Capstone

- Please contact the instructor for the corresponding projects!
- Your instructor will help you to define what should add into the **first Phase report** which is due this Friday

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Applied Machine Learning
Classification: Multiclass Classification

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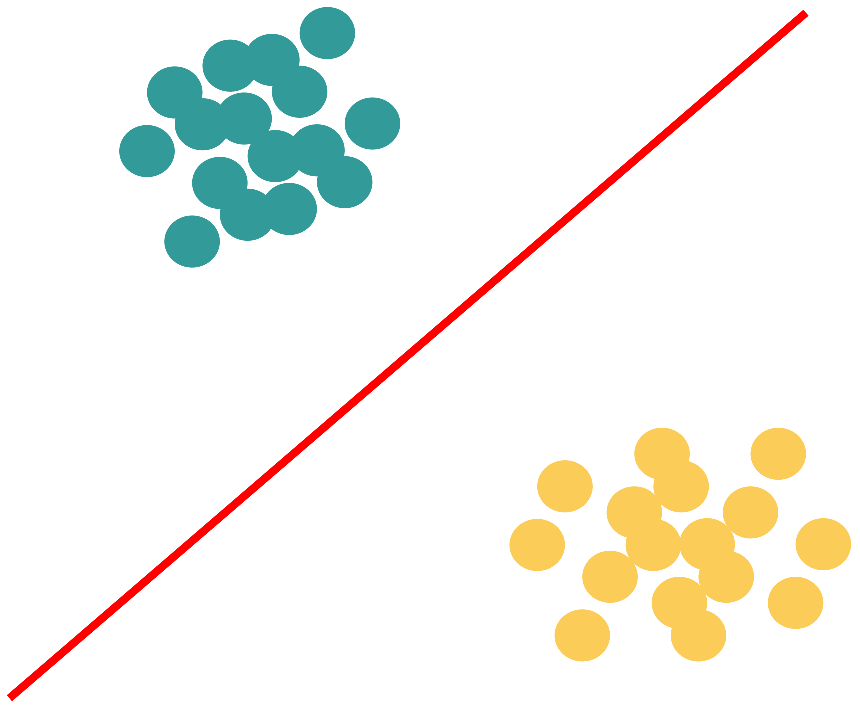
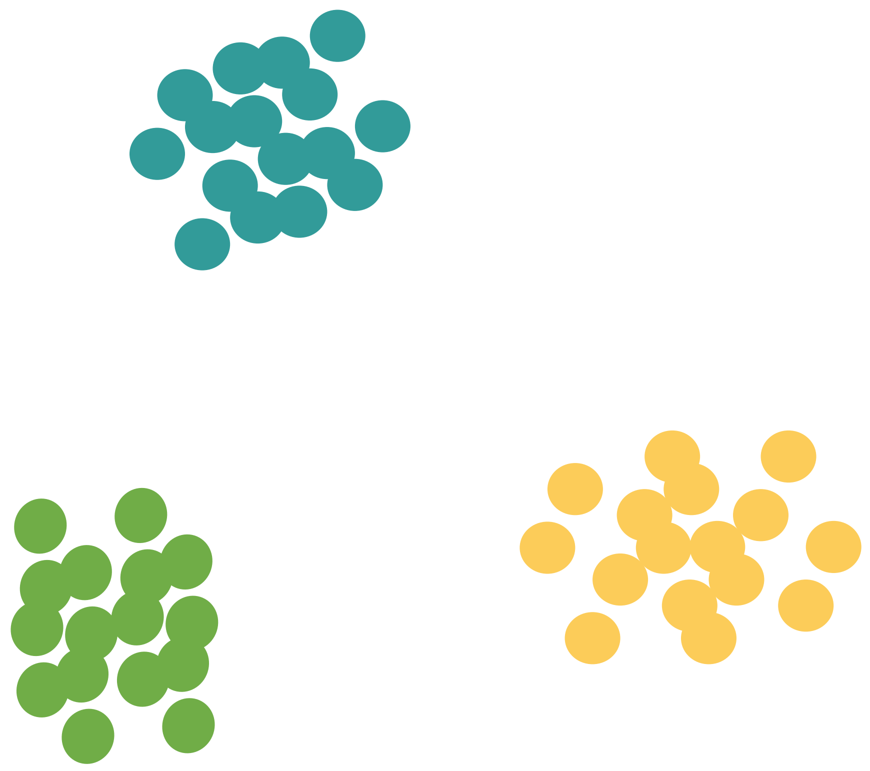
Binary- Classification



Multiclass Classification



Multiclass Classification

OvA: One vs. All (One vs. Rest)

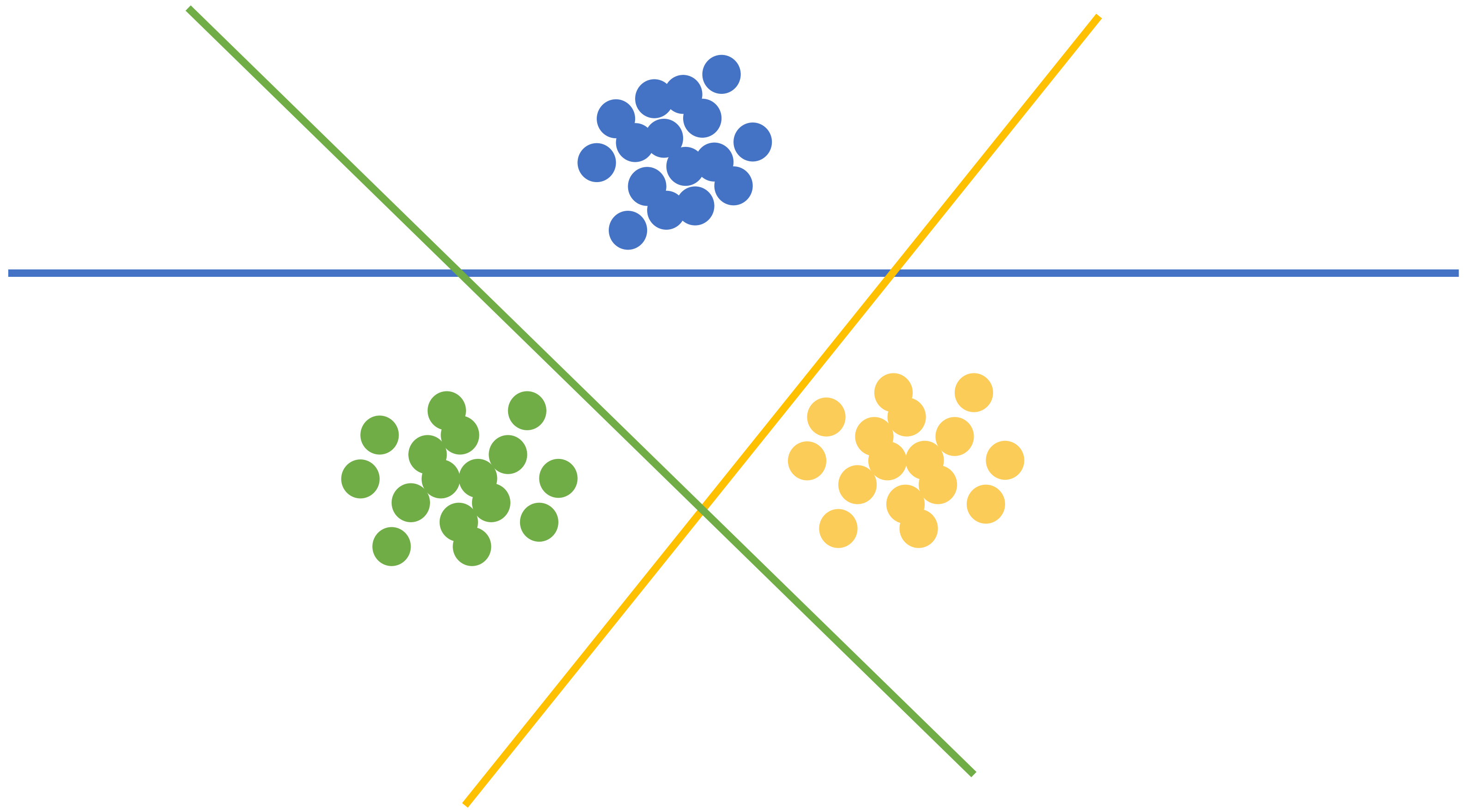
splits the dataset into one binary dataset for each class

OvO: One vs. One

splits the dataset into one dataset for each class versus every other class

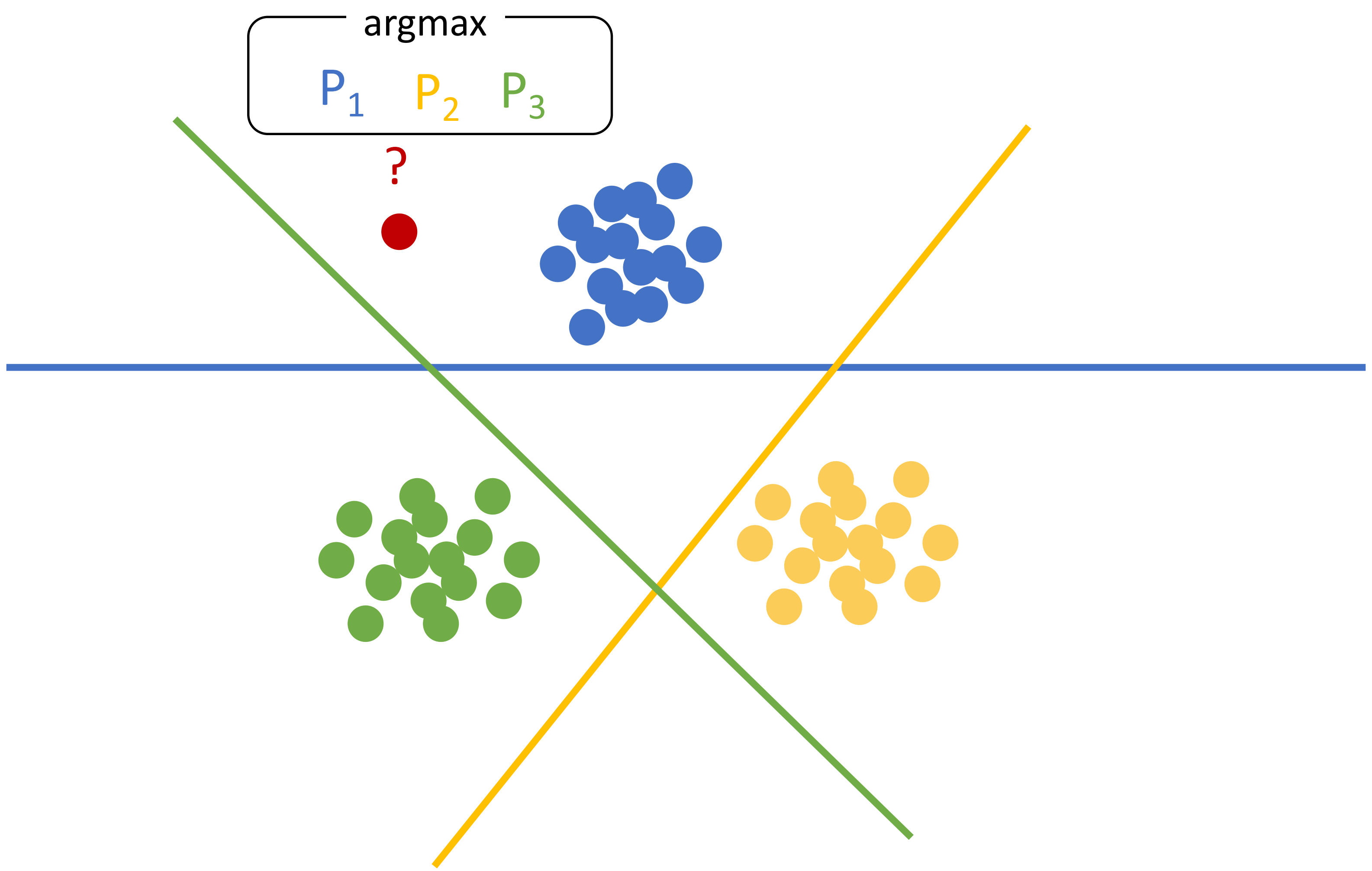
Multiclass Classification: OvA

splits the dataset into one binary dataset for each class



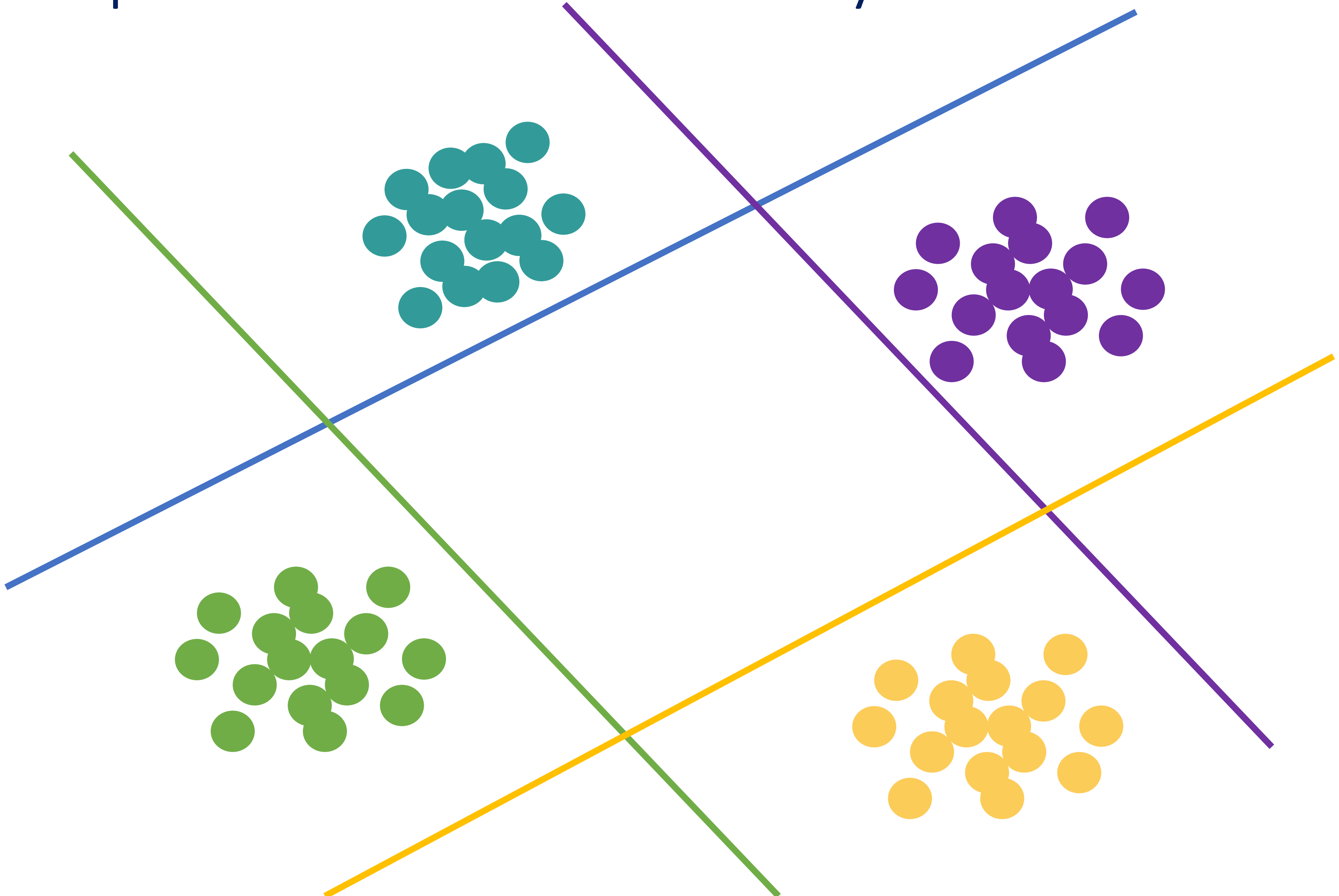
Multiclass Classification: OvA

splits the dataset into one binary dataset for each class



Multiclass Classification: OvA

splits the dataset into one binary dataset for each class

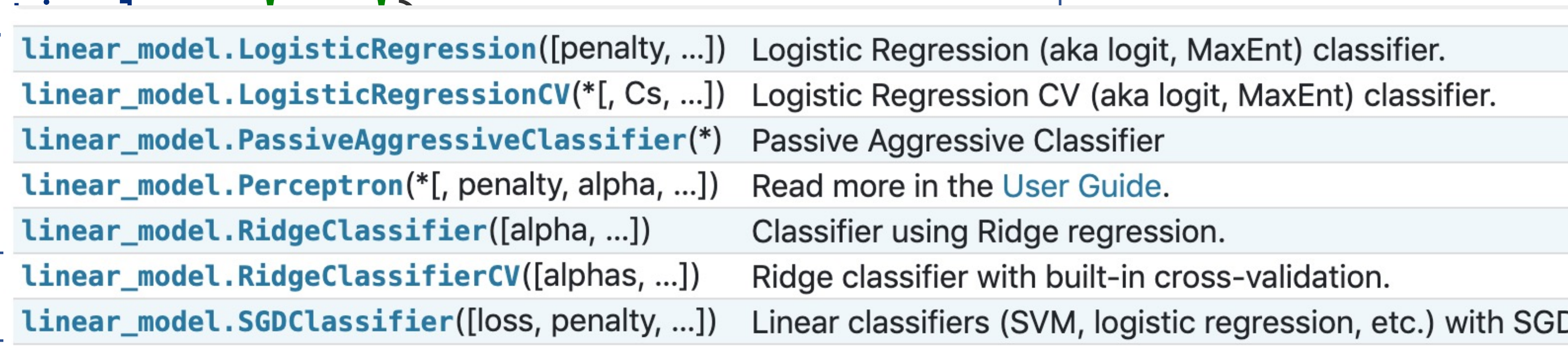


Multiclass Classification: OvA

```
from sklearn.linear_model import LogisticRegression

model = LogisticRegression(mul

model.fit(X, y)
```



`linear_model.LogisticRegression`([penalty, ...])	Logistic Regression (aka logit, MaxEnt) classifier.
`linear_model.LogisticRegressionCV`(*[, Cs, ...])	Logistic Regression CV (aka logit, MaxEnt) classifier.
`linear_model.PassiveAggressiveClassifier`(*)	Passive Aggressive Classifier
`linear_model.Perceptron`(*[, penalty, alpha, ...])	Read more in the User Guide.
`linear_model.RidgeClassifier`([alpha, ...])	Classifier using Ridge regression.
`linear_model.RidgeClassifierCV`([alphas, ...])	Ridge classifier with built-in cross-validation.
`linear_model.SGDClassifier`([loss, penalty, ...])	Linear classifiers (SVM, logistic regression, etc.) with SGD

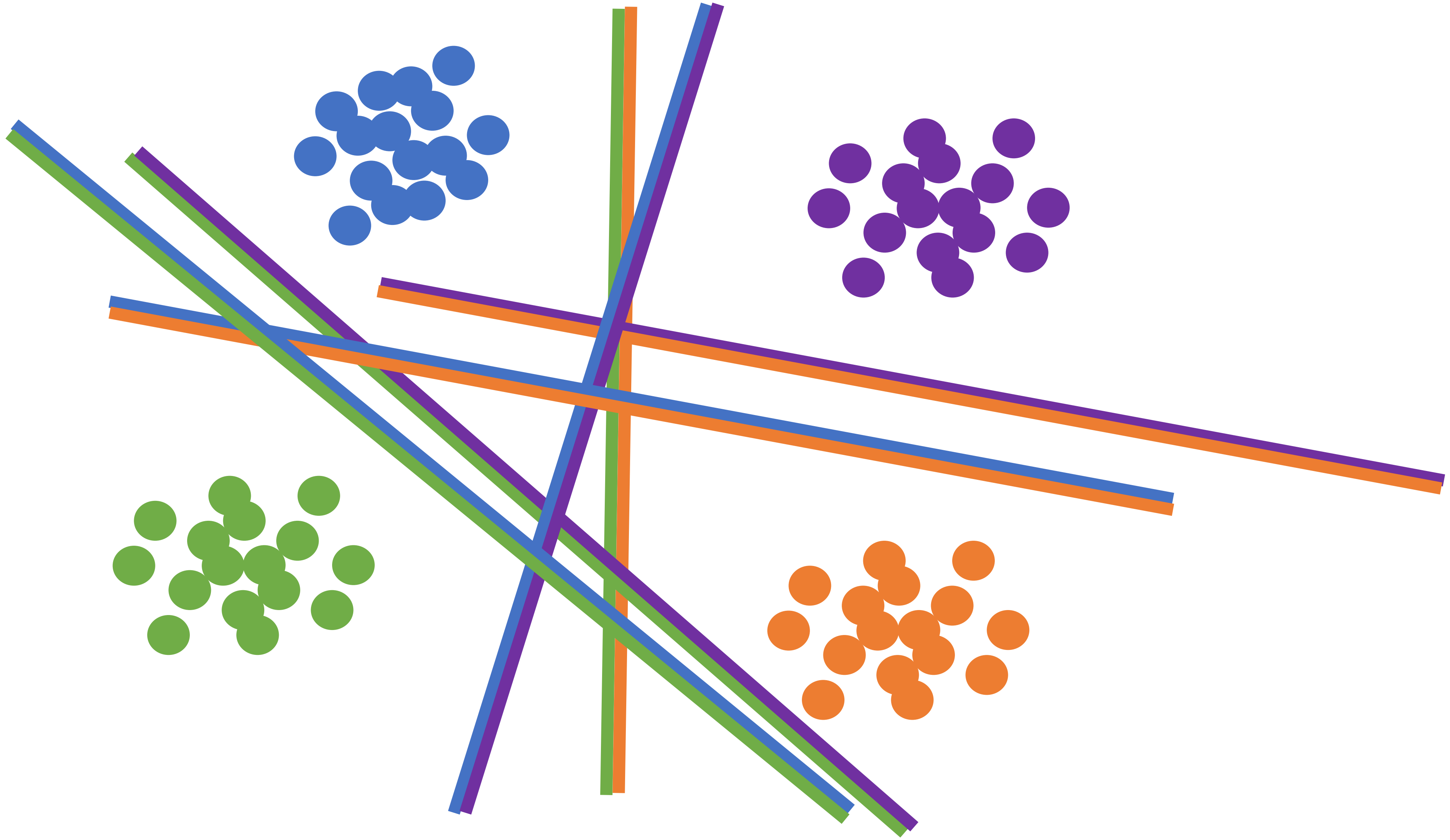
```
model = LogisticRegression()

ovr = OneVsRestClassifier(model)

ovr.fit(X, y)
```

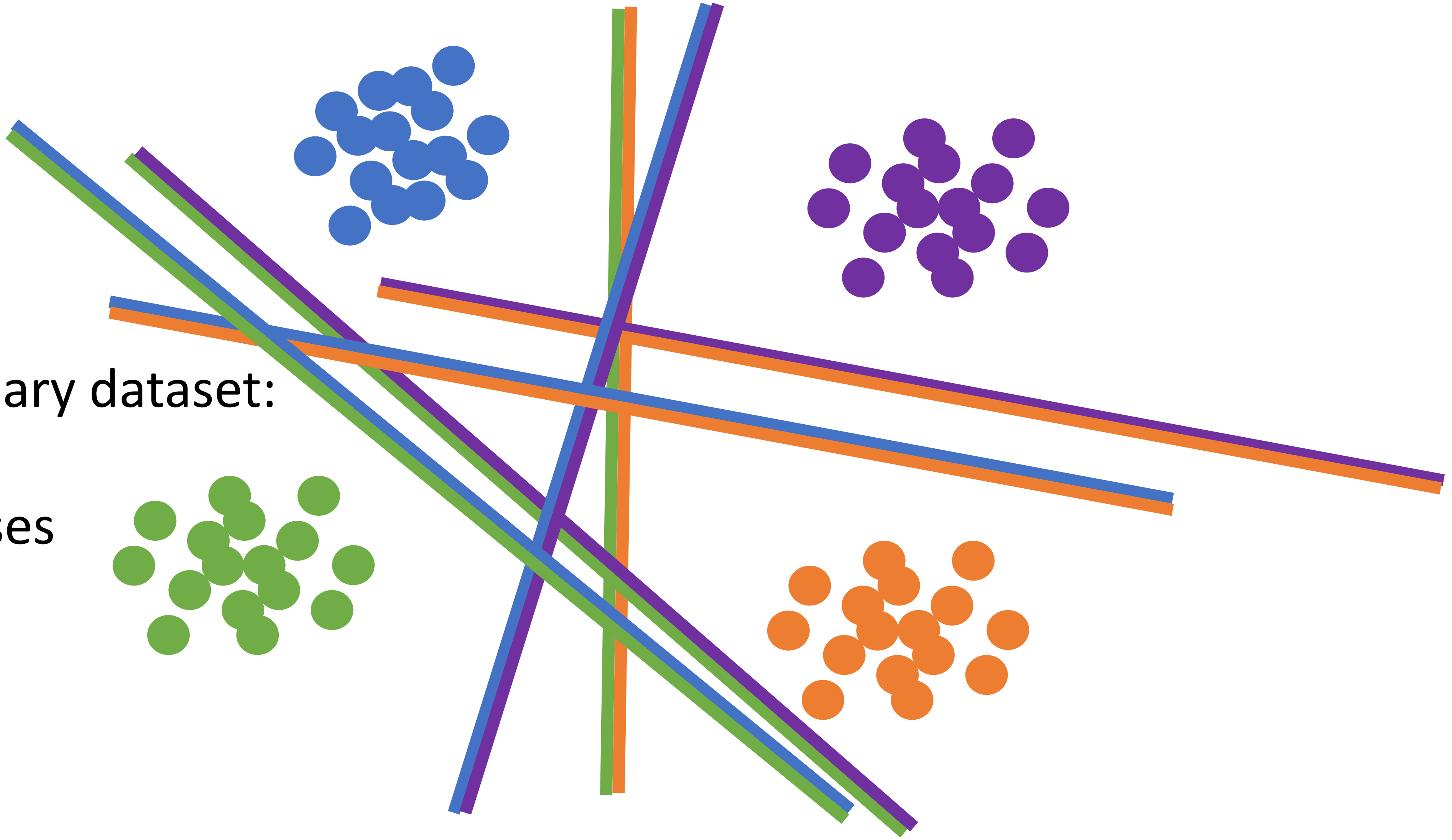
Multiclass Classification: OvO

splits the dataset into one dataset for each class versus every other class



Multiclass Classification: OvO

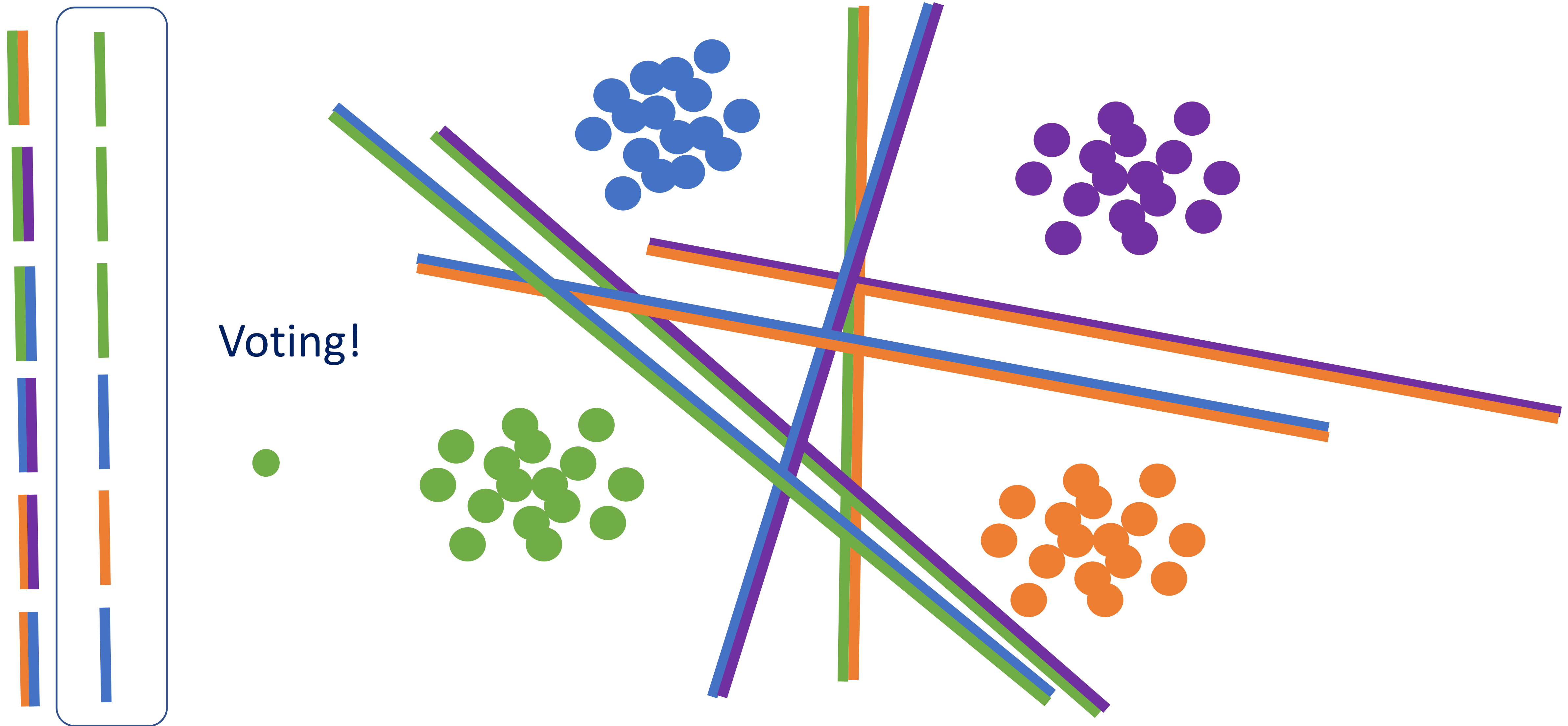
splits the dataset into one dataset for each class versus every other class



The number of binary dataset:
(K * (K – 1)) / 2
K: Number of classes

Multiclass Classification: OvO

splits the dataset into one dataset for each class versus every other class



Multiclass Classification: OvO

```
from sklearn.svm import SVC

model = SVC(decision_function_shape='ovo')

model.fit(X, y)
```

```
from sklearn.svm import SVC

model = SVC()

ovo = OneVsOneClassifier(model)

ovo.fit(X, y)
```

Lab

Input:

Iris Dataset: comes packaged with scikit-learn
contains feature measurements of three different species of iris flowers.
The features are sepal length, sepal width, petal length, and petal width;

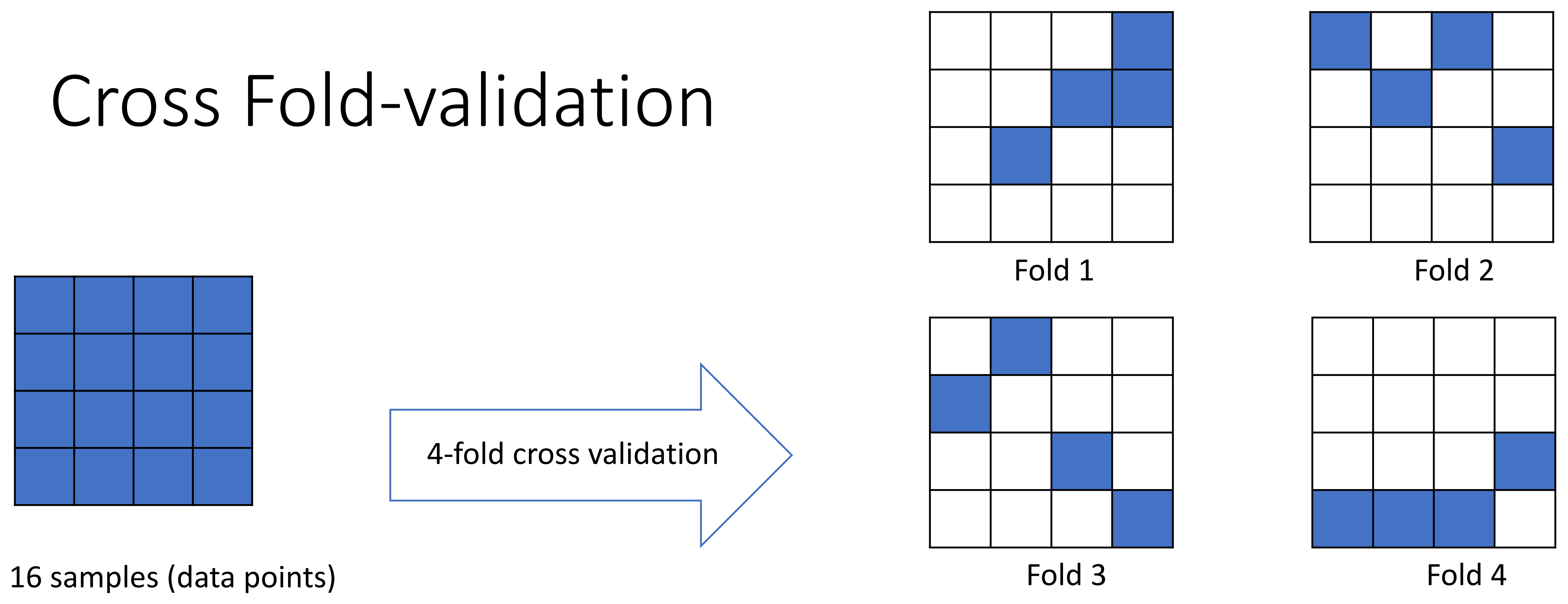
Target:

Is the species of iris flower (class 1: Iris Setosa, class 2: Iris Versicolor, class 3: Iris Virginica).

Cross Fold-validation

1. Randomly shuffle the training data.
2. Split the dataset into k groups. For each group do the following:
    1. Use the group as a test set.
    2. Use the remaining data as a training set.
    3. Train a model on the training data, and evaluate using the test set.
    4. Record the model's overall performance (with whatever metric you're using), and scrap the model.
    5. Repeat for all k groups.

Cross Fold-validation



Model 1: Train on Fold 1 + Fold 2 + Fold 3. Test on Fold 4

Model 2: Train on Fold 1 + Fold 2 + Fold 4. Test on Fold 3

Model 3: Train on Fold 1 + Fold 3 + Fold 4. Test on Fold 2

Model 4: Train on Fold 2 + Fold 3 + Fold 4. Test on Fold 1

Cross Fold-validation

from sklearn.model_selection import cross_val_score

```
from sklearn.model_selection import KFold

kfold = KFold(4, True, 1)

for train, test in kfold.split(data):
```

```
from sklearn.model_selection import cross_val_score
```

https://scikit-learn.org/stable/modules/generated/sklearn.model_selection.cross_val_score.html

Lab

Objective: create a classifier that identifies the producer of a wine based on various properties of the wine

This exercise will have minimal guidance and will allow you to really demonstrate your machine learning skills.