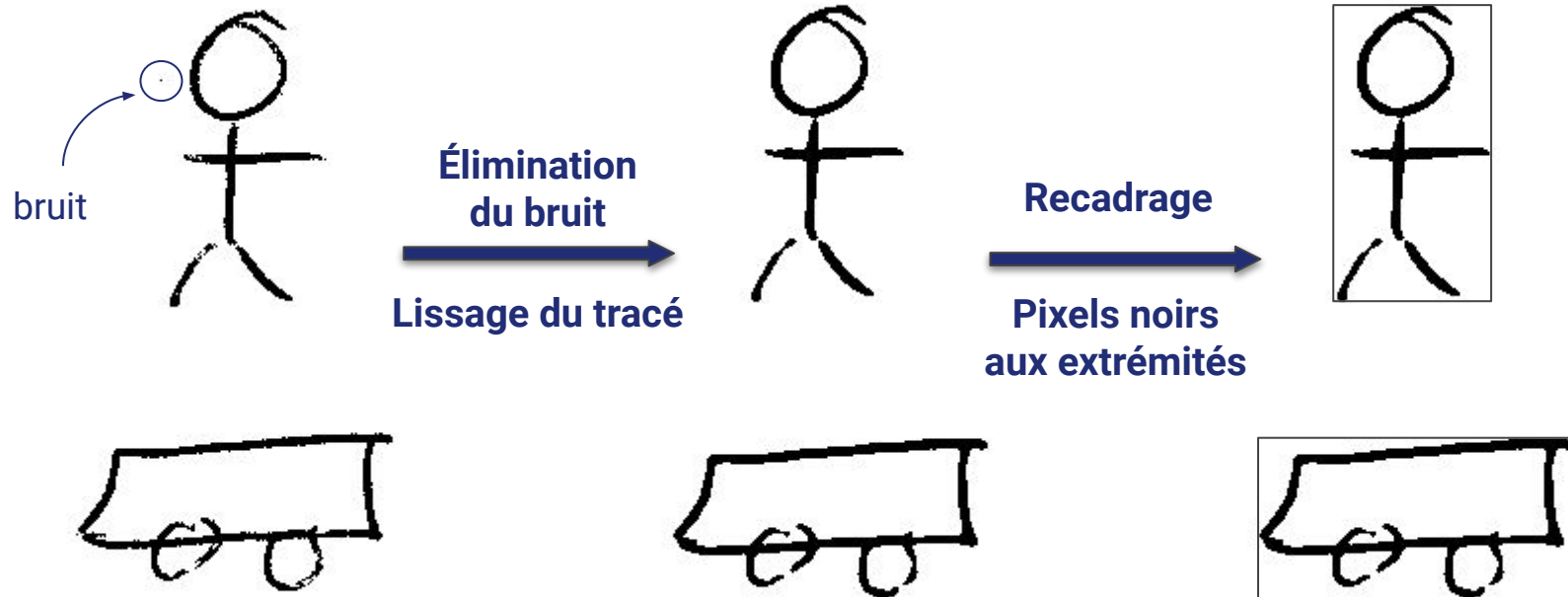


Flou gaussien -> **Supprimer les bruits**  
+  
Seuil: Algorithme d'**Otsu**

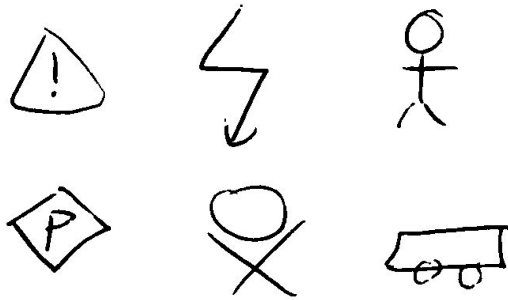
## Pré-processing - Seuil Otsu



## Pré-processing



## Pré-processing

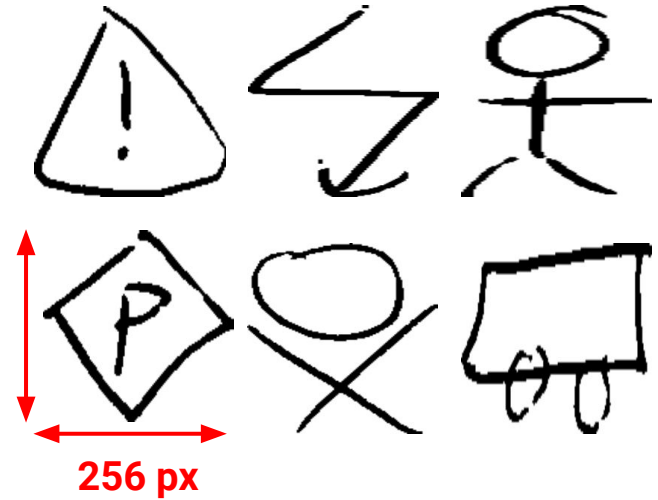


Imagettes binarisées

Normalisation des  
données



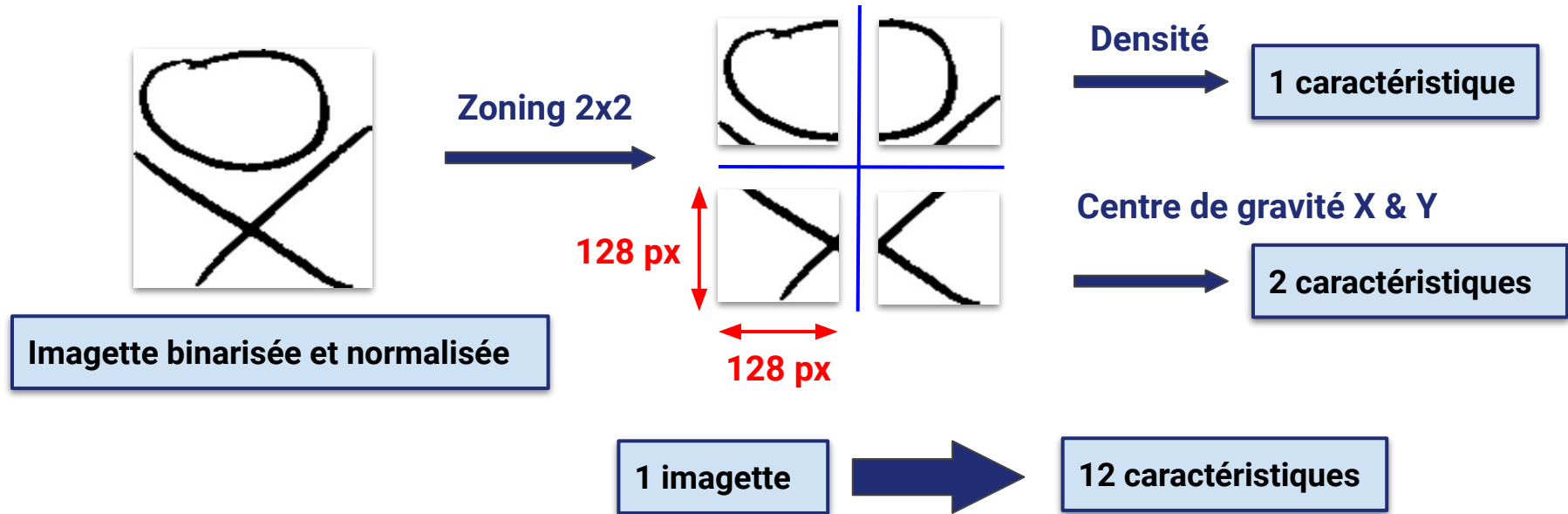
256 px



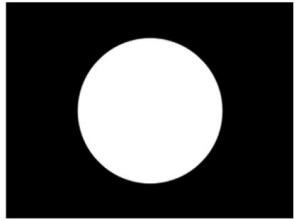
Taille : 256 x 256 pixels



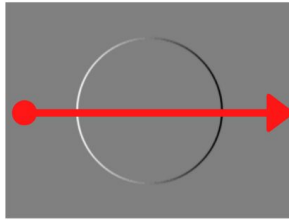
## Zoning sur Densité et Centre de gravité



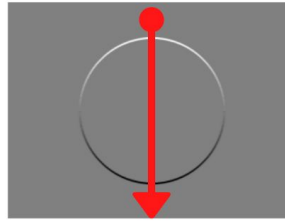
# Histogram of Oriented Gradients - HOG



Original Image



Horizontal  
Gradient



Vertical  
Gradient

for x-direction:  $gx = \partial I / \partial x = f(x+1, y) - f(x-1, y)$

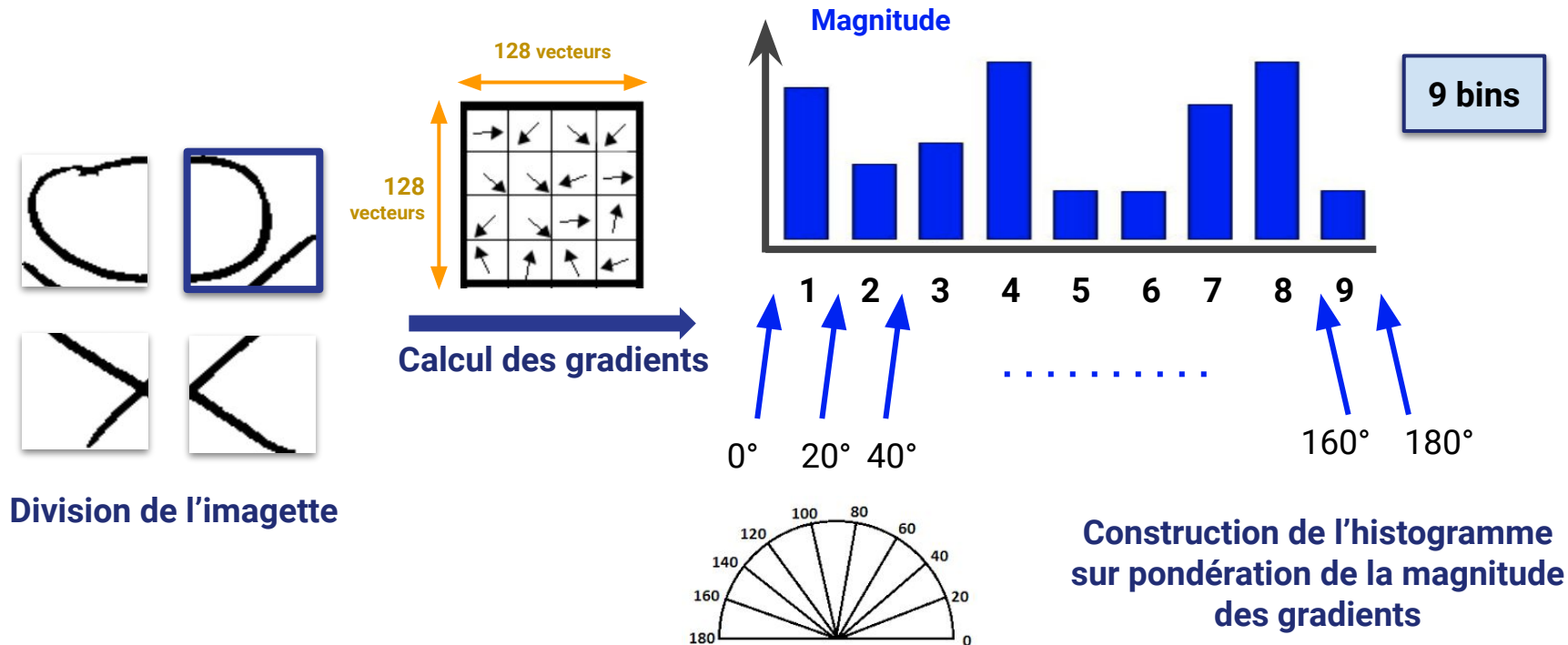
for y-direction:  $gy = \partial I / \partial y = f(x, y+1) - f(x, y-1)$

gradient magnitude:  $M(x, y) = (gx^2 + gy^2)^{1/2}$

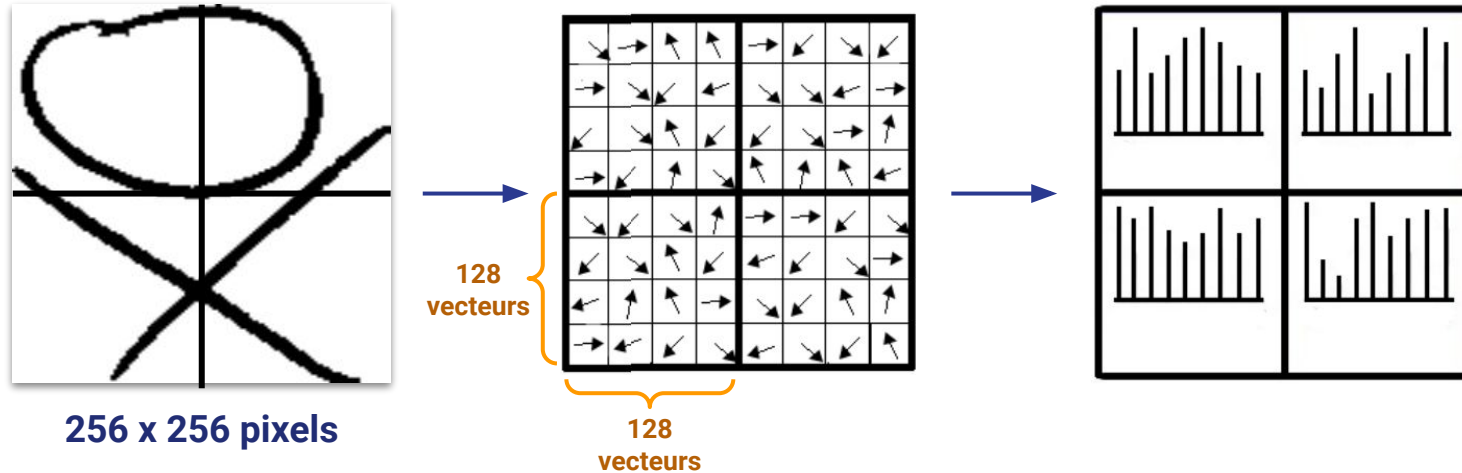
gradient orientation:  $\theta(x, y) = \tan^{-1} (gy/gx)$

**Utilisé pour la détection d'objets dans une image**

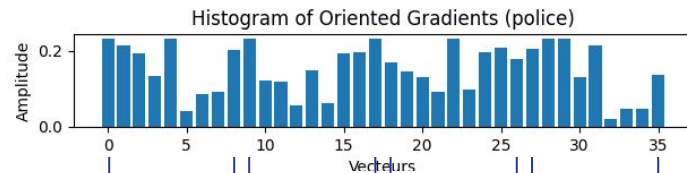
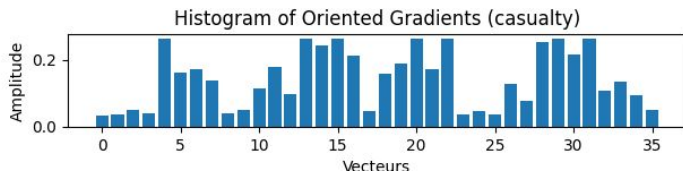
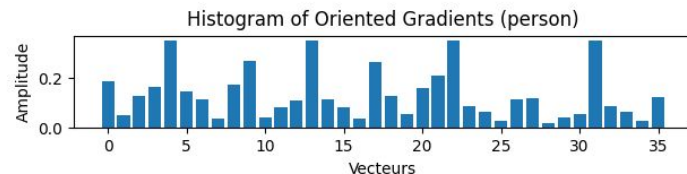
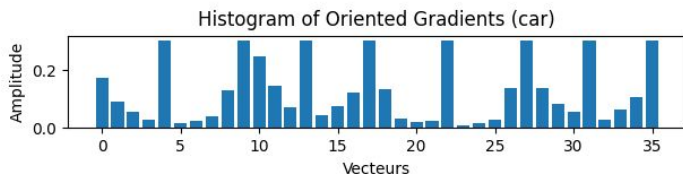
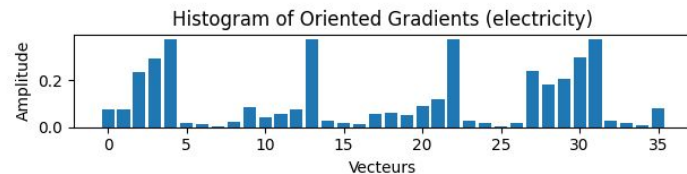
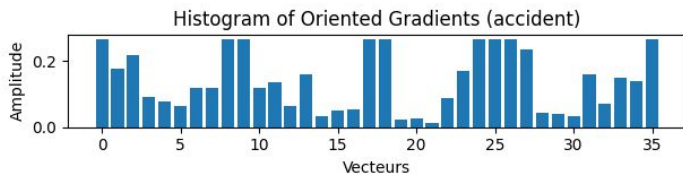
# Histogram of Oriented Gradients - Procédé



# Histogram of Oriented Gradients - Procédé



# Histogram of Oriented Gradients - Visualisation



Sous-images :

1

2

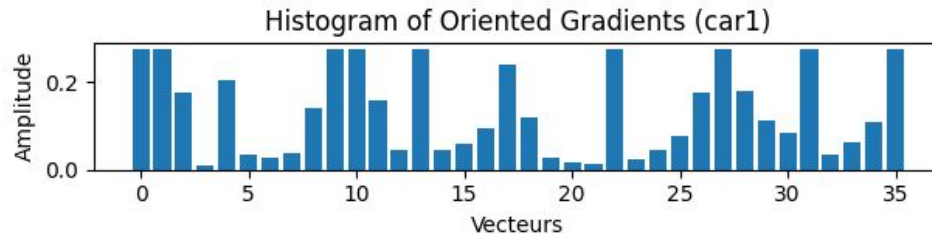
3

4

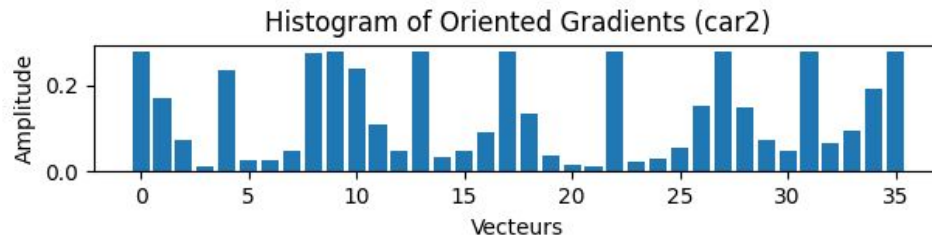
# Histogram of Oriented Gradients - Similarité



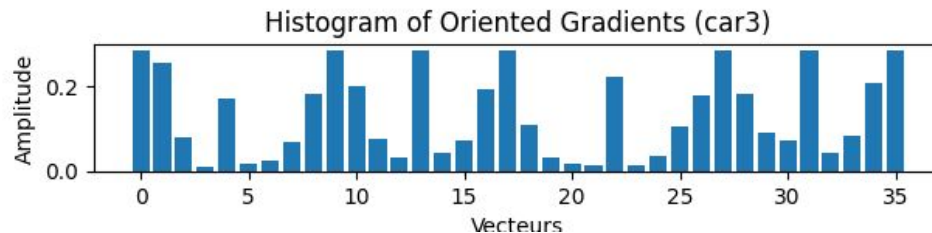
car1



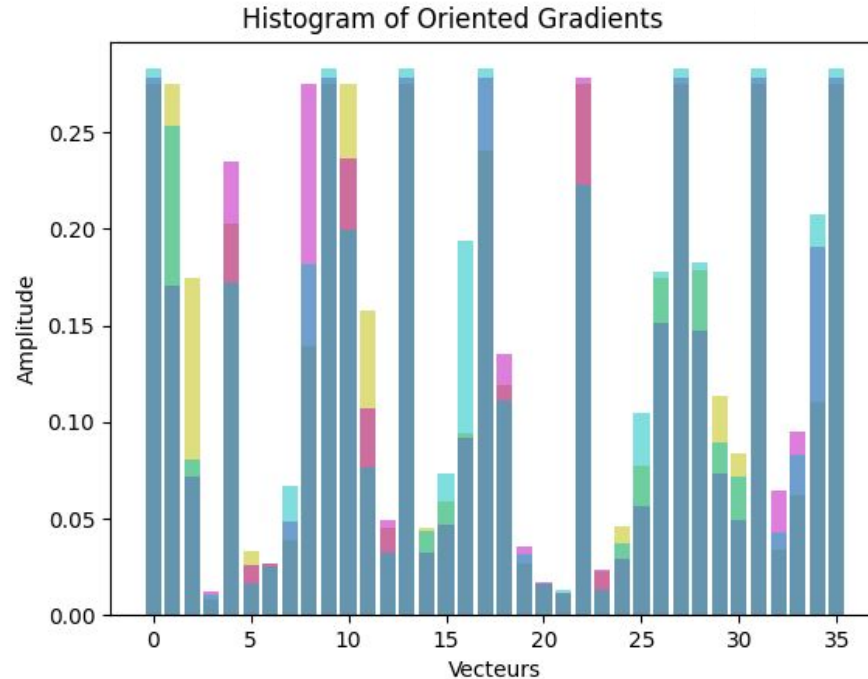
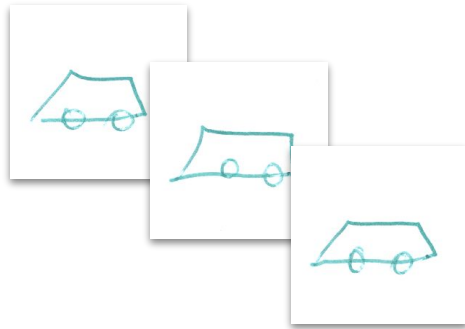
car2



car3



# Histogram of Oriented Gradients - Similarité



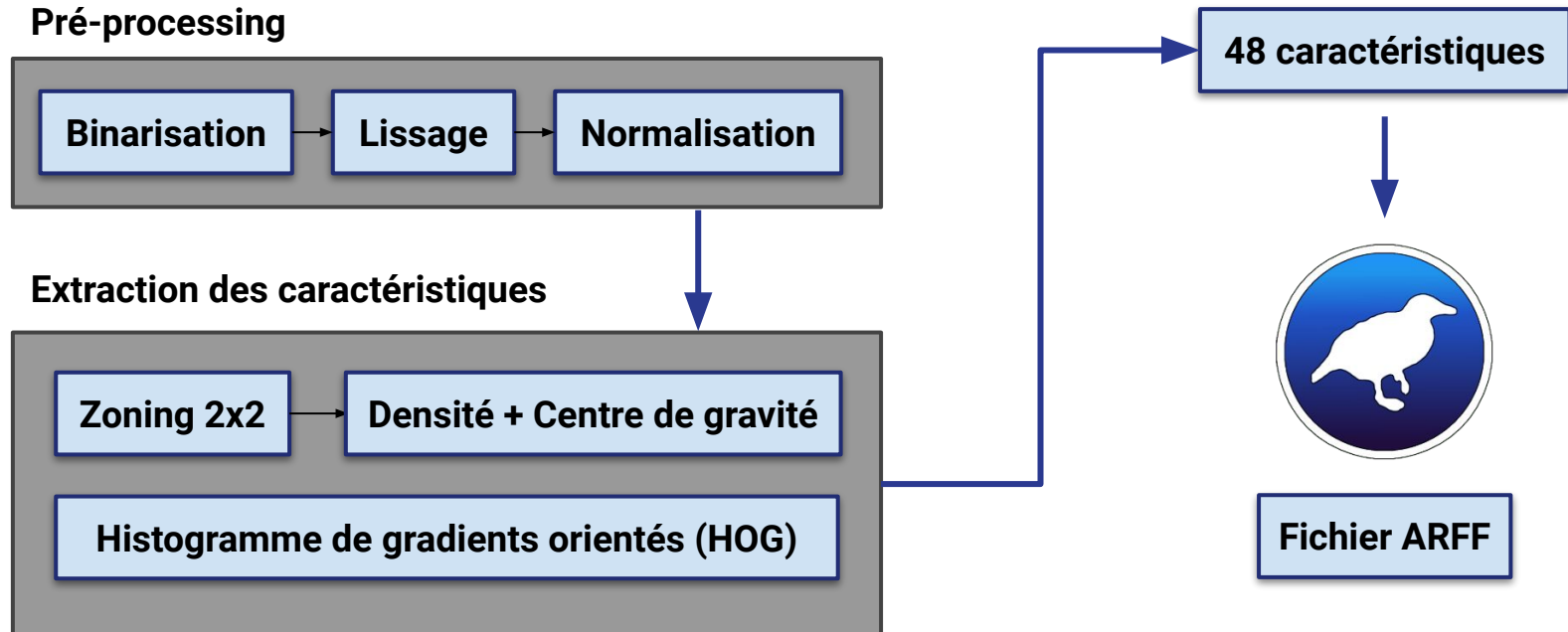
Choix et extraction  
des features

Organisation  
des données

Classification

Évaluation

# Chaîne globale de l'extraction de caractéristique



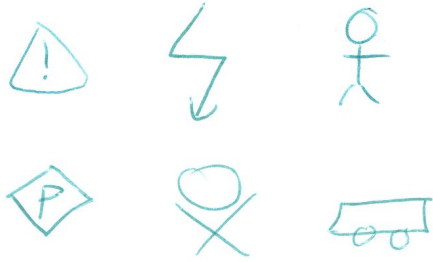




# Organisation des données

# Séparation des données

## Base d'entraînement



**26 943** imageries

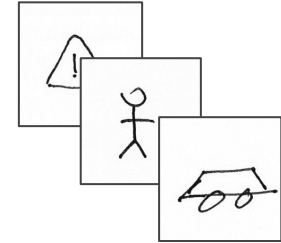
**Calcul du modèle des  
différents classifieurs**

## Bases de test

Cross-Validation (5 & 10 folds)

**-> Robustesse**

## Base de test finale



**350** imageries  
utilisées pour le test final



# Classification

# K-Nearest Neighbors (KNN)

**Cross Validation (10 folds)**

K	F - mesure	
	Distance Euclidienne	Distance Manhattan
1	96.24 %	96.70 %
2	96.04 %	96.21 %
3	<b>96.44 %</b>	<b>96.77 %</b>
4	96.36 %	96.70 %
5	96.38 %	96.67 %
6	96.21 %	96.64 %

Choix et extraction  
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# Multilayer Perceptron (MLP)

Cross Validation (10 folds)

Neurones par couche(s) cachée(s)	F - mesure	
	Learning Rate = 0.25	Learning Rate = 0.3
(31)	96.20 %	96.23 %
(31) (15)	95.90 %	95.89 %

Choix et extraction  
des features

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# Support Vector Machine (SVM)

Cross Validation (5 folds)

F - mesure	
<b>GridSearch</b>  <b>cost = 0.001</b> <b>gamma = 0.001</b>	<b>96.19 %</b>

# Evaluation

## Comparaison et résultats des différents modèles de classifieurs

Base de test finale (350 images)

			Précision	Rappel	F-mesure
KNN	K=3	Distance Euclidienne	96.9 %	96.5 %	96.57 %
		Distance Manhattan	97.7 %	97.6 %	97.71 %
MLP	LR = 0.3	Neurones (31)	98.1 %	98.0 %	98.0 %
SVM	cost = 0.001 gamma = 0.001		98.8 %	98.5 %	98.57 %



Choix et extraction  
des features

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## Résultats du SVM

=== Confusion Matrix ===

Base de test finale (350 imageries)

5 imageries "electricity"  
classés en tant que "bomb"

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	<-- classified as
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	a = accident
0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	b = bomb
0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	c = car
0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	d = casualty
0	5	0	0	20	0	0	0	0	0	0	0	0	0	0	e = electricity
0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	f = fire
0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	g = firebrigade
0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	h = flood
0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	i = gas
0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	j = injury
0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	k = paramedics
0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	l = person
0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	m = police
0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	n = roadblock

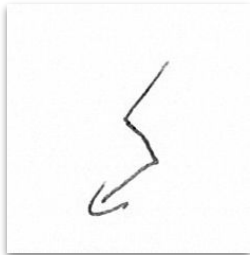
Choix et extraction  
des features

Organisation  
des données

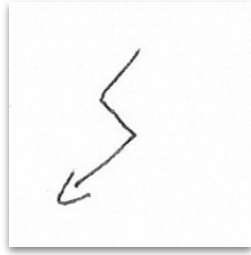
Classification

Évaluation

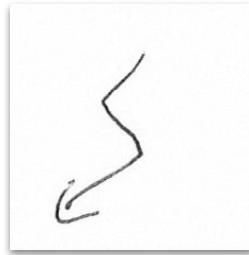
## Imagettes mal-classifiées (SVM sur base finale)



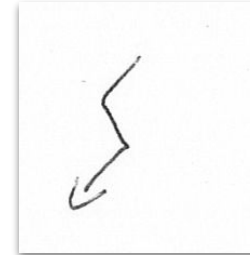
electricity\_5\_5\_4\_0.png



electricity\_5\_5\_4\_1.png



electricity\_5\_5\_4\_2.png



electricity\_5\_5\_4\_3.png

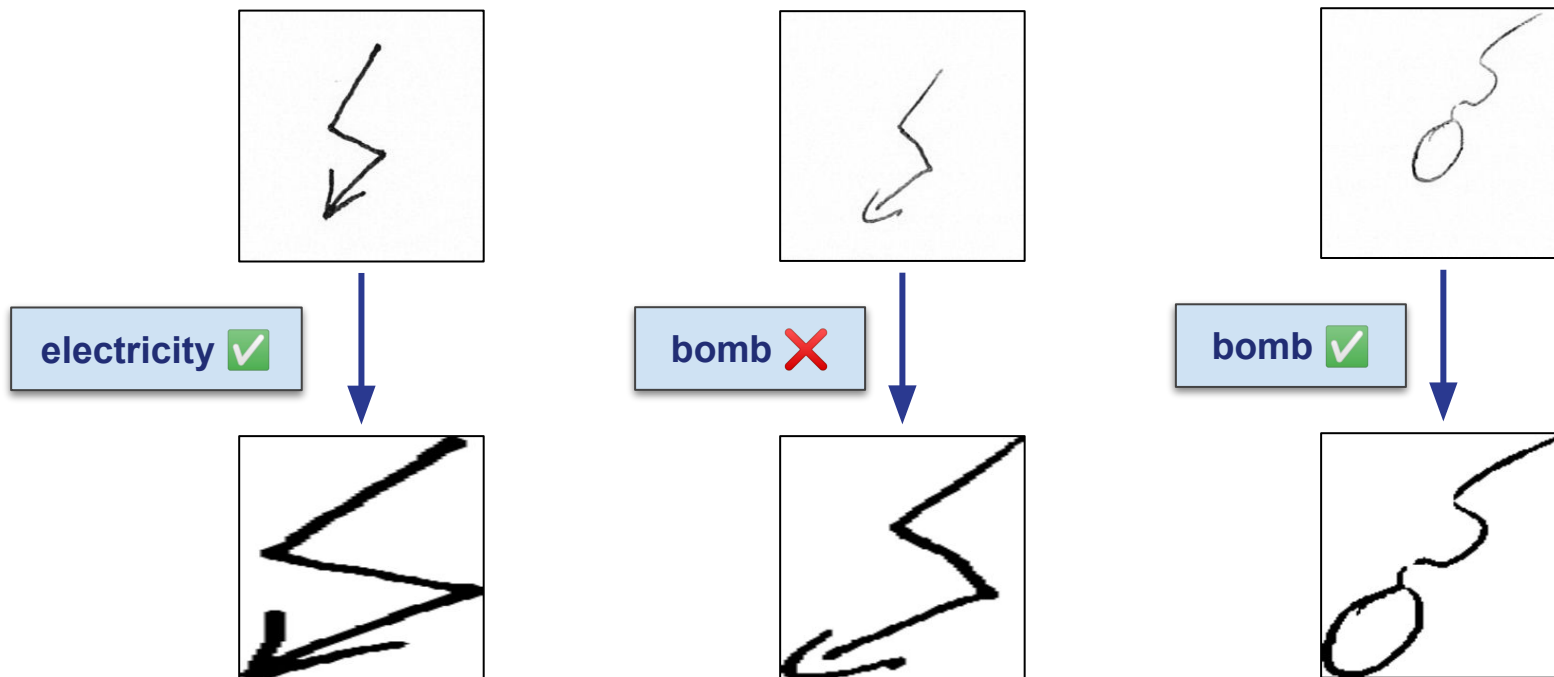


electricity\_5\_5\_4\_4.png



**Imagettes provenant du même scripter**

## Comparaison des imagerie



Choix et extraction  
des features

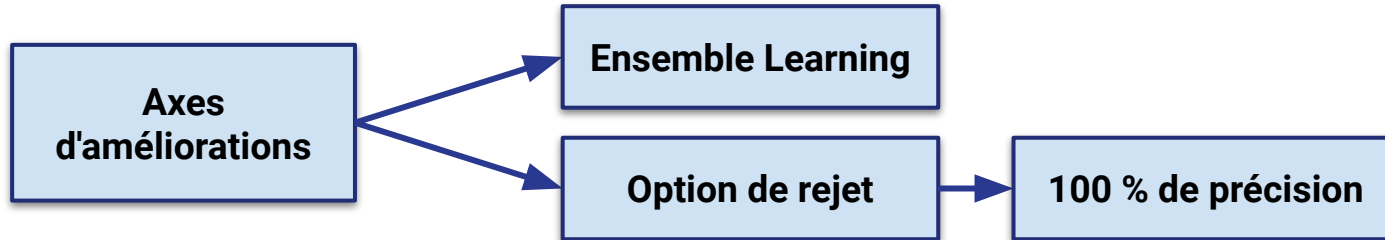
Organisation  
des données

Classification

Évaluation

## Conclusion

**Résultats satisfaisants -> 98,5 % de F-mesure (SVM) sur la base de test finale**





# Questions