03_getting_started_with_iris

February 28, 2024

1 Getting started in scikit-learn with the famous iris dataset

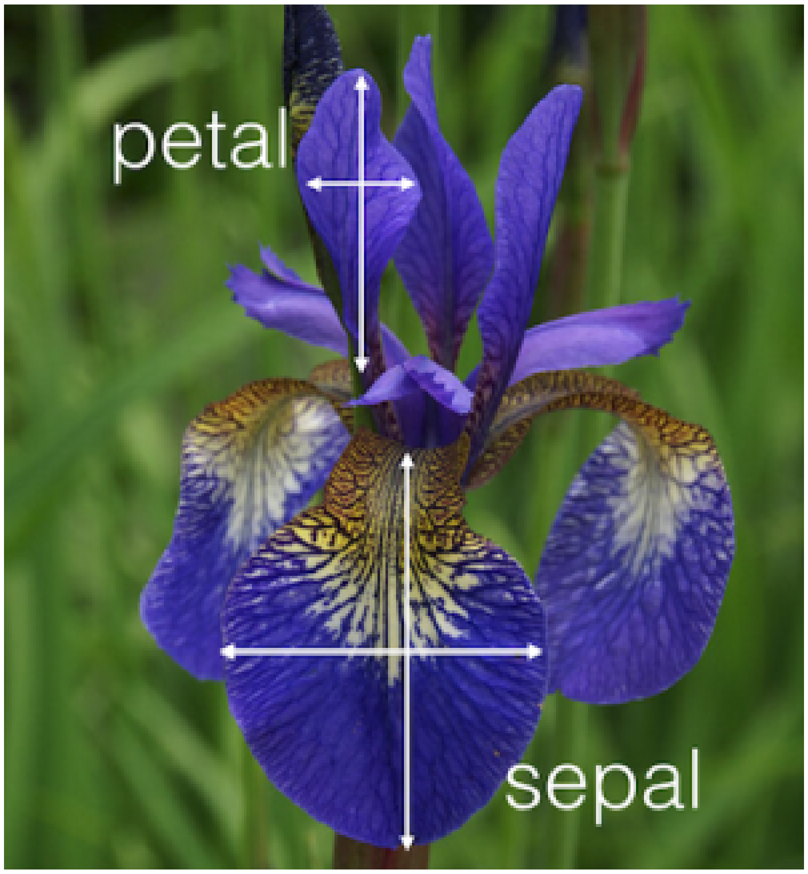
Lesson 3 from Introduction to Machine Learning with scikit-learn

Note: This notebook uses Python 3.9.1 and scikit-learn 0.23.2. The original notebook (shown in the video) used Python 2.7 and scikit-learn 0.16.

1.1 Agenda

- What is the famous iris dataset, and how does it relate to Machine Learning?
- How do we load the iris dataset into scikit-learn?
- How do we describe a dataset using Machine Learning terminology?
- What are scikit-learn's four key requirements for working with data?

1.2 Introducing the iris dataset



- 50 samples of 3 different species of iris (150 samples total)
- Measurements: sepal length, sepal width, petal length, petal width

[1]:
```
# added empty cell so that the cell numbering matches the video
```

[2]:
```
from IPython.display import IFrame
IFrame('https://www.dataschool.io/files/iris.txt', width=300, height=200)
```

[2]:
```
<IPython.lib.display.IFrame at 0x7fe408230e80>
```

1.3 Machine Learning on the iris dataset

- Framed as a **supervised learning** problem: Predict the species of an iris using the measurements
- Famous dataset for Machine Learning because prediction is **easy**
- Learn more about the iris dataset: UCI Machine Learning Repository

1.4 Loading the iris dataset into scikit-learn

[3]:
```python
# import load_iris function from datasets module
from sklearn.datasets import load_iris
```

[4]:
```python
# save "bunch" object containing iris dataset and its attributes
iris = load_iris()
type(iris)
```

[4]:
```
sklearn.utils.Bunch
```

[5]:
```python
# print the iris data
print(iris.data)
```

```
[[5.1 3.5 1.4 0.2]
 [4.9 3.  1.4 0.2]
 [4.7 3.2 1.3 0.2]
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 [6.5 3.  5.2 2. ]
 [6.2 3.4 5.4 2.3]
 [5.9 3.  5.1 1.8]]
```

1.5 Machine Learning terminology

- Each row is an **observation** (also known as: sample, example, instance, record)
- Each column is a **feature** (also known as: predictor, attribute, independent variable, input, regressor, covariate)

[6]:
```
# print the names of the four features
print(iris.feature_names)
```

```
['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)', 'petal width
(cm)']
```

[7]:
```
# print integers representing the species of each observation
print(iris.target)
```

```
[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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 2 2]
```

[8]:
```
# print the encoding scheme for species: 0 = setosa, 1 = versicolor, 2 =␣
 ↪virginica
print(iris.target_names)
```

```
['setosa' 'versicolor' 'virginica']
```

- Each value we are predicting is the **response** (also known as: target, outcome, label, dependent variable)

- **Classification** is supervised learning in which the response is categorical
- **Regression** is supervised learning in which the response is ordered and continuous

1.6 Requirements for working with data in scikit-learn

1. Features and response are **separate objects**
2. Features should always be **numeric**, and response should be **numeric** for regression problems
3. Features and response should be **NumPy arrays**
4. Features and response should have **specific shapes**

[9]:
```
# check the types of the features and response
print(type(iris.data))
print(type(iris.target))
```

```
<class 'numpy.ndarray'>
<class 'numpy.ndarray'>
```

[10]:
```
# check the shape of the features (first dimension = number of observations,␣
 ↪second dimensions = number of features)
print(iris.data.shape)
```

```
(150, 4)
```

[11]:
```
# check the shape of the response (single dimension matching the number of␣
 ↪observations)
print(iris.target.shape)
```

```
(150,)
```

[12]:
```
# store feature matrix in "X"
X = iris.data

# store response vector in "y"
y = iris.target
```

1.7 Resources

- scikit-learn documentation: Dataset loading utilities
- Jake VanderPlas: Fast Numerical Computing with NumPy (slides, video)
- Scott Shell: An Introduction to NumPy (PDF)

1.8 Comments or Questions?

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