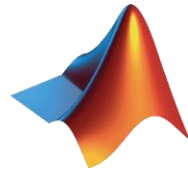


# TP Artificial Intelligence with MATLAB

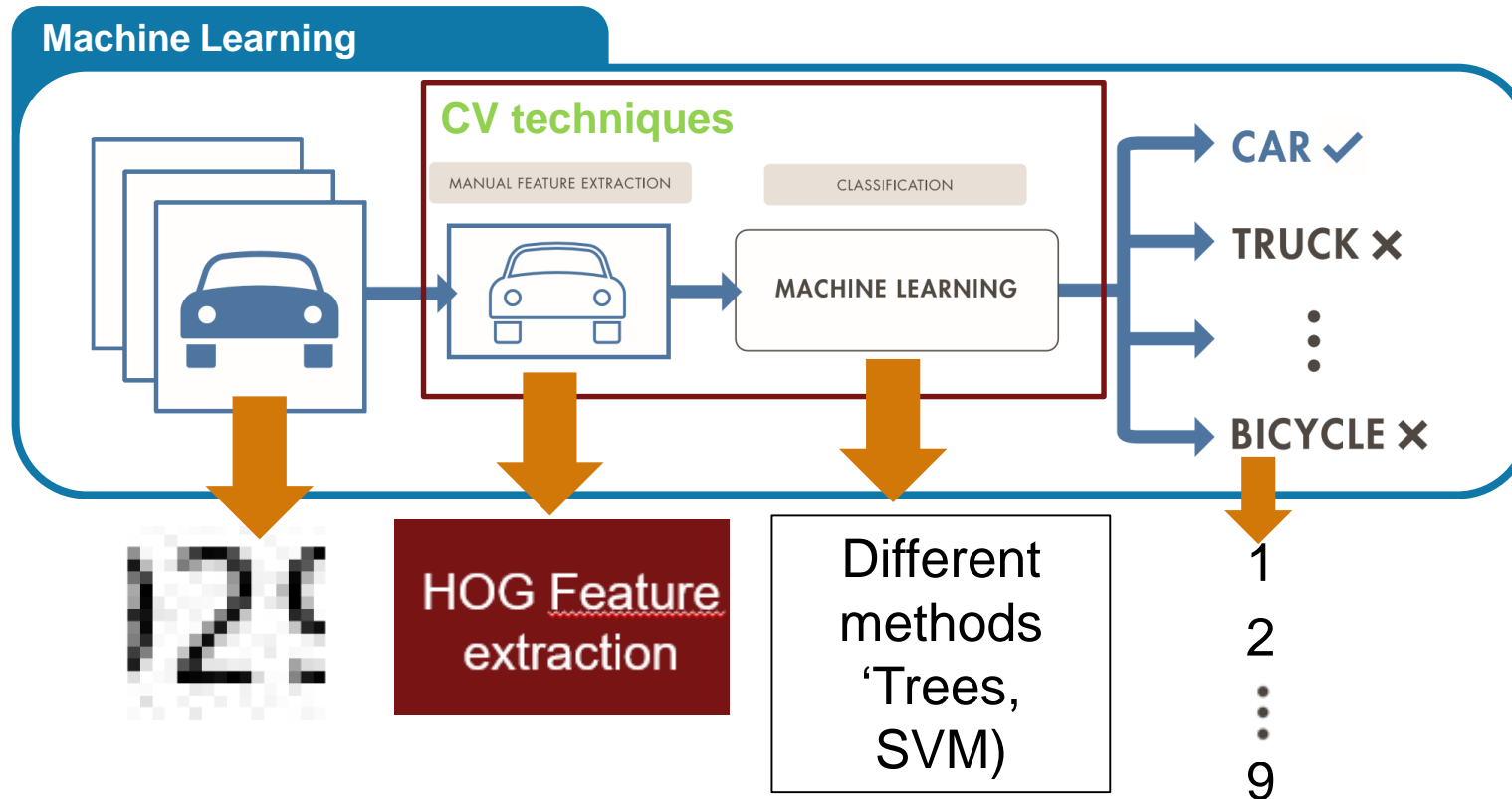


# Agenda

- **Partie 1** (hands-on workshop using MATLAB online): Digit Classification using HOG features extraction
- **Partie 2** (en autonomie): using Machine Learning Onramp

# Partie 1 (Utilisation de MATLAB Online)

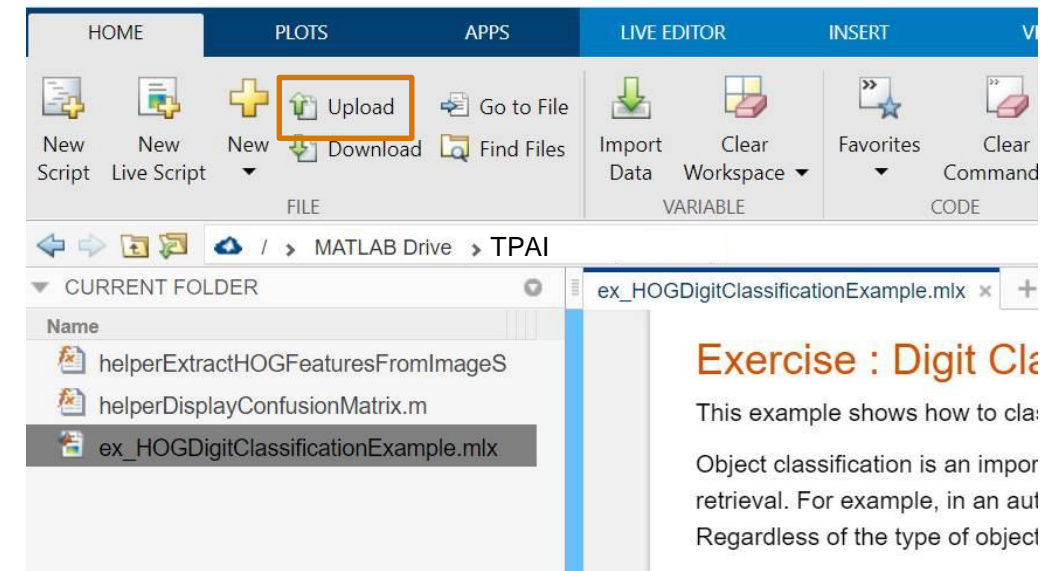
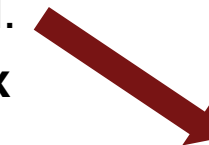
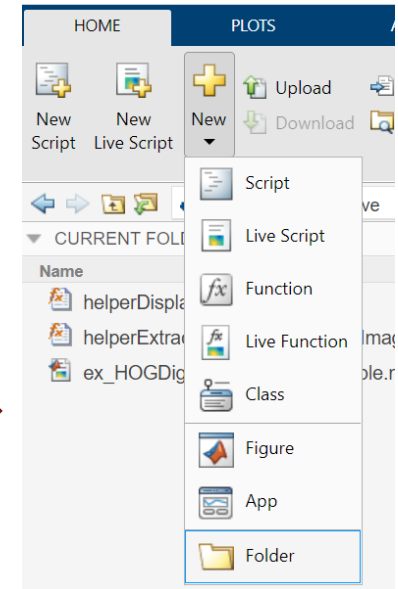
Digit Classification using HOG features extraction



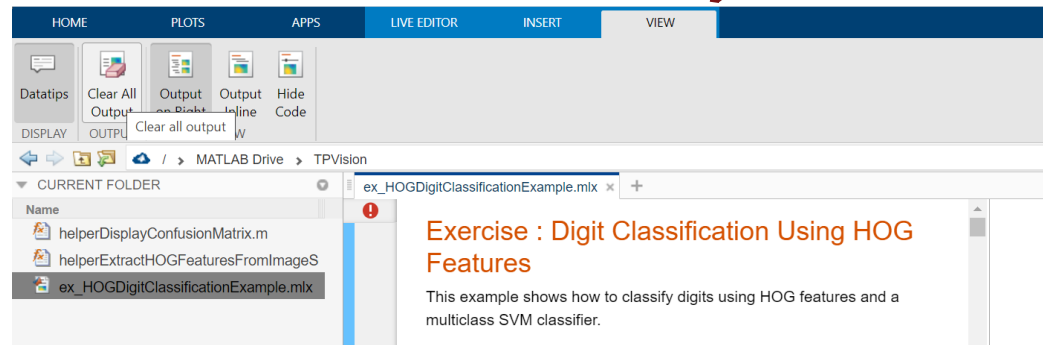
# Utilisation de MATLAB Online

- Se connecter à <https://matlab.mathworks.com/>
- S'identifier avec son compte MathWorks associé à l'adresse mail de l'Ecole.
- Le répertoire de travail sera par défaut MATLAB Drive.
- Créer un dossier en cliquant sur Home>New>Folder puis le nommer (ex: **TPAI**).
- Faire **Upload** pour récupérer les fichiers envoyés par mail.
- Ouvrir le fichier **ex\_HOGDigitClassificationExample.mlx**

Cloud / > MATLAB Drive >



NB: Si besoin, faire Clear all Outputs en allant sur **View> Clear All Outputs**



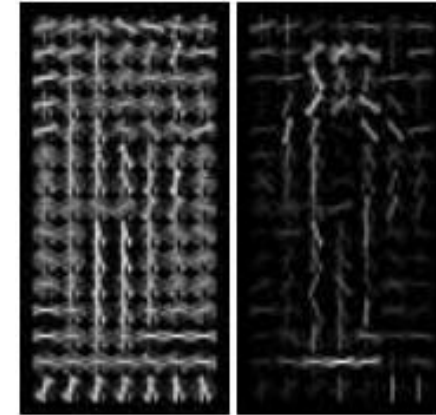
## Exercise : Digit Classification Using HOG Features

This example shows how to classify digits using HOG features and a multiclass SVM classifier.

Object classification is an important task in many computer vision applications. For example, in an autonomous driving application, it is necessary to detect and classify objects in the environment. Regardless of the type of object, classification is a fundamental task in computer vision.

# HOG (« Histogram of Oriented Gradients ») features<sup>1</sup>

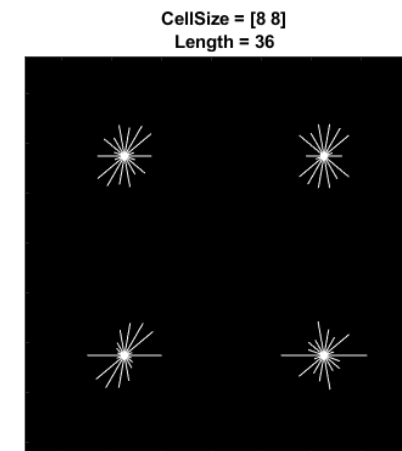
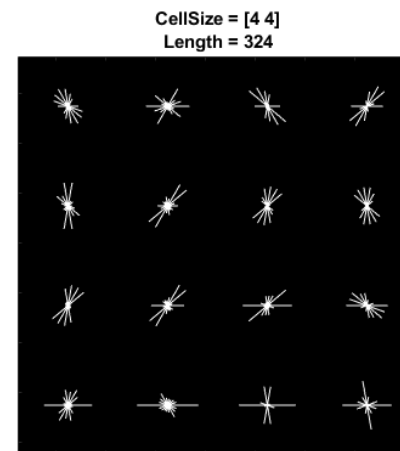
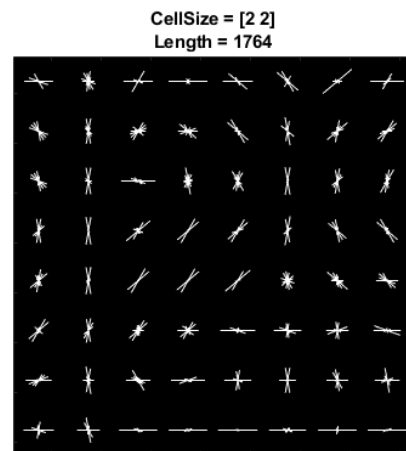
- Originally proposed for a pedestrian detector
- Now used as a generic detector for other applications, e.g. digit recognition
- Basic idea : local object appearance and shape can be characterized by distributions of local intensity gradients or edge directions
- Steps :
  - Divide the image window into small spatial regions called “cells”
  - For each cell, accumulate a local 1-D histogram of gradient directions or edge orientations over the pixels of the cell
  - The HOG representation is the combined histogram entries



# HOG features<sup>1</sup>

*Effect of cell size on the HOG features*

MATLAB function : [extractHOGFeatures](#)

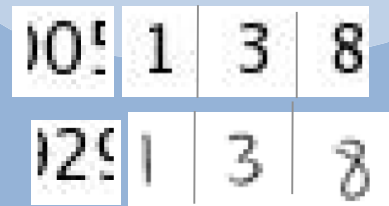




# TP Objective : train a classifier for digits

File : *ex\_HOGDigitClassificationExample.mlx*

Labelisés



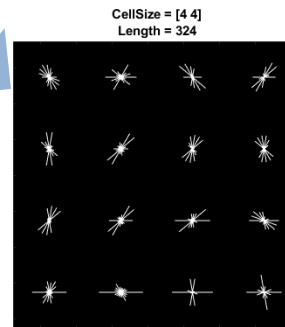
Data : (small)  
database of  
handwritten and  
synthetic digits



Training  
data

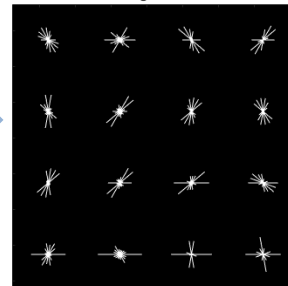
Synthetic Digits

Extract HOG  
features



Extract HOG  
features

CellSize = [4 4]  
Length = 324



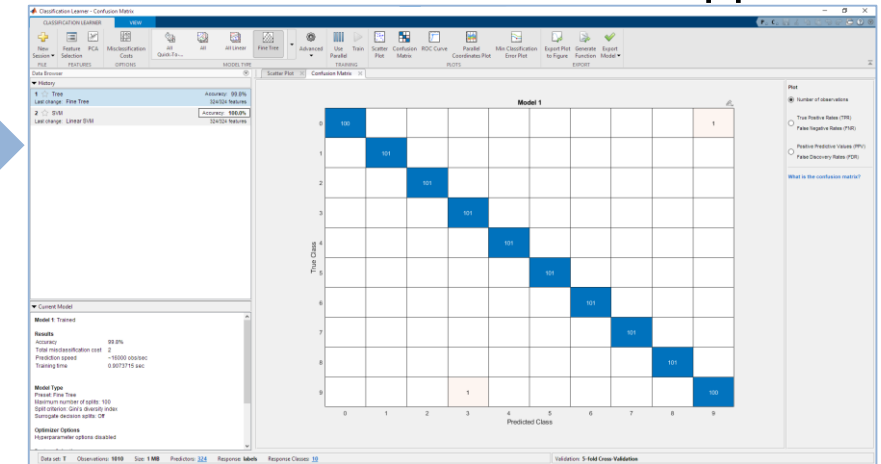
Test data

Handwritten  
Digits

Evaluate  
performance

Trained  
classifier

Try out different classifiers using the  
Classification Learner App



Based on [this](#) example in the documentation

# Partie 2 (Utilisation de Machine Learning Onramp)

This free, two-hour tutorial provides an interactive introduction to practical machine learning methods for classification problems.

Prerequisites: MATLAB Onramp or basic knowledge of MATLAB

[Launch the course](#)



## ■ Etapes à suivre :

- Cliquer sur [Machine Learning Onramp](#)
- S'identifier avec son compte MathWorks si ce n'est pas le cas par défaut
- Faire **les chapitres 1 à 5 (Parties Further Practice et Conclusion ne sont pas nécessaires)**
- Générer un pdf à la fin de la séance en cliquant sur le bonhomme puis sur Download Progress report

