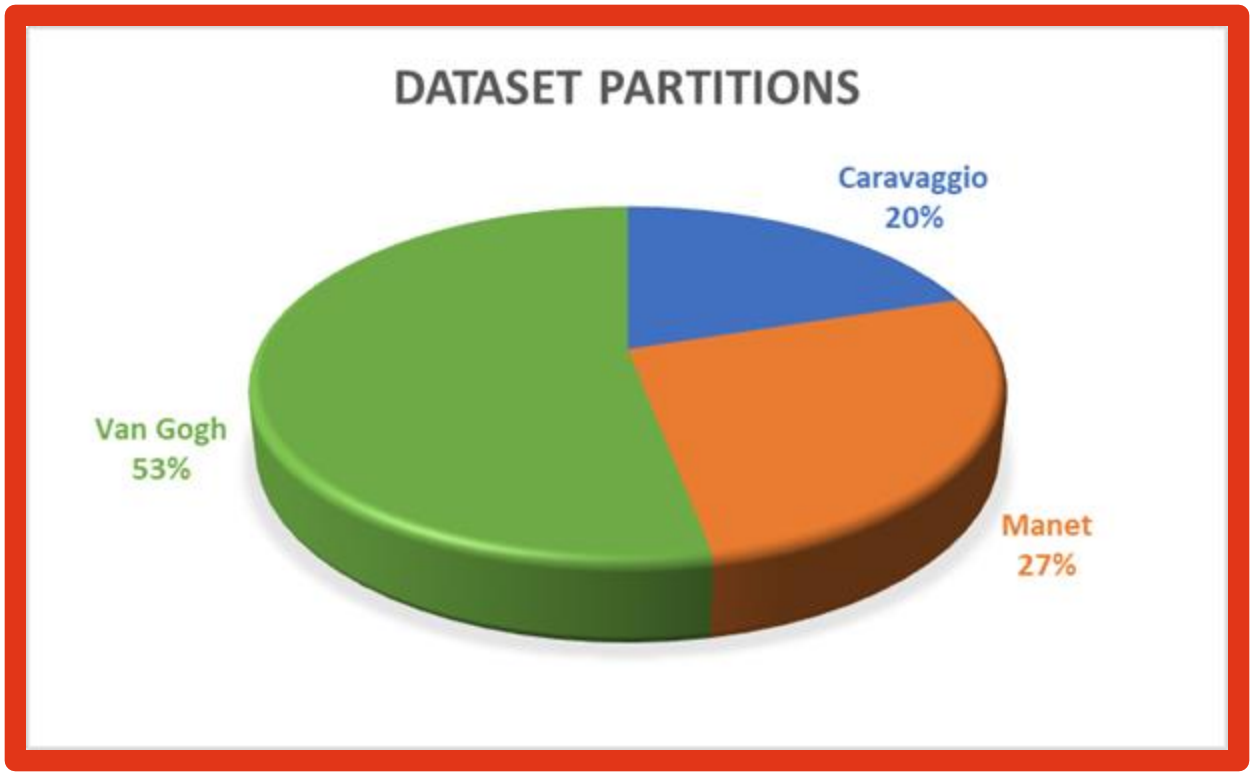
PROJECT WORK ON

PAINTER STYLE RECOGNITION

Dataset building

- ***"Handmade" search***
- ***Search realized by a smart Google Images crawler***
- ***Canva samples***
- ***Careful selection***

8771 images



Dataset splitting

Since the **final** private **test** set is **balanced**,
we decided to obtain a **balanced validation set** too,
even if the **original** collected **dataset** was **unbalanced**

Validation set: 1080 images

Caravaggio	Manet	Van Gogh
360	360	360

Dataset

Training set: 7691 images

Caravaggio	Manet	Van Gogh
1445	2014	4232

Pre-processing pipeline

Since the **training** set was **unbalanced**, we used **random oversampling** to balance it and to obtain a model with good performances on average across all classes

Oversampling implicitly ensures that all the batches provided to the network during the training are balanced

Before Oversampling

Training set: 7691 images

Caravaggio	Manet	Van Gogh
1445	2014	4232

After Oversampling

Training set: 12696 images

Caravaggio	Manet	Van Gogh
4232	4232	4232

Pre-processing pipeline

We decided to use **on-the-fly image data augmentation** on the training set to avoid overfitting as much as possible

Transformations on Training set:

- *rescale = 1./255*
- *brightness_range = (0.3, 1.3)*
- *shear_range = 20*
- *rotation_range = 10*
- *horizontal_flip*
- *fill_mode = 'reflect'*

Transformations on Validation set:

- *rescale = 1./255*
- *resizing to 299x299*

Network Architecture

The technique we selected is **transfer learning** because it allows to have a very deep network already trained on a vast dataset

InceptionResNetV2

Last layer: 3 neurons, one for each class ('caravaggio', 'manet', vangogh')

Image input size: 299-by-299

We adapted all photos to these dimensions by providing to *flow_from_directory* method the right *target_size* parameter: (299, 299)

Training Hyperparameters

Activation function last layer: *softmax*

Loss function: *categorical cross-entropy*

Optimization algorithm: *Adam*

Batch size: *32*

Early Stopping: *the learning procedure stops when validation accuracy does not increment anymore after 3 epochs*

ModelCheckPoint

3 PHASES

Significant reduction of learning rate (phase 2 and phase 3) to avoid (or reduce) overfitting and to readapt in a slow and incremental way the pretrained weights on the available dataset

Performance Analysis

Validation Accuracy: 0.9991

Validation Loss: 0.0053

Top-2 classification accuracy: 1

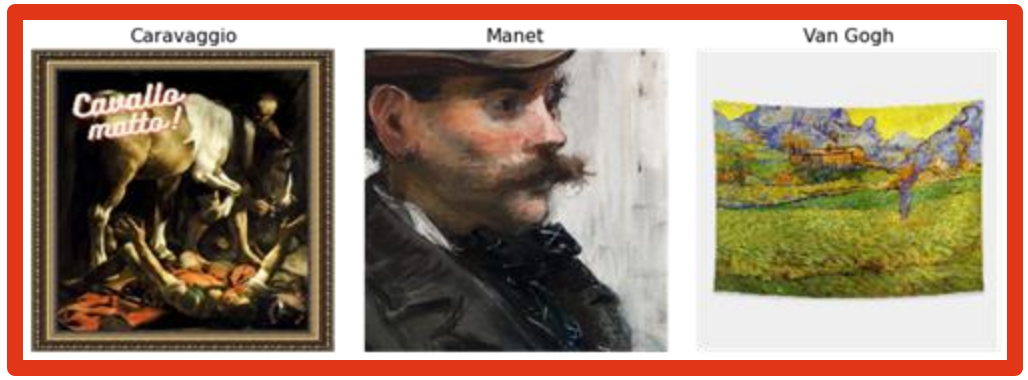
Precision: 1 | 1 | 1

Recall: 1 | 1 | 1

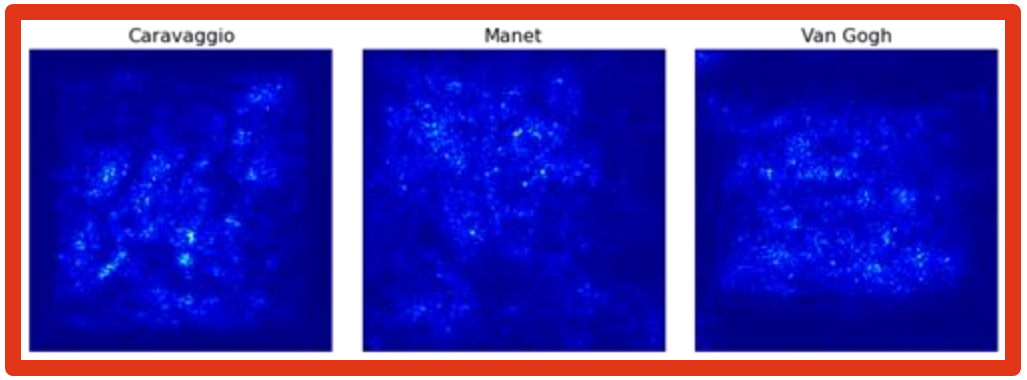
F1-score: 1 | 1 | 1

Confusion matrix

Further Analysis

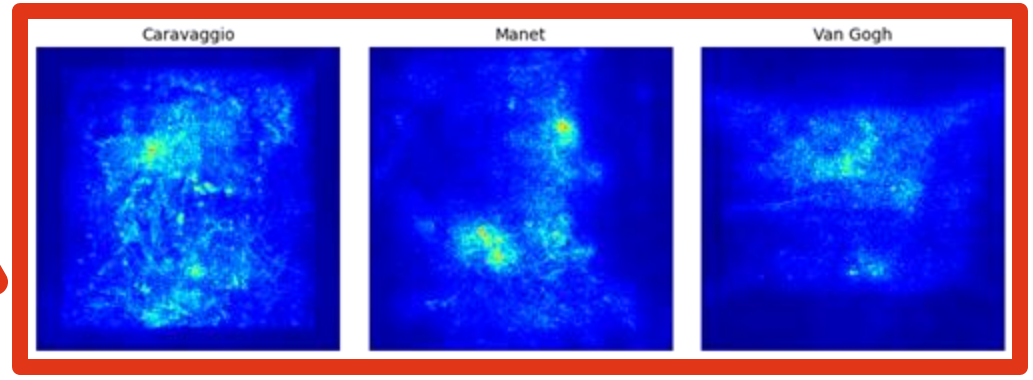


Samples

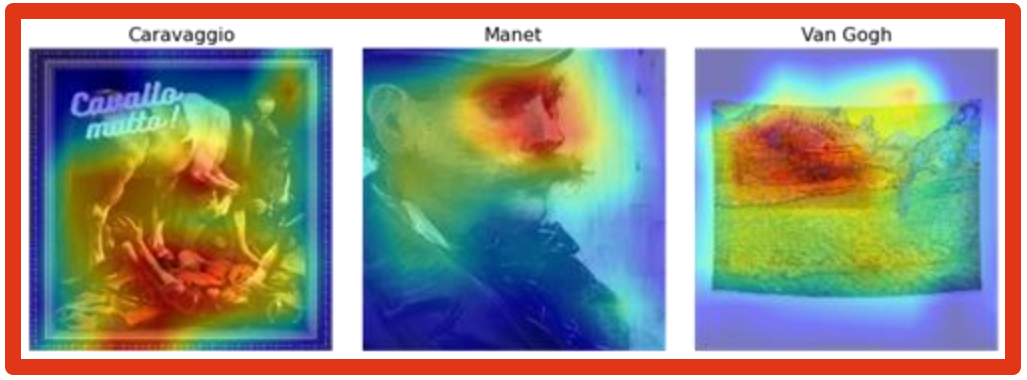


Saliency maps

SmoothGrad maps



GradCam maps



THANKS FOR WATCHING