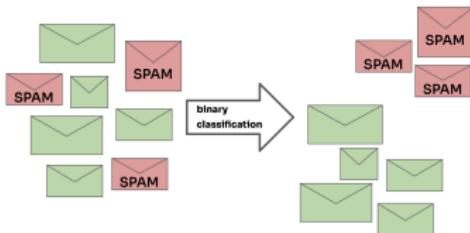


# Introduction to Machine Learning

## Classification Tasks

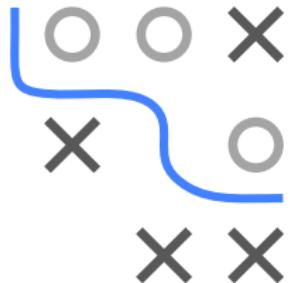


### Learning goals

- Classification is supervised learning with categorical labels
- Binary vs. multiclass
- Some examples of classification tasks

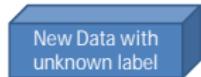
# CLASSIFICATION

Learn functions that assign class labels to observation / feature vectors.  
Each observation belongs to exactly one class. The main difference to regression is that the target is categorical.



Our Data

Sepal Length	Sepal Width	Petal Length	Petal Width	Species
5.1	3.5	1.4	0.2	setosa
5.9	3.0	5.1	1.8	virginica



Classifier



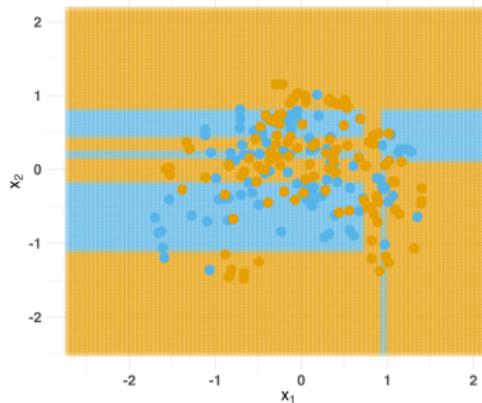
Sepal Length	Sepal Width	Petal Length	Petal Width	Species
5.4	3.3	3.2	1.1	???

# BINARY AND MULTICLASS TASKS

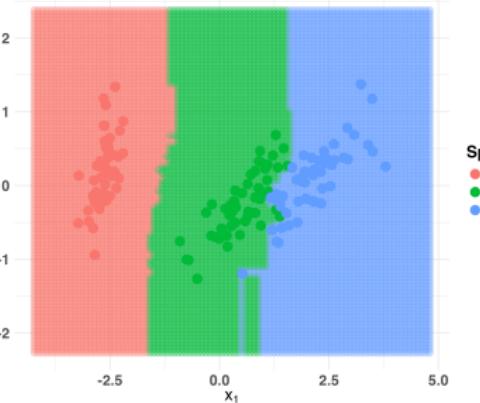
Tasks have a finite number of (unordered) classes.

They can be **binary** or **multiclass**.

Sonar: binary classification

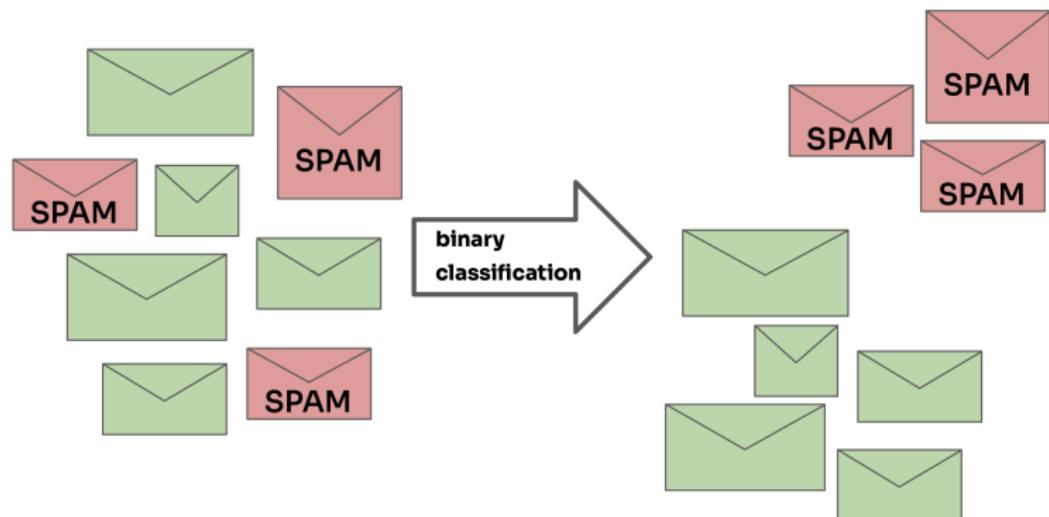


Iris: multiclass classification



# BINARY CLASSIFICATION TASK - EXAMPLES

- Credit risk prediction, based on personal data and transactions
- Spam detection, based on textual features
- Churn prediction, based on customer behavior
- Predisposition for specific illness, based on genetic data



# MULTICLASS TASK - MEDICAL DIAGNOSIS

INFO    SYMPTOMS    QUESTIONS    CONDITIONS    DETAILS    TREATMENT

Conditions that match your symptoms

UNDERSTANDING YOUR RESULTS ⓘ

- Acute Sinusitis >  
Moderate match
- Influenza (flu) adults >  
Moderate match
- Common cold >  
Fair match
- Asthma (Teen and Adult) >  
Fair match
- Whooping cough >  
Fair match

↓ LOAD MORE CONDITIONS

Gender Female    Age 25    [Edit](#)

My Symptoms    [Edit](#)  
cough, headache, nausea

Could you be pregnant?    [Edit](#)  
No

[Start Over](#)



<https://symptoms.webmd.com>

# MULTICLASS TASK - IRIS

The iris dataset was introduced by the statistician Ronald Fisher and is one of the most frequent used data sets. Originally, it was designed for linear discriminant analysis.



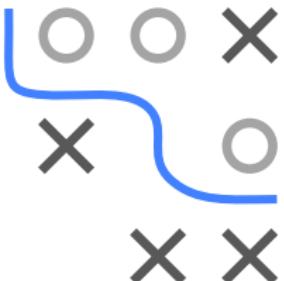
Setosa



Versicolor



Virginica

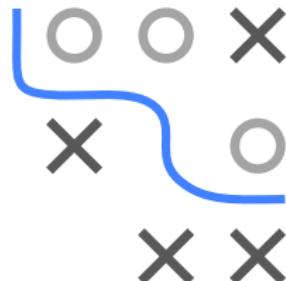
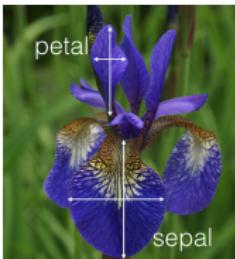


Source:

[https://en.wikipedia.org/wiki/Iris\\_flower\\_data\\_set](https://en.wikipedia.org/wiki/Iris_flower_data_set)

# MULTICLASS TASK - IRIS

- 150 iris flowers
- Predict subspecies
- Based on sepal and petal length / width in [cm]



```
##      Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1:          5.1         3.5          1.4         0.2  setosa
## 2:          4.9         3.0          1.4         0.2  setosa
## 3:          4.7         3.2          1.3         0.2  setosa
## 4:          4.6         3.1          1.5         0.2  setosa
## 5:          5.0         3.6          1.4         0.2  setosa
## ---
## 146:         6.7         3.0          5.2         2.3 virginica
## 147:         6.3         2.5          5.0         1.9 virginica
## 148:         6.5         3.0          5.2         2.0 virginica
## 149:         6.2         3.4          5.4         2.3 virginica
## 150:         5.9         3.0          5.1         1.8 virginica
```

# MULTICLASS TASK - IRIS

