Project

FAIN Thony
LONCHAMBON Alexis

Install

Install Commands

In [ ]:

```
# !pip install tqdm
# !pip install time

# %pip install --force-reinstall -v "ipywidgets == 7.7.2"
# %pip install --force-reinstall -v "jupyterlab_widgets == 1.1.1"
```

Imports

In [ ]:

```
# ALL IMPORTS FOR CODE

import os
import sys
import numpy as np
import pandas as pd
import time
import json
import math
import requests
import shutil
import PIL.Image
import webcolors
from types import SimpleNamespace
from PIL.ExifTags import TAGS
from IPython.display import display
from tqdm import tqdm
from tqdm.notebook import tqdm_notebook
from pandas import json_normalize
from IPython.display import Image, HTML
from SPARQLWrapper import SPARQLWrapper, JSON
import matplotlib.pyplot as plot
from sklearn.cluster import KMeans, MiniBatchKMeans
```

Settings

In [ ]:

```
## CLUSTERING

# Numbers of color clusters for classification
NUM_CLUSTERS = 3


## DATA

#Database names
DB_NAME = "db.json"
IMG_DB_NAME = "db_images.json"

#Image paths
IMG_FOLDER = "img"
PLT_FOLDER = "plt"
```

Global Methods

In [ ]:

```
# ALL GLOBAL FUNCITONS

def path_to_image_html(path):
    '''Transforms an url to an image balise for displaying'''
    return '<img width="500" src="'+ path + '"/>'

def format_exif(data):
    '''Formats exifs to HTML display'''
    out = ""
    for tag, value in data.items():
        if tag in TAGS:
            out+=f"{TAGS[tag]}: {value}<br>"
    return out

def closest_color(col):
    '''Returns the name of the closest color'''
    min_colours = {}
    for key, name in webcolors.CSS3_HEX_TO_NAMES.items():
        r_c, g_c, b_c = webcolors.hex_to_rgb(key)
        rd = (r_c - col[0]) ** 2
        gd = (g_c - col[1]) ** 2
        bd = (b_c - col[2]) ** 2
        min_colours[(rd + gd + bd)] = name
    return min_colours[min(min_colours.keys())]

def format_exif_json(data):
    '''Formats exifs to a dict for JSON parsing'''

    if(not data) :
        return None

    #This creates a object flexible enough to add attributes dynamically
    out = SimpleNamespace()

    for tag, value in data.items():
        if tag in TAGS:
            tagS = TAGS[tag]

            #Some tags are ignored because they contain lots of useless bytes va
            if tagS in ["MakerNote", "UserComment", "InterColorProfile", "Compon
                continue

            #Some string values contain empty
            if isinstance(value, str):
                value = value.rstrip('\x00').rstrip('\u0000')

            # add attribute to our object
            setattr(out,tagS, value)
    #We need to return it as a dict for JSON parsing
    return out.__dict__

def get_colors(path):
    '''Returns a plot with the colors'''
    if not os.path.exists(PLT_FOLDER):
        # Create a new directory because it does not exist
        os.makedirs(PLT_FOLDER)
    if not os.path.exists(f"{PLT_FOLDER}/{IMG_FOLDER}"):
        # Create a new directory because it does not exist
        os.makedirs(f"{PLT_FOLDER}/{IMG_FOLDER}")

    #Open image
    imgfile = PIL.Image.open(path).convert('RGBA')
    #We want a certain number of dominant colors
    numClusters = NUM_CLUSTERS

    try:
        plot.clf()

        # Resize to speed up image handling
        imgfile = imgfile.resize((512,512), PIL.Image.Resampling.LANCZOS)

        # Convert to 2D array
        imgfile = np.array(imgfile)
        w, h, d = tuple(imgfile.shape)
        image_array = np.reshape(imgfile, (w * h, d))

        # numarray = np.array(imgfile.getdata(), np.uint8)

        #Clustering with MiniBatchKmeans
        clusters = MiniBatchKMeans(n_clusters=numClusters, random_state=0, n_ini
        # clusters = KMeans(n_clusters=numClusters, random_state=0, n_init=2, n_
        clusters.fit(image_array)
        npbins = np.arange(0, numClusters+1)
        histogram = np.histogram(clusters.labels_, bins=npbins)
        labels = np.unique(clusters.labels_)
        barlist = plot.bar(labels, histogram[0])
        for i in range(numClusters):
            barlist[i].set_color(
                "#%02x%02x%02x"
                % (
                    math.ceil(clusters.cluster_centers_[i][0]),
                    math.ceil(clusters.cluster_centers_[i][1]),
                    math.ceil(clusters.cluster_centers_[i][2]),
                )
            )
        plot.savefig(f"{PLT_FOLDER}/{path}")
        return clusters
    except Exception as inst:
        print(f"RIP for {path} : {inst}")
        return None


def download_image(url):
    '''Downloads the image from an url to the img path'''


    filepath = os.path.join(IMG_FOLDER, os.path.basename(url))

    #creates the directory to avoid a crash (I love python...)
    if not os.path.exists(IMG_FOLDER):
        # Create a new directory because it does not exist
        os.makedirs(IMG_FOLDER)
        # print("The new directory is created!")
    headers = {"User-Agent": "Mozilla/5.0"}

    #Ignore the download if the file exists
    if os.path.isfile(filepath) :
        return filepath

    #Download code
    request = requests.get(url, allow_redirects=True, headers=headers, stream=Tr
    if request.status_code == 200:
        with open(filepath, "wb") as image:
            request.raw.decode_content = True
            shutil.copyfileobj(request.raw, image)
        shutil.copyfileobj(request.raw, image)
    return filepath
```

Dataset Initialisation

Getting the images and setting up the database

In [ ]:

```
endpoint_url = "https://query.wikidata.org/sparql"
imgmax = 1000

# Get cities
query = """SELECT DISTINCT ?planeLabel ?entry ?image {
  ?plane wdt:P31 wd:Q15056993;
               wdt:P729 ?entry;
               wdt:P729 ?retirement;
               wdt:P18 ?image.

  SERVICE wikibase:label { bd:serviceParam wikibase:language "fr". }
} LIMIT 1000"""

#get the results from the query from wikidata
def get_results(endpoint_url, query):
    user_agent = "WDQS-example Python/%s.%s" % (
        sys.version_info[0],
        sys.version_info[1],
    )
    sparql = SPARQLWrapper(endpoint_url, agent=user_agent)
    sparql.setQuery(query)
    sparql.setReturnFormat(JSON)
    return sparql.query().convert()


#array for dataframe
array = []

#array for JSON formatting
db = []
results = get_results(endpoint_url, query)
res = results["results"]["bindings"]
i = 0

#Parsing all results
for result in tqdm(res):
    i+=1

    #Weird formats are ignored.
    filename, file_extension = os.path.splitext(os.path.basename(result["image"]
    if file_extension not in [".png", ".jpg"] :
        continue

    #Download and get image exif data
    path = download_image(result["image"]["value"])
    img = PIL.Image.open(path)
    exif_data = img._getexif()

    #Parse data for JSON DB
    db.append(
        {
            "name" : result["planeLabel"]["value"],
            "img" : path,
            "width" : img.width,
            "height" : img.height,
            "orientation" : ("Paysage" if img.width > img.height else "Portrait"
            "tags" : format_exif_json(exif_data)
        }
    )

    #Parse data for dataframe display
    array.append(
        (
        (
            result["planeLabel"]["value"],
            result["entry"]["value"],
            path,
            img.width,
            img.height,
            ("Paysage" if img.width > img.height else "Portrait"),
            exif_data
        )
    )


dataframe = pd.DataFrame(array, columns=["planeLabel", "entry", "image", "width"
dataframe = dataframe.astype(
    dtype={"planeLabel": "<U200", "entry" : "<U200", "image": "<U200", "width":
)
# srt = dataframe.sort_values("data")


# Serializing json
json_object = json.dumps(db, indent=4, default=lambda o: f"{o}")

# Writing to db.json
with open(DB_NAME, "w") as outfile:
    outfile.write(json_object)

#HTML Display
pd.set_option('display.max_colwidth', 100)

# HTML(srt.to_html(escape=False ,formatters=dict(image=path_to_image_html)))
```

```
100%|██████████| 553/553 [07:13<00:00,  1.27it/s]
```

Filtering data

In [ ]:

```
# We remove data if there are no tags
filter1 = dataframe["data"] != "None"
filtered = dataframe.where(filter1).dropna()
# HTML(filtered.to_html(escape=False ,formatters=dict(image=path_to_image_html))
# filtered
mapped = filtered
# bars = get_colors(mapped["image"])
# mapped["bars"] = mapped['image'].apply(lambda x: get_colors(x))
# mapped["data"] = mapped['data'].apply(lambda x: format_exif(x))
# mapped
# HTML(mapped.to_html(escape=False ,formatters=dict(image=path_to_image_html)))
mapped
```

Out[ ]:

	planeLabel	entry	
5	Iliouchine Il-14	1954-11-30T00:00:00Z	img/%D0%A1%D0%A1%D0%A1%D0%A0-9161
7	Yak-3	1944-04-01T00:00:00Z	i
8	C-17 Globemaster III	1995-01-17T00:00:00Z	
11	Lockheed S-3 Viking	1974-01-01T00:00:00Z	S-3B%20Viking%20launched%20off%20the%20flight%20deck
13	Boeing F/A-18E/F Super Hornet	2001-09-01T00:00:00Z	
...	...	...	
482	Lavochkin La-9	1947-01-01T00:00:00Z	
485	E-Jet	2004-03-17T00:00:00Z	img
486	Winjeel	1955-01-01T00:00:00Z	
487	Bell H-13 Sioux	1946-01-01T00:00:00Z	
497	Tomtit	1930-01-01T00:00:00Z	img/Hawker%20Tomtit%20%E2%80%98K1786%E2%80%

245 rows × 7 columns

Dominant Color Annotation

Load the parsed data

In [ ]:

```
# Opening JSON file
f = open(DB_NAME)

# returns JSON object as a dictionary
data = json.load(f)

df = pd.DataFrame(data)

df
```

Out[ ]:

	name	img	width	height	orientation
0	Mirage F1	img/Ecuadorian%20Air%20Force%20Dassault%20Mira...	2800	1810	Paysage
1	ATR 72	img/ATR%20ATR-72-202%2C%20LOT%20-%20Polish%20A...	1200	800	Paysage
2	Boeing Vertol CH-47 Chinook	img/Boeing%20Vertol%20CH-47%20Chinook%203-view...	574	385	Paysage
3	Il-2 Sturmovik	img/Il2%20sturmovik.jpg	650	234	Paysage
4	Mil Mi-1	img/Mi-1m%20museum.jpg	640	468	Paysage
...	...	...	...	...	...
496	Short C-23 Sherpa	img/ Short%20C-23A%20Sherpa%20%28330-200%29%2C%...	1024	678	Paysage
497	Tomtit	img/ Hawker%20Tomtit%20%E2%80%98K1786%E2%80%99%...	3773	2515	Paysage
498	Vildebeest	img/Vickers%20Vildebeest%20in%20flight.jpg	352	317	Paysage
499	Savoia-Marchetti S.55	img/Aeroflot%20Savoia-Marchetti%20S.55P.jpg	1072	396	Paysage
500	Mitsubishi Ki-51	img/Mitsubishi%20Ki-51-1.jpg	1920	1319	Paysage

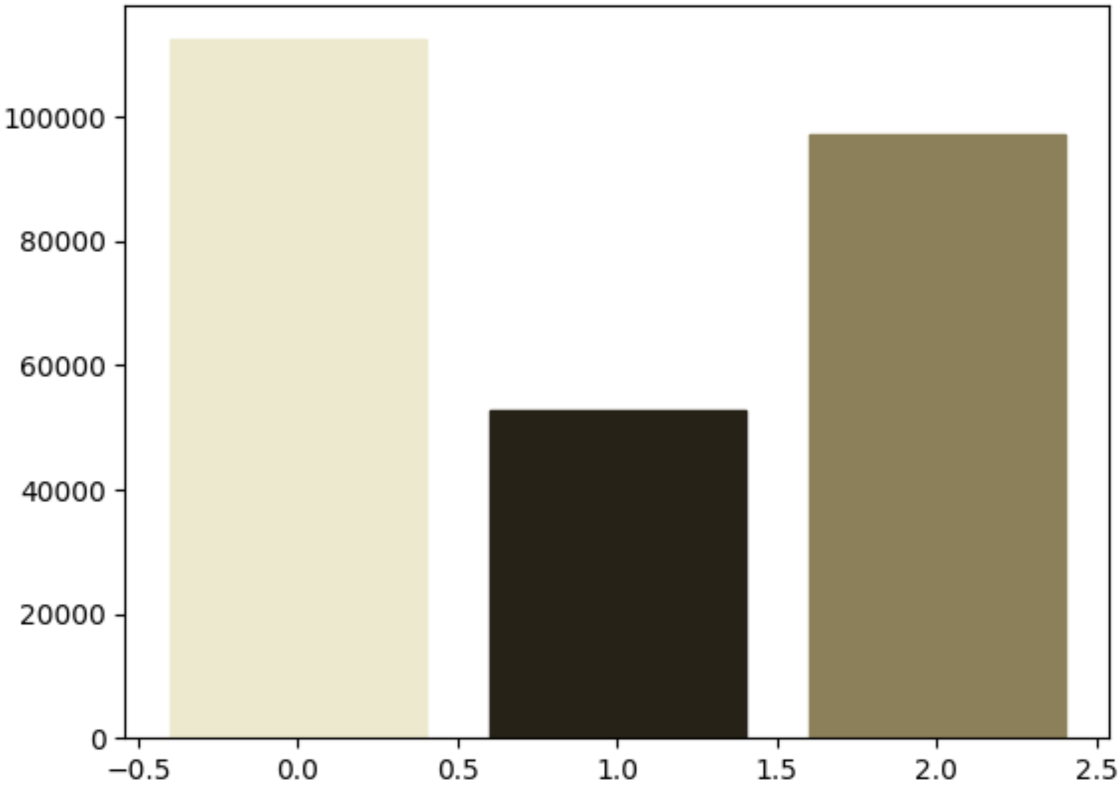
501 rows × 6 columns

Dominant Color annotation

In [ ]:

```
for entry in tqdm(data):
    # Get image path
    path = entry["img"]

    # Process image dominant colors with Kmeans
    clusters = get_colors(path)

    # If it worked and did not crash and burned, tag the image with the dominant
    if clusters:
        i = 0
        colorlist = []

        for color in clusters.cluster_centers_:
            c = {}
            c["R"] = int(color[0])
            c["G"] = int(color[1])
            c["B"] = int(color[2])

            colorlist.append(c)
        entry["colors"] = colorlist

    # Serializing json
    json2 = json.dumps(data, indent=4, default=lambda o: f"{o}")

    # Writing to db_images.json
    with open(IMG_DB_NAME, "w") as outfile:
        outfile.write(json2)

    #HTML Display settings
    pd.set_option('display.max_colwidth', 100)
```

```
100%|██████████| 501/501 [05:40<00:00,  1.47it/s]
```



Open Color-Tagged database

In [ ]:

```
# Opening JSON file
f = open(IMG_DB_NAME)

# returns JSON object as
# a dictionary
data = json.load(f)

df = pd.DataFrame(data)

df
```

Out[ ]:

	name	img	width	height	orientation
0	Mirage F1	img/Ecuadorian%20Air%20Force%20Dassault%20Mira...	2800	1810	Paysage
1	ATR 72	img/ATR%20ATR-72-202%2C%20LOT%20-%20Polish%20A...	1200	800	Paysage
2	Boeing Vertol CH-47 Chinook	img/Boeing%20Vertol%20CH-47%20Chinook%203-view...	574	385	Paysage
3	Il-2 Sturmovik	img/Il2%20sturmovik.jpg	650	234	Paysage
4	Mil Mi-1	img/Mi-1m%20museum.jpg	640	468	Paysage
...	...	...	...	...	...
496	Short C-23 Sherpa	img/Short%20C-23A%20Sherpa%20%28330-200%29%2C%...	1024	678	Paysage

	name	img	width	height	orientation
497	Tomtit	img/ Hawker%20Tomtit%20%E2%80%98K1786%E2%80%99%...	3773	2515	Paysage
498	Vildebeest	img/Vickers%20Vildebeest%20in%20flight.jpg	352	317	Paysage
499	Savoia-Marchetti S.55	img/Aeroflot%20Savoia-Marchetti%20S.55P.jpg	1072	396	Paysage
500	Mitsubishi Ki-51	img/Mitsubishi%20Ki-51-1.jpg	1920	1319	Paysage

501 rows × 7 columns

Classification and Prediction

Data splitting

In [ ]:

```python
from sklearn.ensemble import RandomForestClassifier
from sklearn.preprocessing import LabelEncoder
import random

results = []
array = []
predict = []
favList = ["likes", "yikes"]
outList = ["training", "predict"]
for line in data:
    # Extract colors
    c1 = line["colors"][0]
    c1 =  closest_color((c1["R"], c1["G"], c1["B"]))
    c2 = line["colors"][1]
    c2 =  closest_color((c2["R"], c2["G"], c2["B"]))
    c3 = line["colors"][2]
    c3 =  closest_color((c3["R"], c3["G"], c3["B"]))

    #Extract exif
    exif = line["tags"]

    #We get rid of non-exifed data
    if(exif):
        Make = exif["Make"] if "Make" in exif else None
        ResolutionUnit = exif["ResolutionUnit"] if "ResolutionUnit" in exif else
        Model = exif["Model"] if "Model" in exif else None
        XResolution = exif["XResolution"] if "XResolution" in exif else None
        YResolution = exif["YResolution"] if "YResolution" in exif else None
        ISOSpeedRatings = exif["ISOSpeedRatings"] if "ISOSpeedRatings" in exif e

        # 10 out of 250 images will be used for prediction. The rest is training
        if(random.randint(0, 250) < 100):
            predict.append(
                (
                    c1,
                    c2,
                    c3,
                    Make,
                    ResolutionUnit,
                    Model,
                    XResolution,
                    YResolution,
                    ISOSpeedRatings,
                    line["orientation"]
                )
            )
        else:
            array.append(
                (
                    c1,
                    c2,
                    c3,
                    Make,
                    ResolutionUnit,
                    Model,
                    XResolution,
                    YResolution,
                    ISOSpeedRatings,
                    line["orientation"]
                )
            )
            # We randomly like or not an image. Later, we will chose the images
            results.append(random.choices(favList, weights= [1, 10]))
            results.append(random.choices(favList, weights=[1, 10]))

# Get dataframe for training and predict for prediction
dataframe = pd.DataFrame(array, columns=["color1", "color2", "color3", "Make", "
predict = pd.DataFrame(predict, columns=["color1", "color2", "color3", "Make", "

results = pd.DataFrame(results, columns=["Favorite"])
encoded = pd.DataFrame()
pred_en = pd.DataFrame()
en_resu = pd.DataFrame()
# generating numerical labels for colors
le11 = LabelEncoder()
encoded["color1_en"] = le11.fit_transform(dataframe["color1"])
pred_en["color1_en"] = le11.fit_transform(predict["color1"])
le12 = LabelEncoder()
encoded["color2_en"] = le12.fit_transform(dataframe["color2"])
pred_en["color2_en"] = le11.fit_transform(predict["color2"])
le13 = LabelEncoder()
encoded["color3_en"] = le13.fit_transform(dataframe["color3"])
pred_en["color3_en"] = le11.fit_transform(predict["color3"])

# generating numerical labels for Make
le2 = LabelEncoder()
encoded["Make_en"] = le2.fit_transform(dataframe["Make"])
pred_en["Make_en"] = le2.fit_transform(predict["Make"])

# Generating ResolutionUnit labels
le_ResolutionUnit = LabelEncoder()
encoded["ResolutionUnit_en"] = le_ResolutionUnit.fit_transform(dataframe["Resolu
pred_en["ResolutionUnit_en"] = le_ResolutionUnit.fit_transform(predict["Resoluti

# Generating Model labels
le_Model = LabelEncoder()
encoded["Model_en"] = le_Model.fit_transform(dataframe["Model"])
pred_en["Model_en"] = le_Model.fit_transform(predict["Model"])

# Generating XResolution labels
le_XResolution = LabelEncoder()
encoded["XResolution_en"] = le_XResolution.fit_transform(dataframe["XResolution"
pred_en["XResolution_en"] = le_XResolution.fit_transform(predict["XResolution"])

# Generating YResolution labels
le_YResolution = LabelEncoder()
encoded["YResolution_en"] = le_YResolution.fit_transform(dataframe["YResolution"
pred_en["YResolution_en"] = le_YResolution.fit_transform(predict["YResolution"])

# Generating ISOSpeedRatings labels
le_ISOSpeedRatings = LabelEncoder()
encoded["ISOSpeedRatings_en"] = le_ISOSpeedRatings.fit_transform(dataframe["ISOS
pred_en["ISOSpeedRatings_en"] = le_ISOSpeedRatings.fit_transform(predict["ISOSpe

# generating numerical labels
le3 = LabelEncoder()
encoded["orientation_en"] = le2.fit_transform(dataframe["orientation"])
pred_en["orientation_en"] = le2.fit_transform(predict["orientation"])


# generating numerical labels
le_res = LabelEncoder()
en_resu["Favorite_en"] = le_res.fit_transform(results["Favorite"])

# dataframe
# encoded
```

```
dataframe.join(encoded).join(results).join(en_resu)
```

Out[ ]:

	color1	color2	color3	Make	ResolutionUnit	Model	XResol
0	darkgray	darkolivegreen	firebrick	SONY	2.0	DSLR-A200	
1	gainsboro	saddlebrown	silver	Canon	2.0	Canon EOS 60D	
2	whitesmoke	gray	darkslategray	None	2.0	None	
3	whitesmoke	darkslategray	darkgray	None	2.0	None	
4	gray	silver	darkslategray	None	2.0	None	
...	...	...	...	...	...	...	
128	whitesmoke	darkslategray	darkgray	None	2.0	None	
129	tan	darkslategray	gray	None	2.0	None	
130	skyblue	darkslategray	gainsboro	NIKON CORPORATION	2.0	NIKON D3200	505
131	lightsteelblue	dimgray	black	Canon	3.0	Canon EOS 350D DIGITAL	
132	gainsboro	darkslategray	gray	None	NaN	None	

133 rows × 22 columns

In [ ]:

```
#The is the data to be predicted later
predict.join(pred_en)
```

Out[ ]:

	color1	color2	color3	Make	ResolutionUnit	Model	XResc
0	lightgray	darkslategray	gray	None	2.0	None	
1	lightsteelblue	darkslategray	slategray	NIKON CORPORATION	2.0	NIKON D2X	
2	slategray	cadetblue	darkslategray	Canon	2.0	Canon PowerShot SD770 IS	
3	lightsteelblue	dimgray	lightgray	None	2.0	None	
4	lavender	darkslategray	olivedrab	NIKON CORPORATION	2.0	NIKON D700	2
...	...	...	...	...	...	...	
98	lightgray	black	gray	None	NaN	None	
99	lightsteelblue	black	darkslategray	None	2.0	None	
100	slategray	darkgray	darkslategray	Canon	2.0	Canon PowerShot A610	
101	steelblue	gainsboro	darkslategray	Canon	2.0	Canon EOS 550D	
102	darkgray	darkslategray	dimgray	NIKON CORPORATION	2.0	NIKON D3200	62

103 rows × 20 columns

Classifier Setup

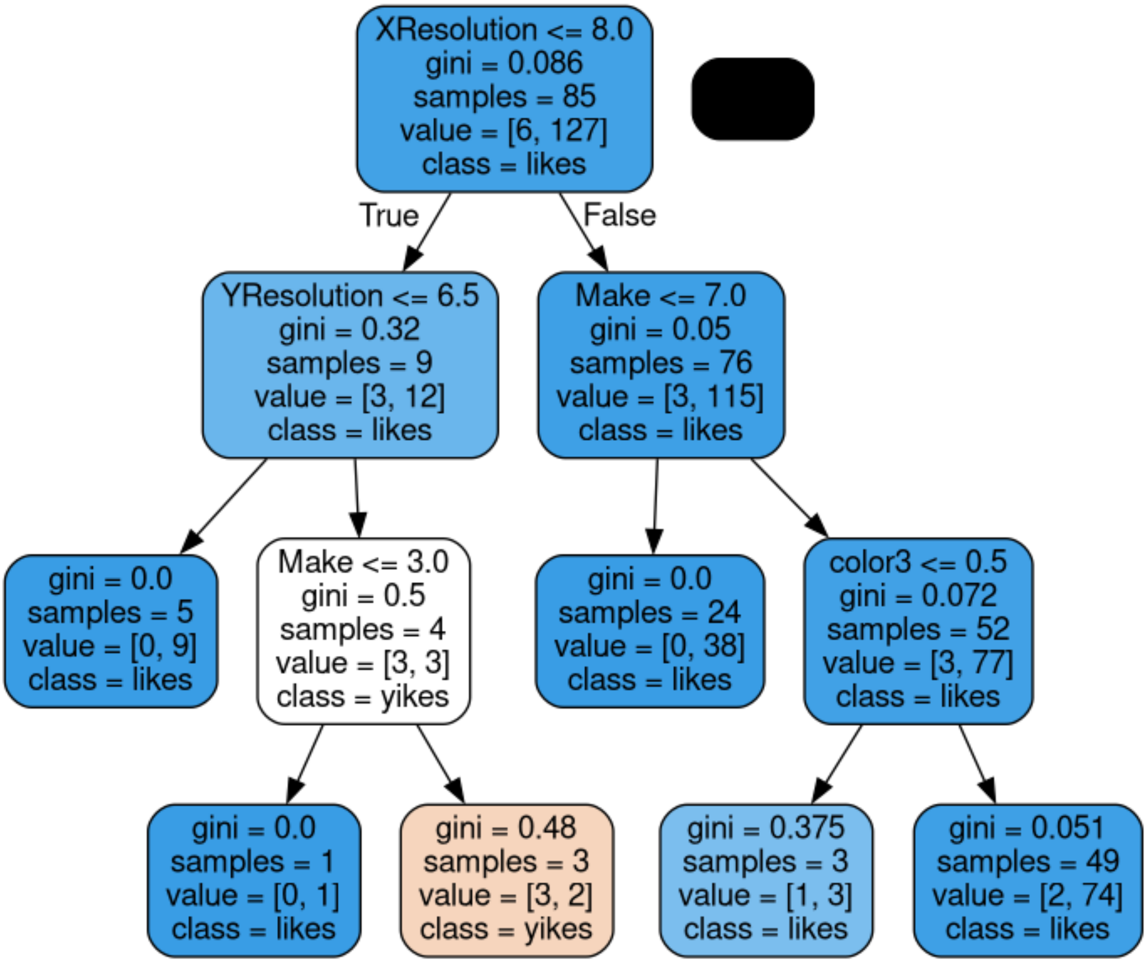
In [ ]:

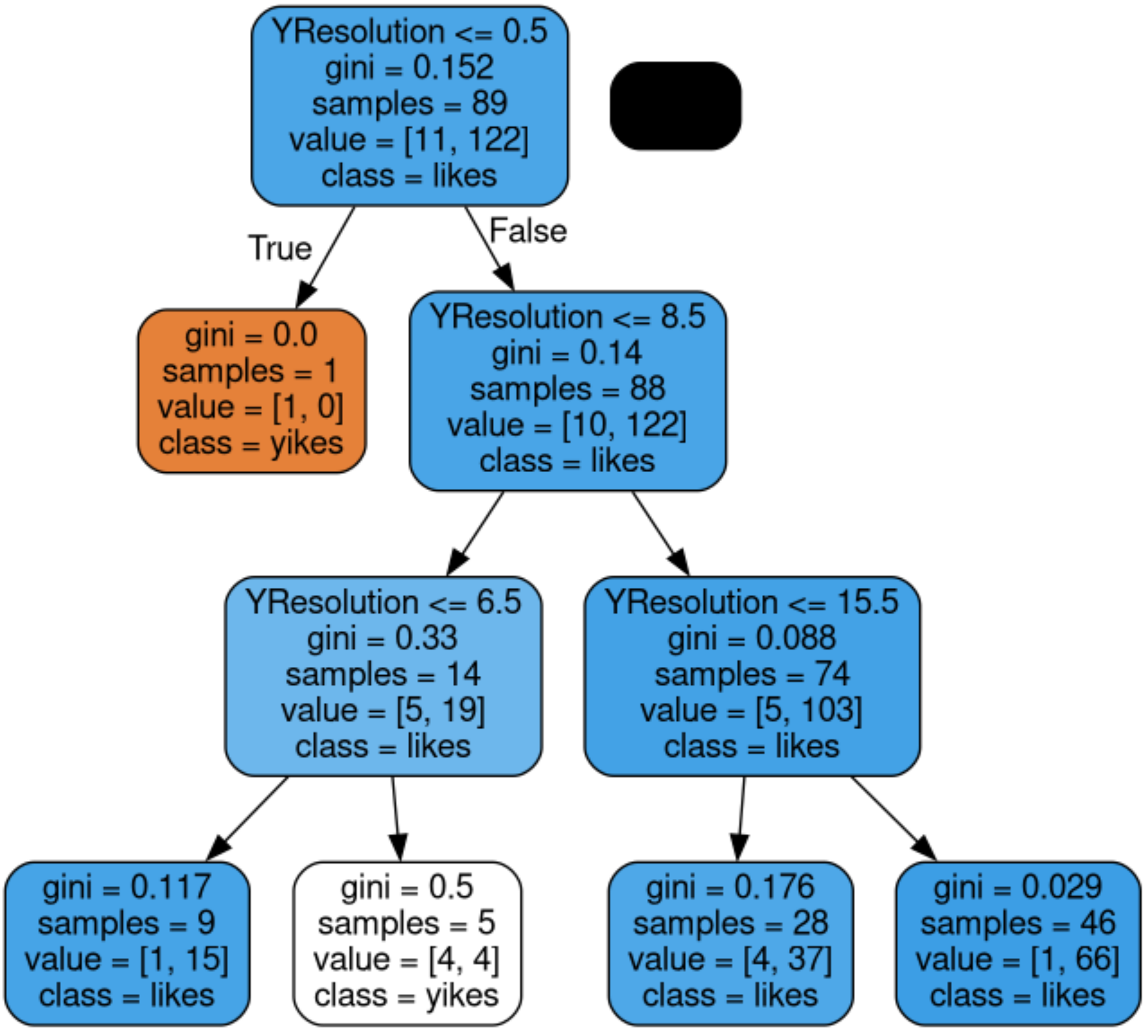
```
#We set our classifier

#Here I decided to use the RandomForestClassifier but I wanted to try the Decisi
#I also increased Max Depth to have more accurate answers given the amount of in
rfc = RandomForestClassifier(
    n_estimators=10,
    max_depth=5,
    random_state=0,
)

#And now get fit, get swole
rfc = rfc.fit(encoded.values, en_resu.values.ravel())
```

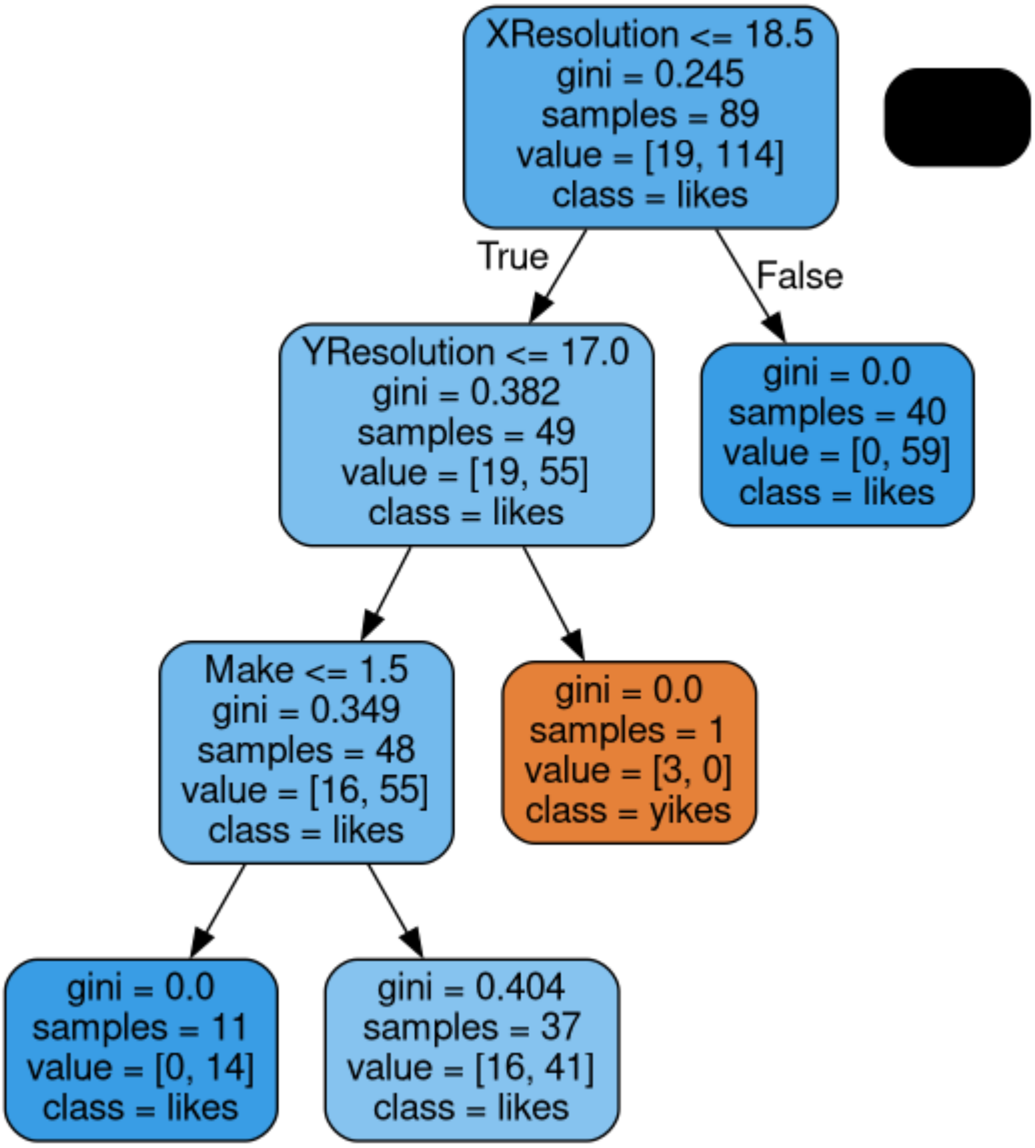
Classifier Visualisation

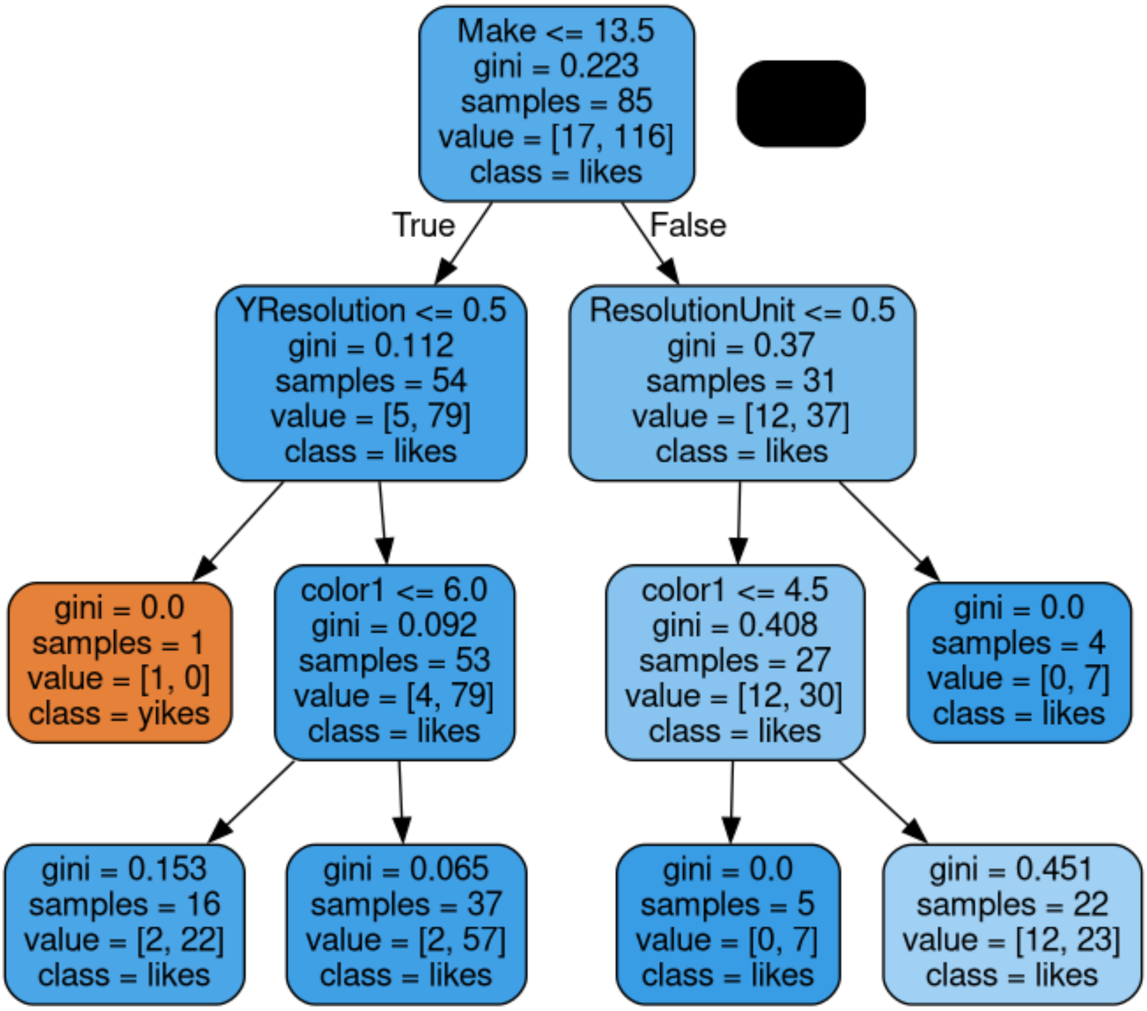
In [ ]:

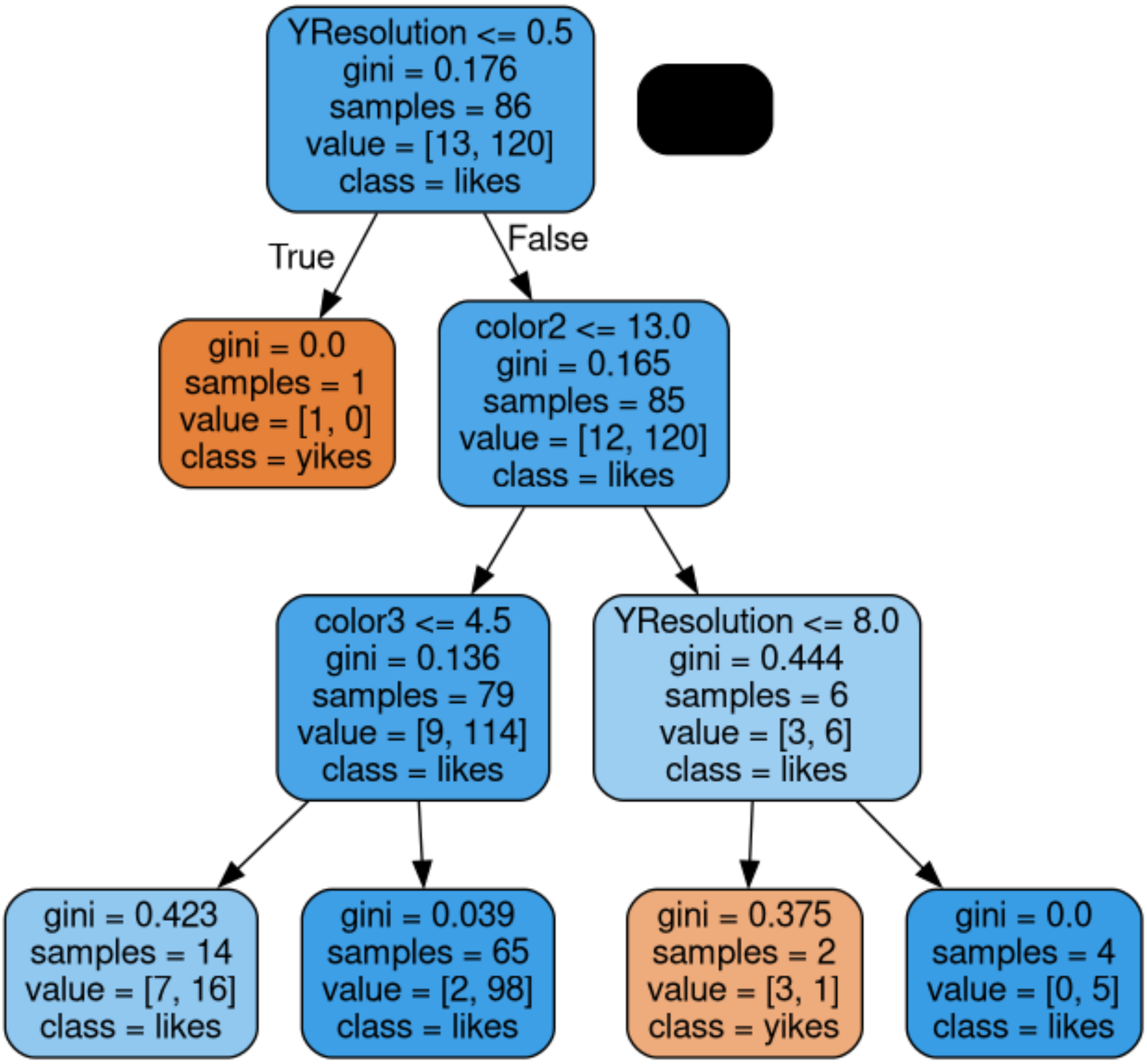
```
import graphviz
import pydotplus
from sklearn import tree

# We now display all our decision trees
for i in range(10):
    dot_data = tree.export_graphviz(
        rfc.estimators_[i],
        out_file=None,
        feature_names=dataframe.columns,
        filled=True,
        rounded=True,
        class_names=le_res.inverse_transform(en_resu.Favorite_en.unique()),
    )
    graph = graphviz.Source(dot_data)
    pydot_graph = pydotplus.graph_from_dot_data(dot_data)
    img = Image(pydot_graph.create_png())
    display(img)
```

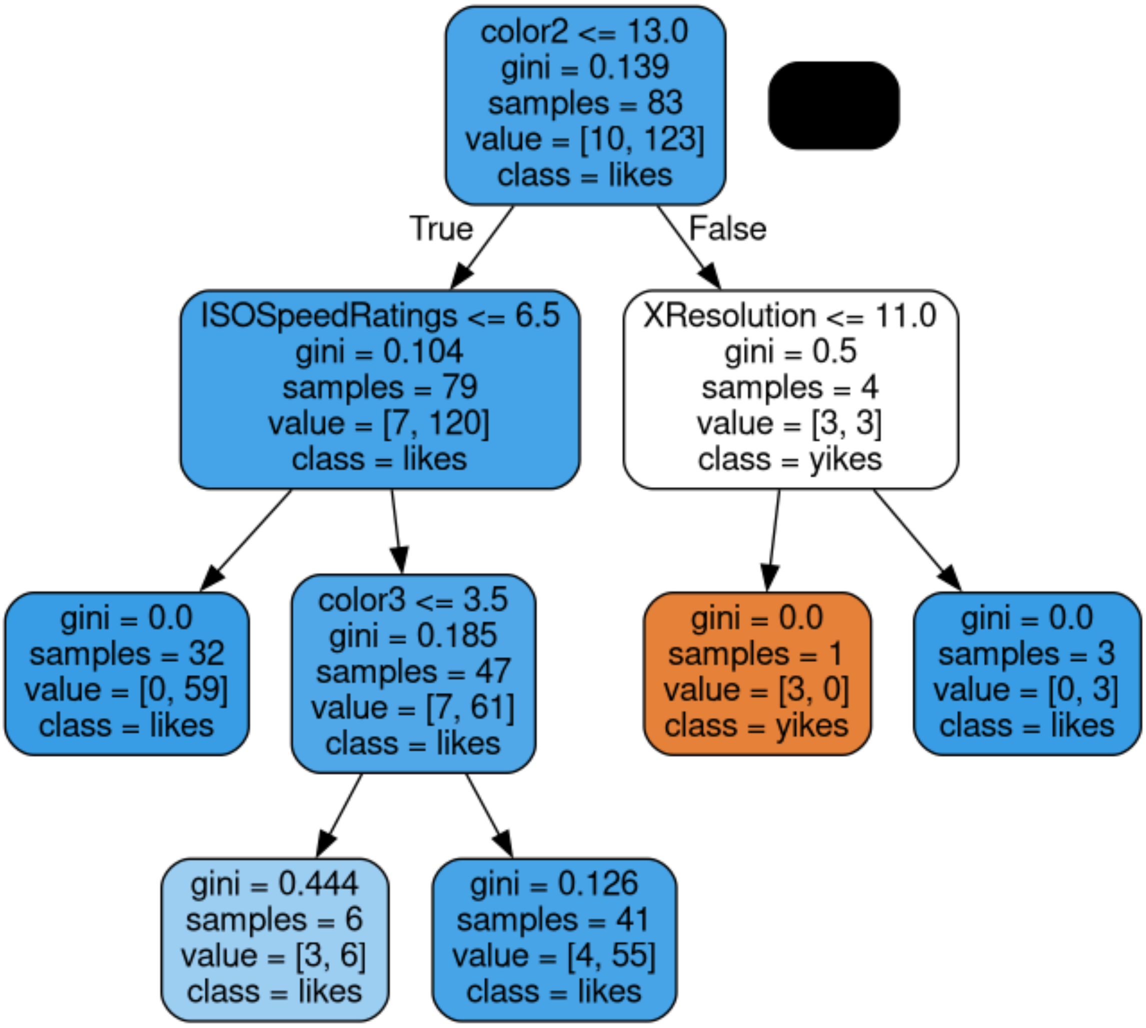


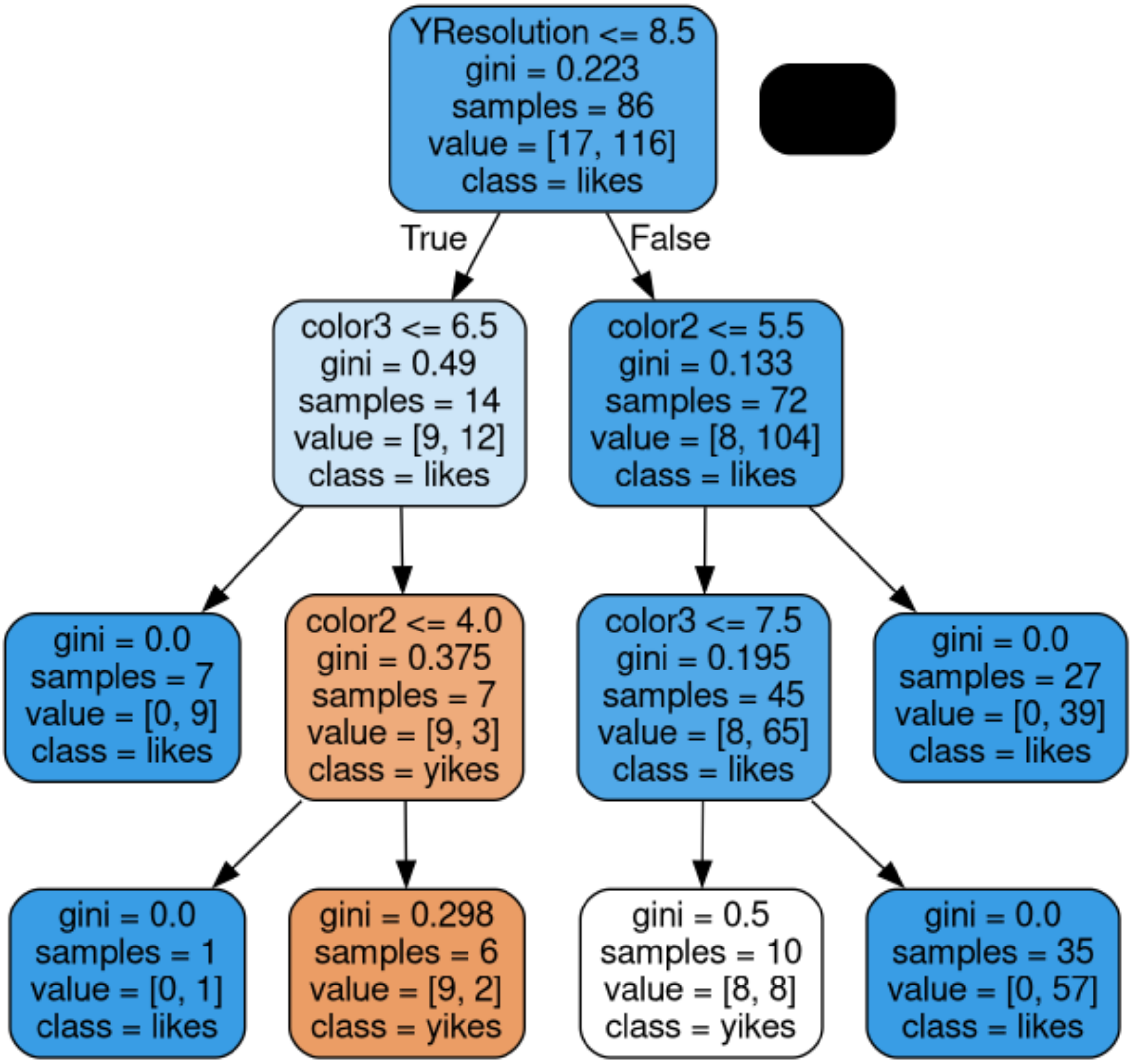

YResolution <= 0.5
gini = 0.152
samples = 89
value = [11, 122]
class = likes
True
False
gini = 0.0
samples = 1
value = [1, 0]
class = yikes
YResolution <= 8.5
gini = 0.14
samples = 88
value = [10, 122]
class = likes
YResolution <= 6.5
gini = 0.33
samples = 14
value = [5, 19]
class = likes
YResolution <= 15.5
gini = 0.088
samples = 74
value = [5, 103]
class = likes
gini = 0.117
samples = 9
value = [1, 15]
class = likes
gini = 0.5
samples = 5
value = [4, 4]
class = yikes
gini = 0.176
samples = 28
value = [4, 37]
class = likes
gini = 0.029
samples = 46
value = [1, 66]
class = likes

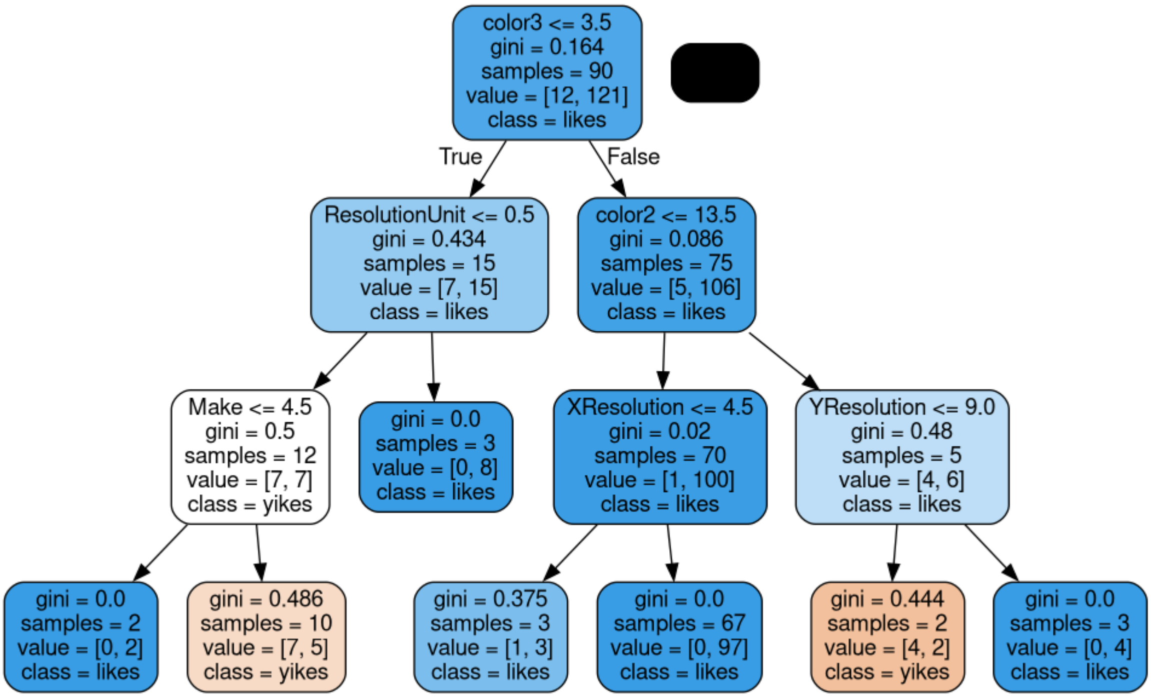

XResolution <= 18.5
gini = 0.245
samples = 89
value = [19, 114]
class = likes
True
False
YResolution <= 17.0
gini = 0.382
samples = 49
value = [19, 55]
class = likes
gini = 0.0
samples = 40
value = [0, 59]
class = likes
Make <= 1.5
gini = 0.349
samples = 48
value = [16, 55]
class = likes
gini = 0.0
samples = 1
value = [3, 0]
class = yikes
gini = 0.0
samples = 11
value = [0, 14]
class = likes
gini = 0.404
samples = 37
value = [16, 41]
class = likes

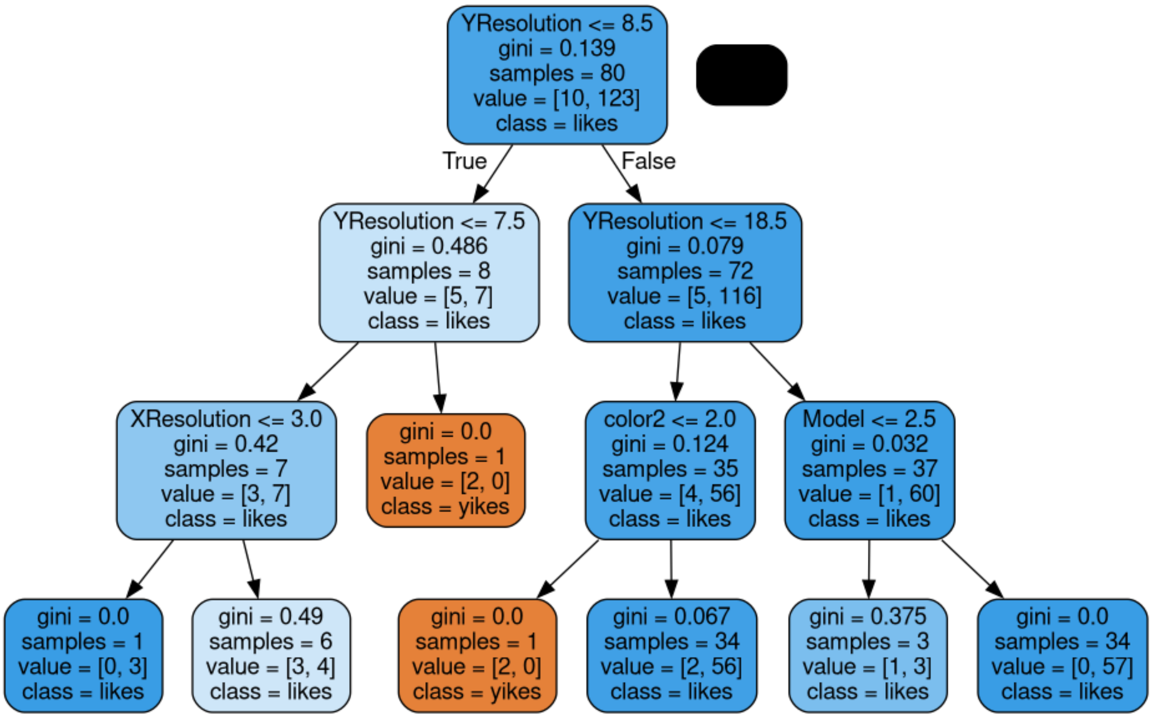

Make <= 13.5
gini = 0.223
samples = 85
value = [17, 116]
class = likes
True
False
YResolution <= 0.5
gini = 0.112
samples = 54
value = [5, 79]
class = likes
ResolutionUnit <= 0.5
gini = 0.37
samples = 31
value = [12, 37]
class = likes
gini = 0.0
samples = 1
value = [1, 0]
class = yikes
color1 <= 6.0
gini = 0.092
samples = 53
value = [4, 79]
class = likes
color1 <= 4.5
gini = 0.408
samples = 27
value = [12, 30]
class = likes
gini = 0.0
samples = 4
value = [0, 7]
class = likes
gini = 0.153
samples = 16
value = [2, 22]
class = likes
gini = 0.065
samples = 37
value = [2, 57]
class = likes
gini = 0.0
samples = 5
value = [0, 7]
class = likes
gini = 0.451
samples = 22
value = [12, 23]
class = likes

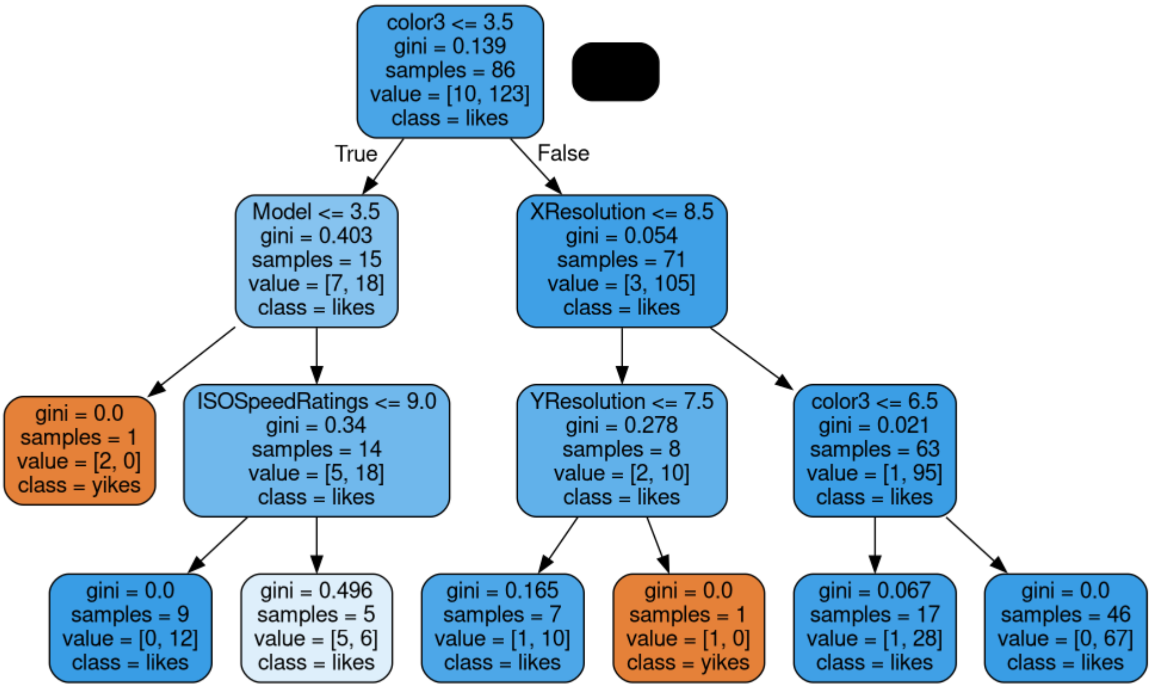

YResolution <= 0.5
gini = 0.176
samples = 86
value = [13, 120]
class = likes
True
False
gini = 0.0
samples = 1
value = [1, 0]
class = yikes
color2 <= 13.0
gini = 0.165
samples = 85
value = [12, 120]
class = likes
color3 <= 4.5
gini = 0.136
samples = 79
value = [9, 114]
class = likes
YResolution <= 8.0
gini = 0.444
samples = 6
value = [3, 6]
class = likes
gini = 0.423
samples = 14
value = [7, 16]
class = likes
gini = 0.039
samples = 65
value = [2, 98]
class = likes
gini = 0.375
samples = 2
value = [3, 1]
class = yikes
gini = 0.0
samples = 4
value = [0, 5]
class = likes


color2 <= 13.0
gini = 0.139
samples = 83
value = [10, 123]
class = likes
[redacted]
True
False
ISOSpeedRatings <= 6.5
gini = 0.104
samples = 79
value = [7, 120]
class = likes
XResolution <= 11.0
gini = 0.5
samples = 4
value = [3, 3]
class = yikes
gini = 0.0
samples = 32
value = [0, 59]
class = likes
color3 <= 3.5
gini = 0.185
samples = 47
value = [7, 61]
class = likes
gini = 0.0
samples = 1
value = [3, 0]
class = yikes
gini = 0.0
samples = 3
value = [0, 3]
class = likes
gini = 0.444
samples = 6
value = [3, 6]
class = likes
gini = 0.126
samples = 41
value = [4, 55]
class = likes


YResolution <= 8.5
gini = 0.223
samples = 86
value = [17, 116]
class = likes
True
False
color3 <= 6.5
gini = 0.49
samples = 14
value = [9, 12]
class = likes
color2 <= 5.5
gini = 0.133
samples = 72
value = [8, 104]
class = likes
gini = 0.0
samples = 7
value = [0, 9]
class = likes
color2 <= 4.0
gini = 0.375
samples = 7
value = [9, 3]
class = yikes
color3 <= 7.5
gini = 0.195
samples = 45
value = [8, 65]
class = likes
gini = 0.0
samples = 27
value = [0, 39]
class = likes
gini = 0.0
samples = 1
value = [0, 1]
class = likes
gini = 0.298
samples = 6
value = [9, 2]
class = yikes
gini = 0.5
samples = 10
value = [8, 8]
class = yikes
gini = 0.0
samples = 35
value = [0, 57]
class = likes


color3 <= 3.5
gini = 0.164
samples = 90
value = [12, 121]
class = likes
True
False
ResolutionUnit <= 0.5
gini = 0.434
samples = 15
value = [7, 15]
class = likes
color2 <= 13.5
gini = 0.086
samples = 75
value = [5, 106]
class = likes
Make <= 4.5
gini = 0.5
samples = 12
value = [7, 7]
class = yikes
gini = 0.0
samples = 3
value = [0, 8]
class = likes
XResolution <= 4.5
gini = 0.02
samples = 70
value = [1, 100]
class = likes
YResolution <= 9.0
gini = 0.48
samples = 5
value = [4, 6]
class = likes
gini = 0.0
samples = 2
value = [0, 2]
class = likes
gini = 0.486
samples = 10
value = [7, 5]
class = yikes
gini = 0.375
samples = 3
value = [1, 3]
class = likes
gini = 0.0
samples = 67
value = [0, 97]
class = likes
gini = 0.444
samples = 2
value = [4, 2]
class = yikes
gini = 0.0
samples = 3
value = [0, 4]
class = likes





Prediction

In [ ]:

```
# Prediction part : we predict all our dataframe built previously
prediction = rfc.predict(pred_en)

# We then reverse transform the prediction tag for a readable output
prediction2 = le_res.inverse_transform(prediction)
prediction = pd.DataFrame(prediction, columns=["Fav"])

# Display output to jupyter
prediction2 = pd.DataFrame(prediction2)
predict.join(prediction).join(prediction2).sort_values("Fav")
```

```
/mnt/e/Code/CPE-Keelah/S8-MachineLearning/env/lib/python3.10/site-packages/sklea
rn/base.py:432: UserWarning: X has feature names, but RandomForestClassifier was
fitted without feature names
  warnings.warn(
```

Out[ ]:

	color1	color2	color3	Make	ResolutionUnit	Model	XResc
78	lightsteelblue	lightslategray	darkslategray	NIKON CORPORATION	2.0	NIKON D3	
0	lightgray	darkslategray	gray	None	2.0	None	
74	whitesmoke	darkolivegreen	darkgray	NIKON CORPORATION	2.0	NIKON D50	
73	slategray	darkgray	darkolivegreen	Canon	2.0	Canon EOS 20D	
72	gray	darkslategray	darkgray	None	2.0	None	
...	...	...	...	...	...	...	
29	lightsteelblue	dimgray	beige	NIKON	2.0	E8800	
28	lightslategray	darkslategray	dimgray	None	2.0	None	
27	steelblue	silver	dimgray	SONY	2.0	DSLR-A200	
37	lightsteelblue	darkslategray	dimgray	Canon	2.0	Canon EOS 350D DIGITAL	
102	darkgray	darkslategray	dimgray	NIKON CORPORATION	2.0	NIKON D3200	62

103 rows × 12 columns