Computer Vision

Jacobs University Bremen

Fall 2022

Homework 6

Use machine learning techniques to identify specific geomorphological features on the Archytas Dome on the Moon.

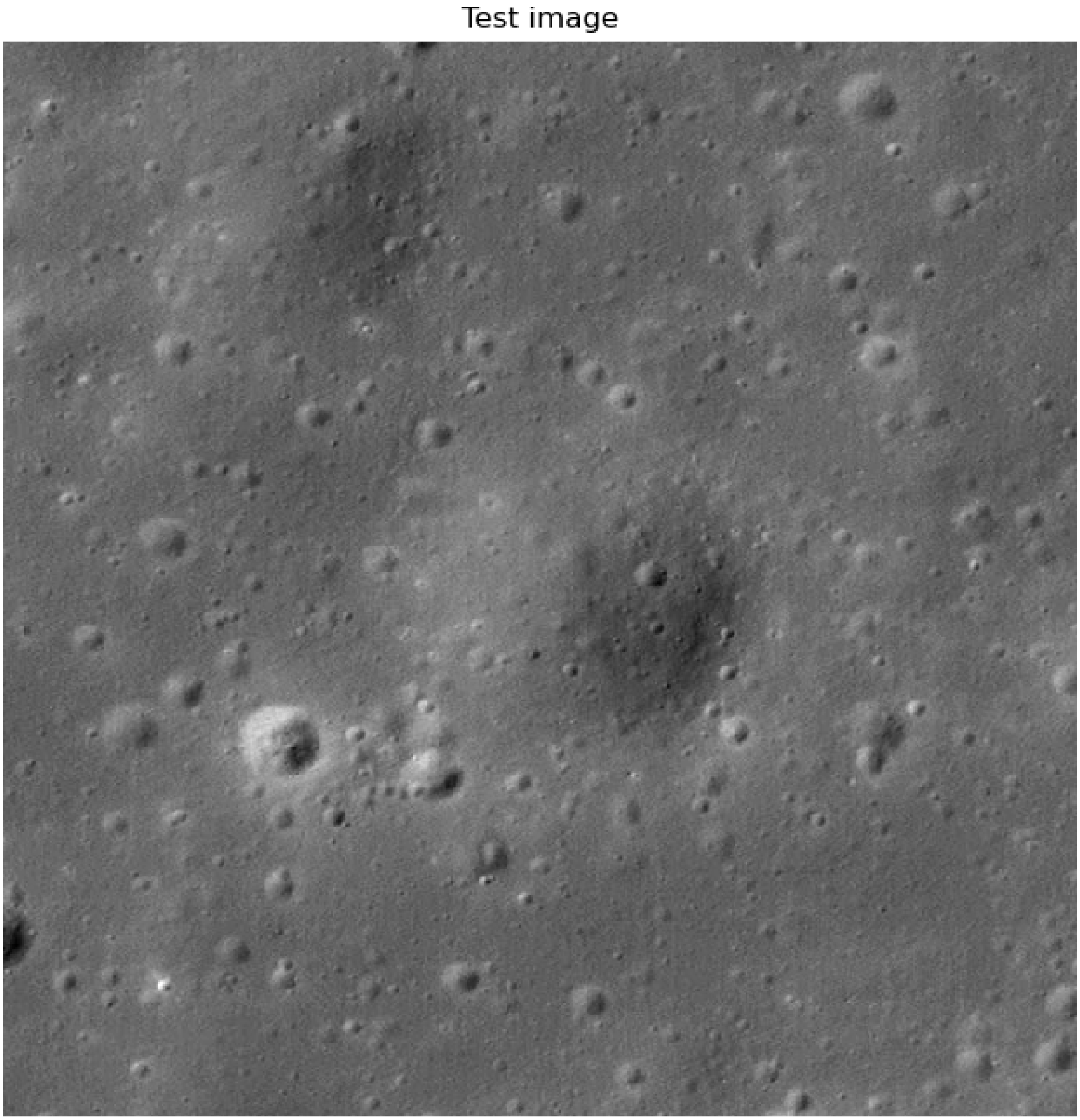
In [54]:

```
import numpy as np
from matplotlib import pyplot as plt
from skimage import io
from PIL import Image
from sklearn.neighbors import NearestNeighbors
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn import neighbors, datasets
from sklearn.inspection import DecisionBoundaryDisplay
import argparse
import os
import seaborn as sns
from matplotlib.colors import ListedColormap


from __future__ import print_function

%matplotlib inline
plt.rcParams['figure.figsize'] = (10.0, 8.0) # set default size of plots
plt.rcParams['image.interpolation'] = 'nearest'
plt.rcParams['image.cmap'] = 'gray'

# for auto-reloading extenrnal modules
%load_ext autoreload
%autoreload 2
```

```
The autoreload extension is already loaded. To reload it, use:
  %reload_ext autoreload
```

In [55]:

```
img = io.imread('Moon.jpg', as_gray=True)

# Show image
plt.imshow(img)
plt.axis('off')
plt.title("Test image")
plt.show()
```



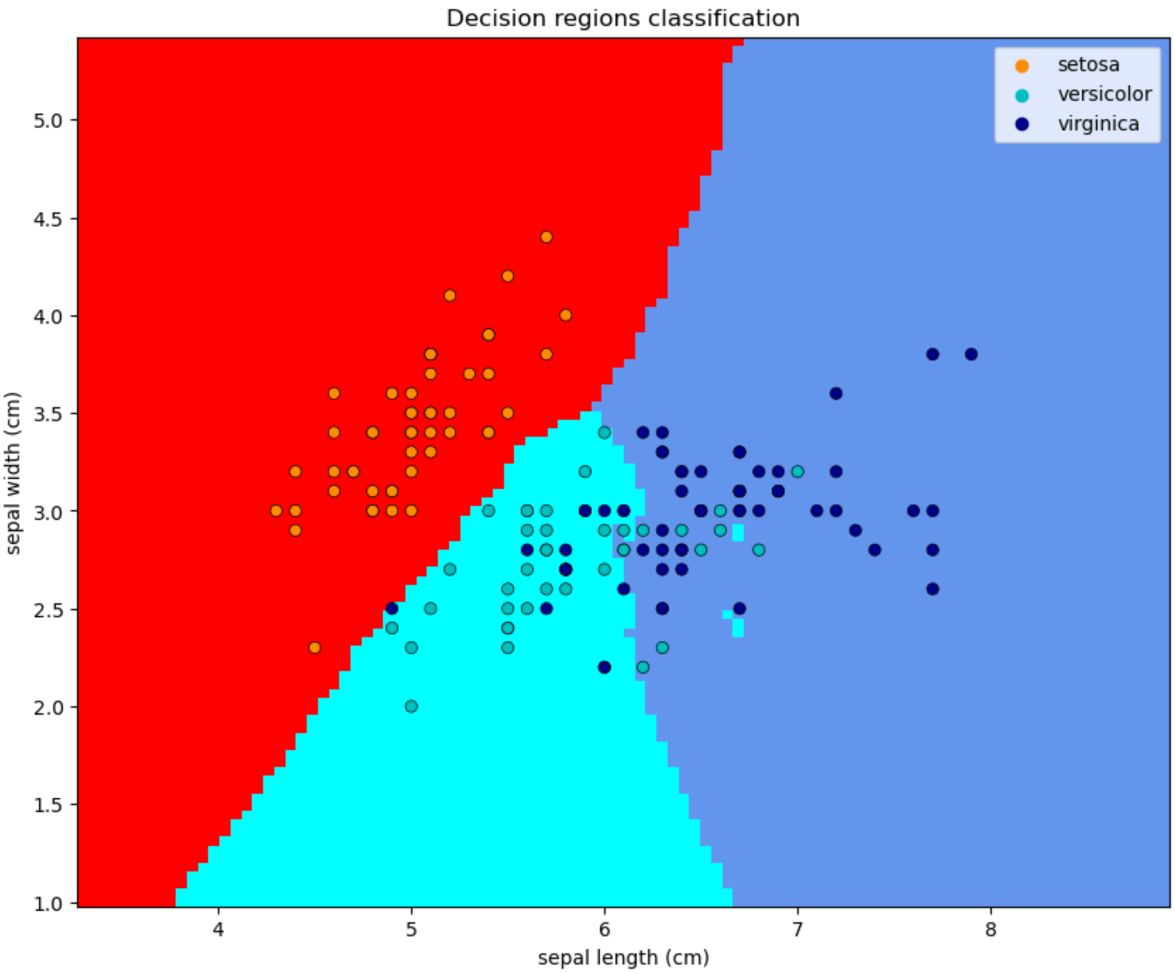
Part 1: K-nearest neighbor

1.1 Distance measure - Euclidean

Graphical representation of the distance measurement between data points in order to create different classes that help object recognition.

In [67]:

```
n_neighbors = 17

iris = datasets.load_iris()

### we only take the first two features.
X = iris.data[:, :2]
y = iris.target

### Create color maps
cmap_light = ListedColormap(["red", "cyan", "cornflowerblue"])
cmap_bold = ["darkorange", "c", "darkblue"]

for weights in ["uniform", "distance"]:
    ### Creating an instance of Neighbours Classifier and fit the data.
    clf = neighbors.KNeighborsClassifier(n_neighbors, weights=weights)
    clf.fit(X, y)

    _, ax = plt.subplots()
    DecisionBoundaryDisplay.from_estimator(clf, X, cmap=cmap_light, ax=ax,
        response_method="predict",
        plot_method="pcolormesh",
        xlabel=iris.feature_names[0],
        ylabel=iris.feature_names[1],
        shading="auto",
    )

    ### Ploting the data
    sns.scatterplot(x=X[:, 0], y=X[:, 1], hue=iris.target_names[y],
    palette=cmap_bold, alpha=1.0,
    edgecolor="black")
    plt.title("Decision regions classification")
```


Decision regions classification
setosa
versicolor
virginica
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
sepal width (cm)
4
5
6
7
8
sepal length (cm)

Decision regions classification