

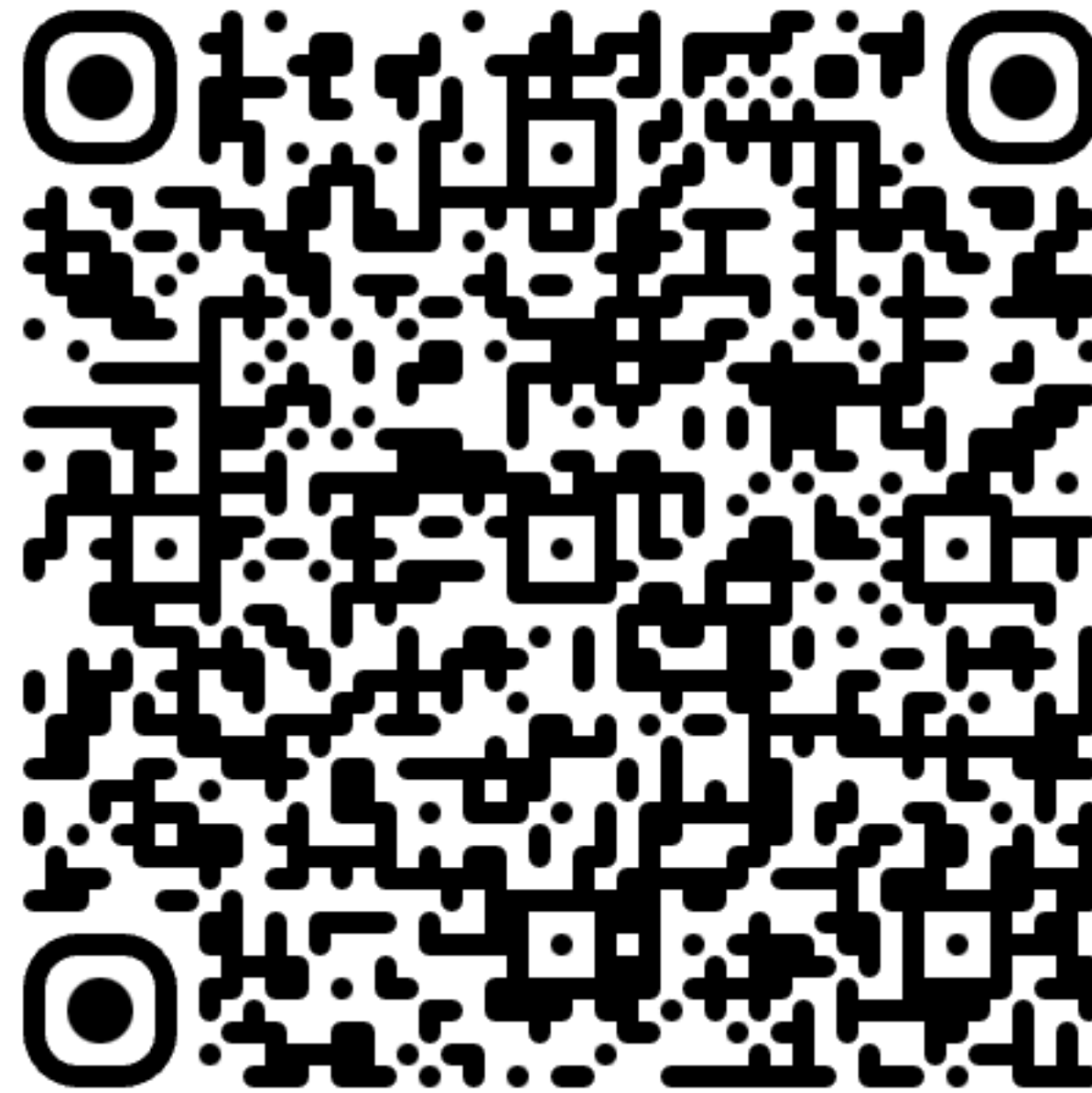
Coding for Economists

Session 7

Jian Cao

24 March 2025

Module Files



[Google Drive Folder](#)

Outline

Outline

- Machine Learning

Outline

- Machine Learning
 - Supervised/Unsupervised

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 - Supervised/Unsupervised
- Prepare for ML

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 - Train/Test Sets

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- Machine Learning
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 - Scaling

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- Machine Learning
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 - Train/Test Sets
 - Scaling
 - Encoding

Machine Learning

Machine Learning



Machine Learning



Machine Learning

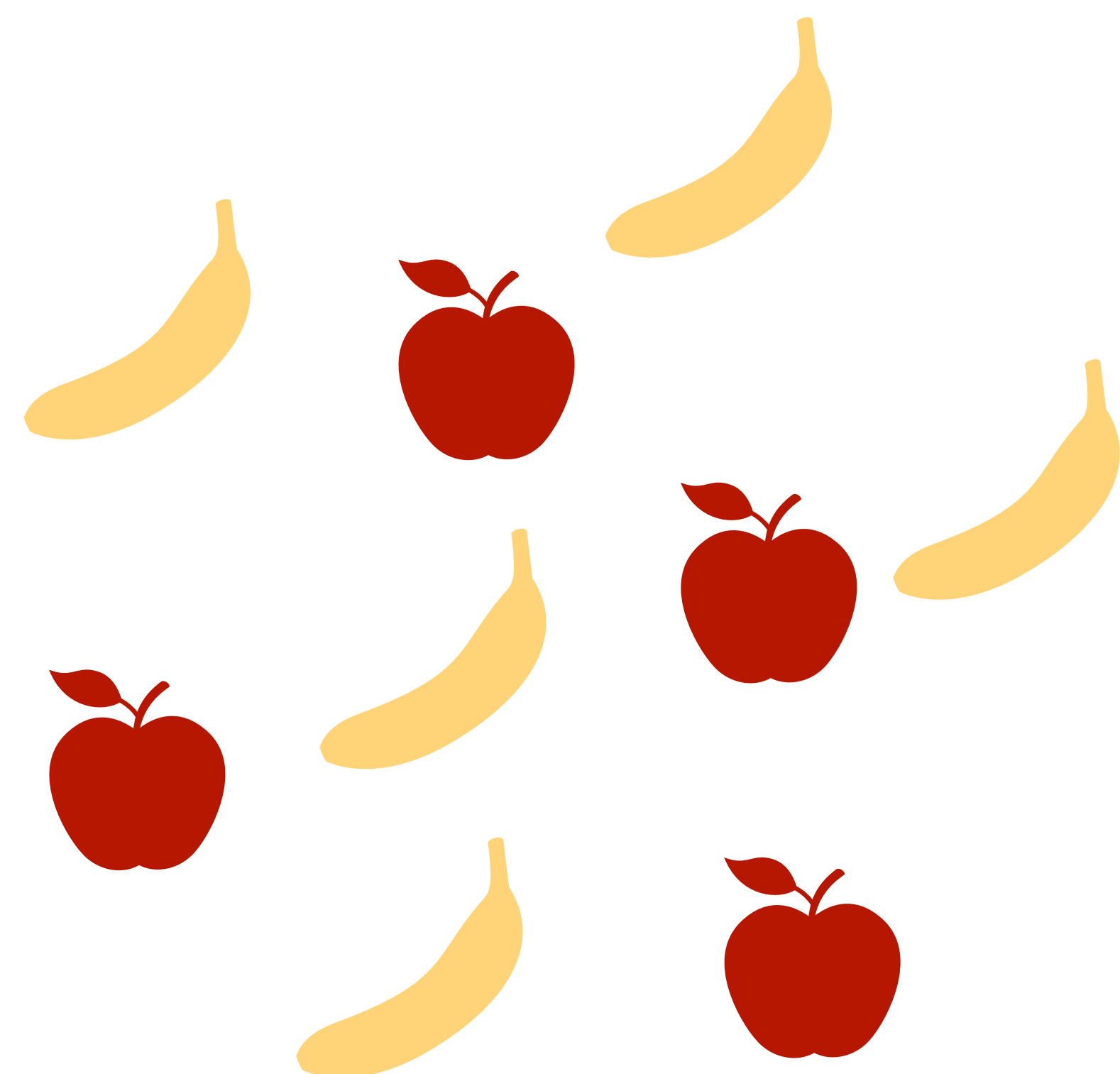


Machine Learning

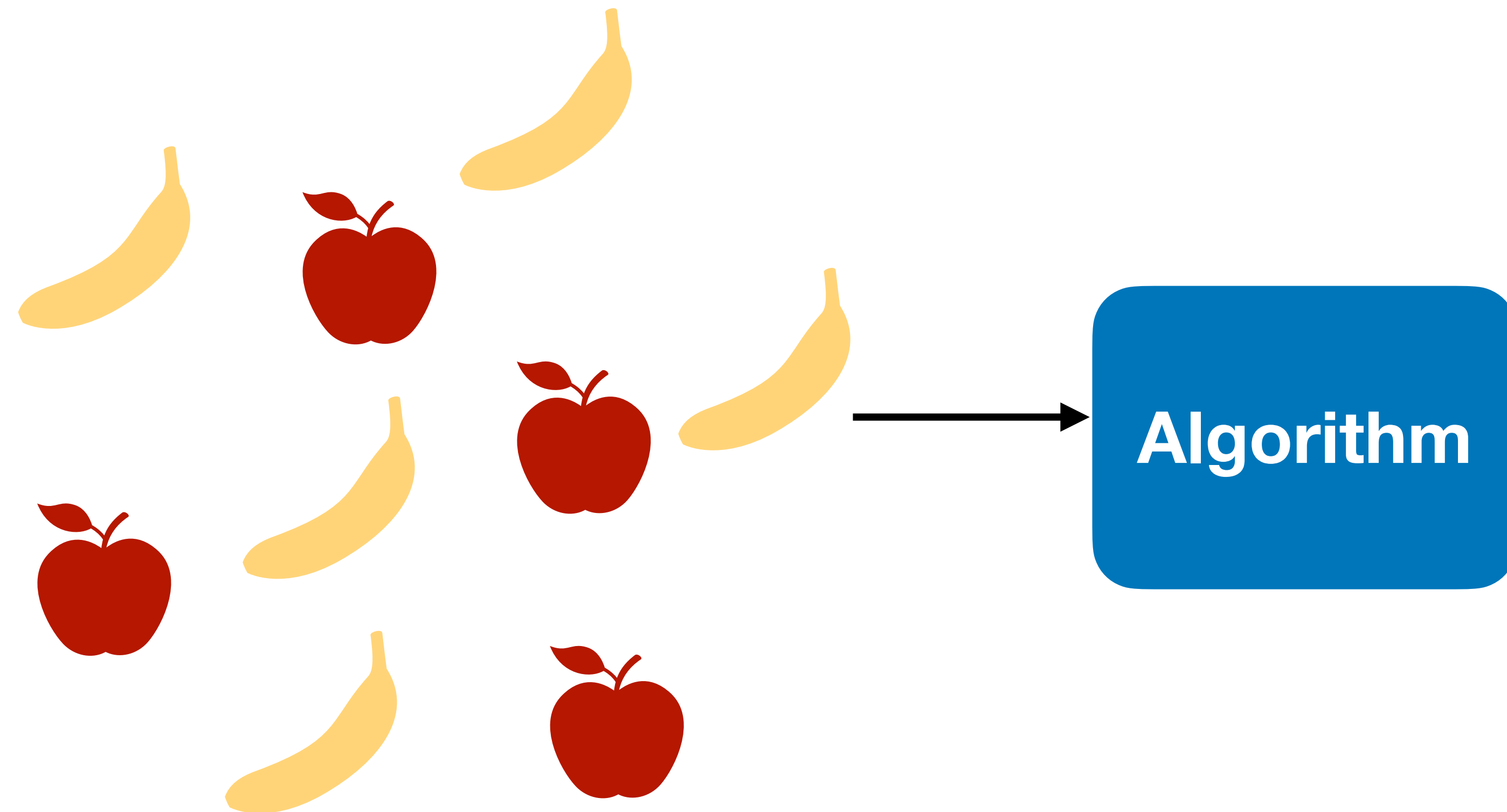


Machine Learning

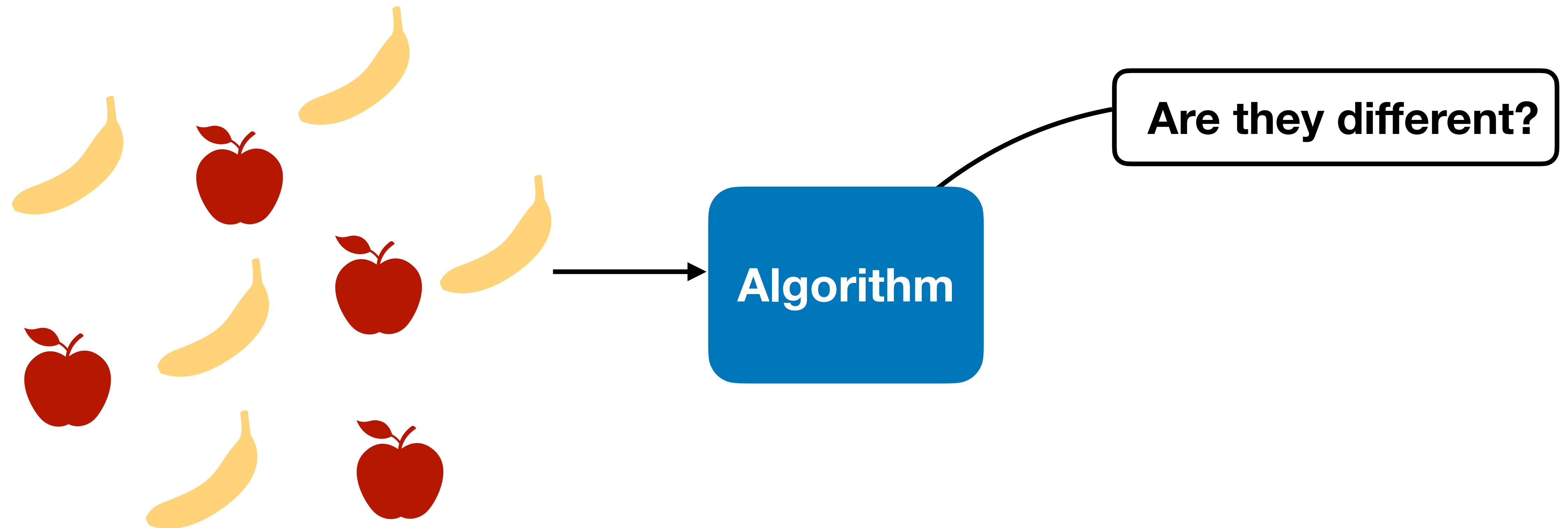
Machine Learning



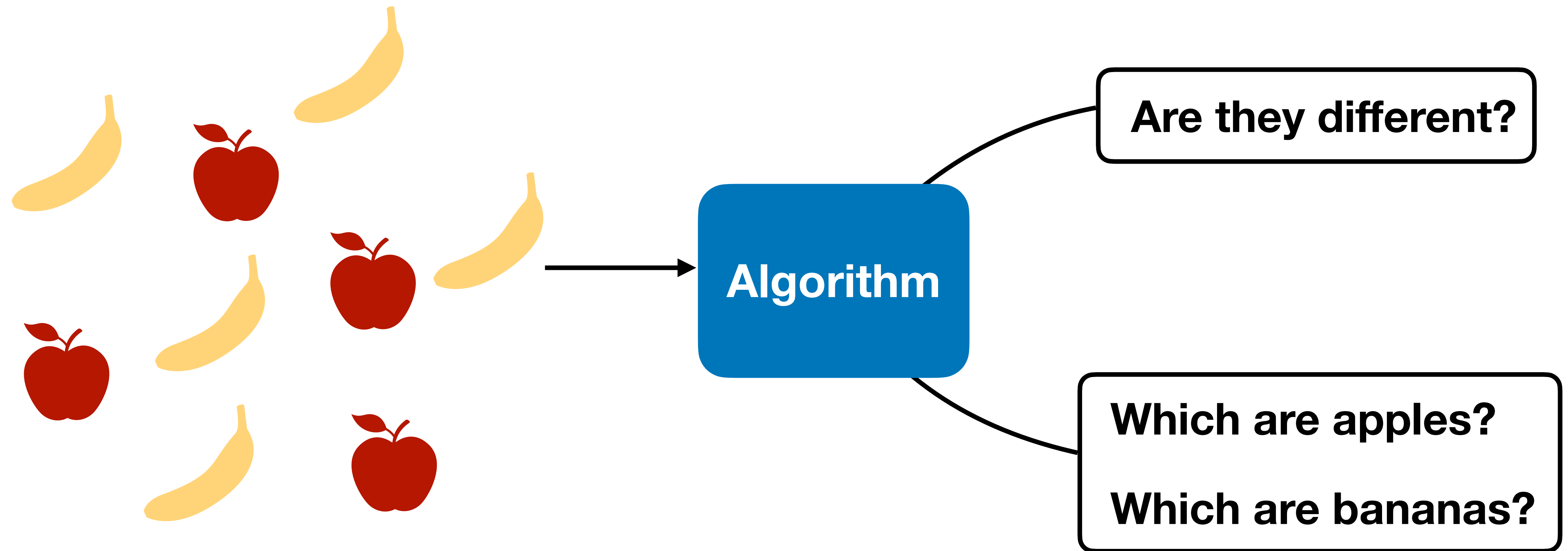
Machine Learning



Machine Learning



Machine Learning



Machine Learning

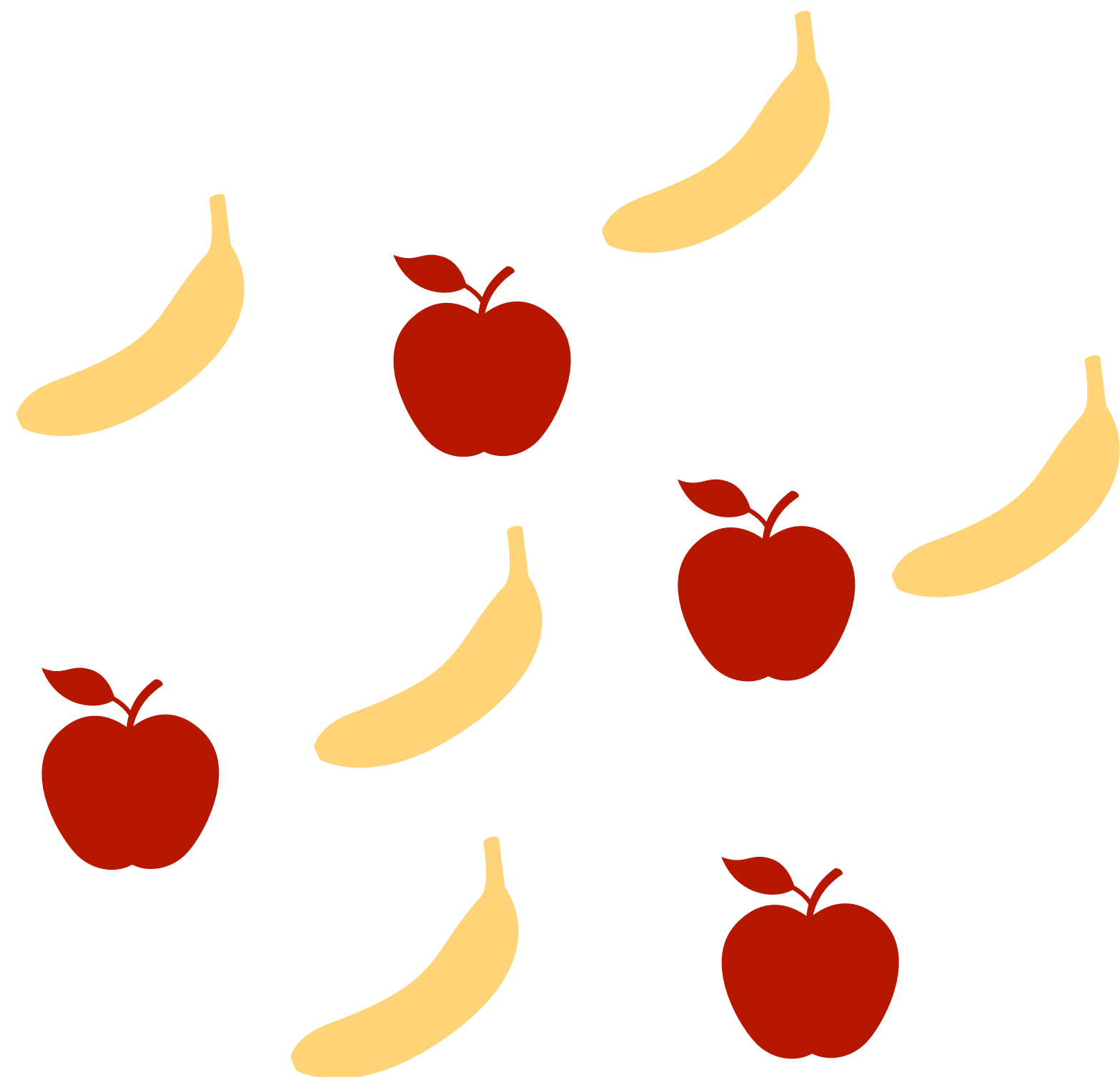
Unsupervised ML

Are they different?

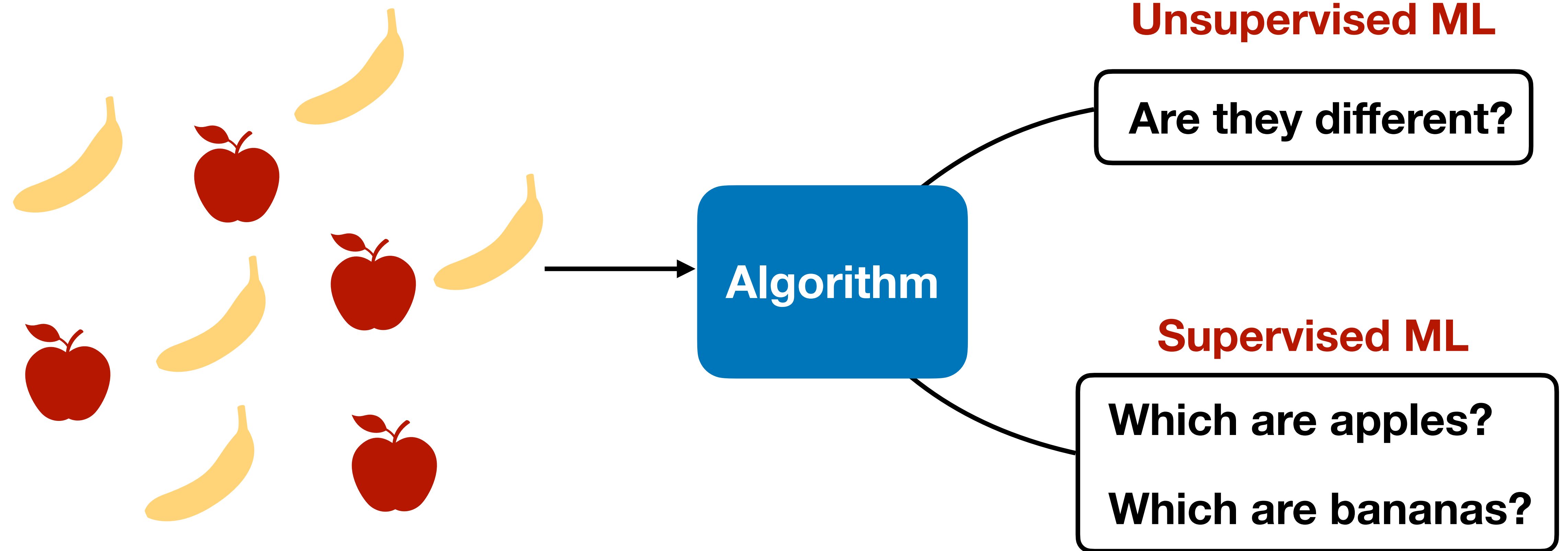
Algorithm

Which are apples?

Which are bananas?

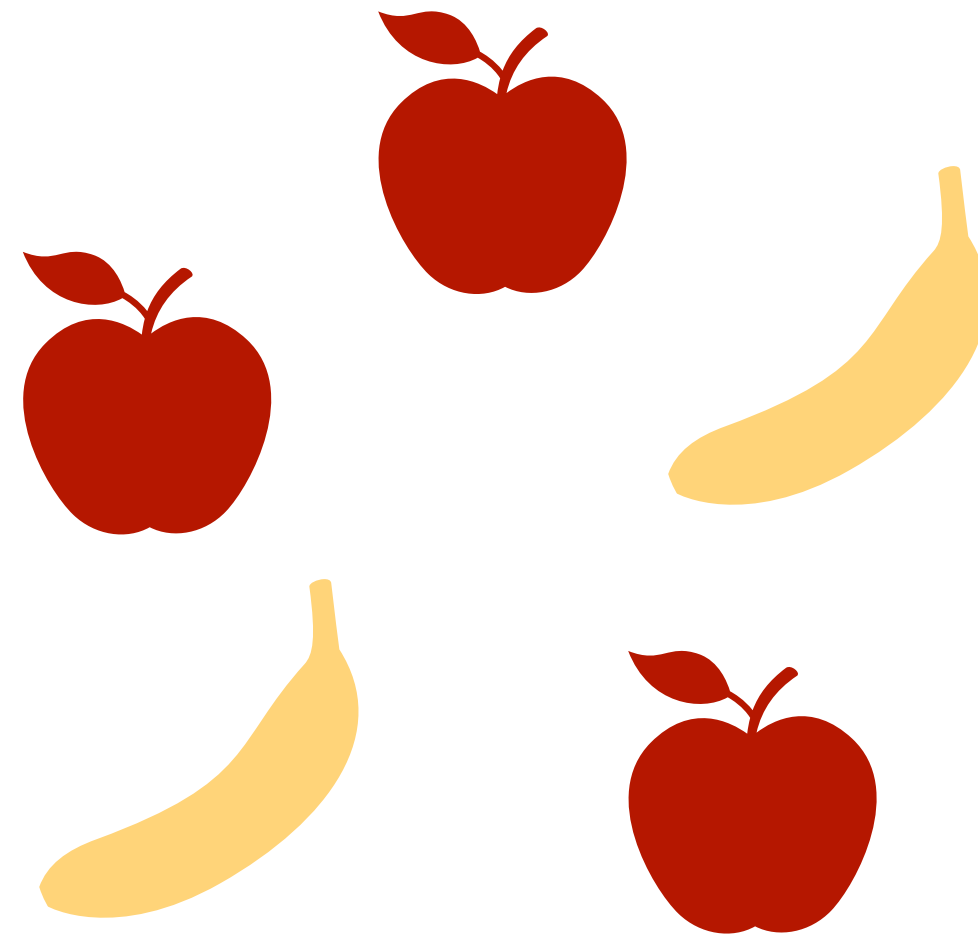


Machine Learning

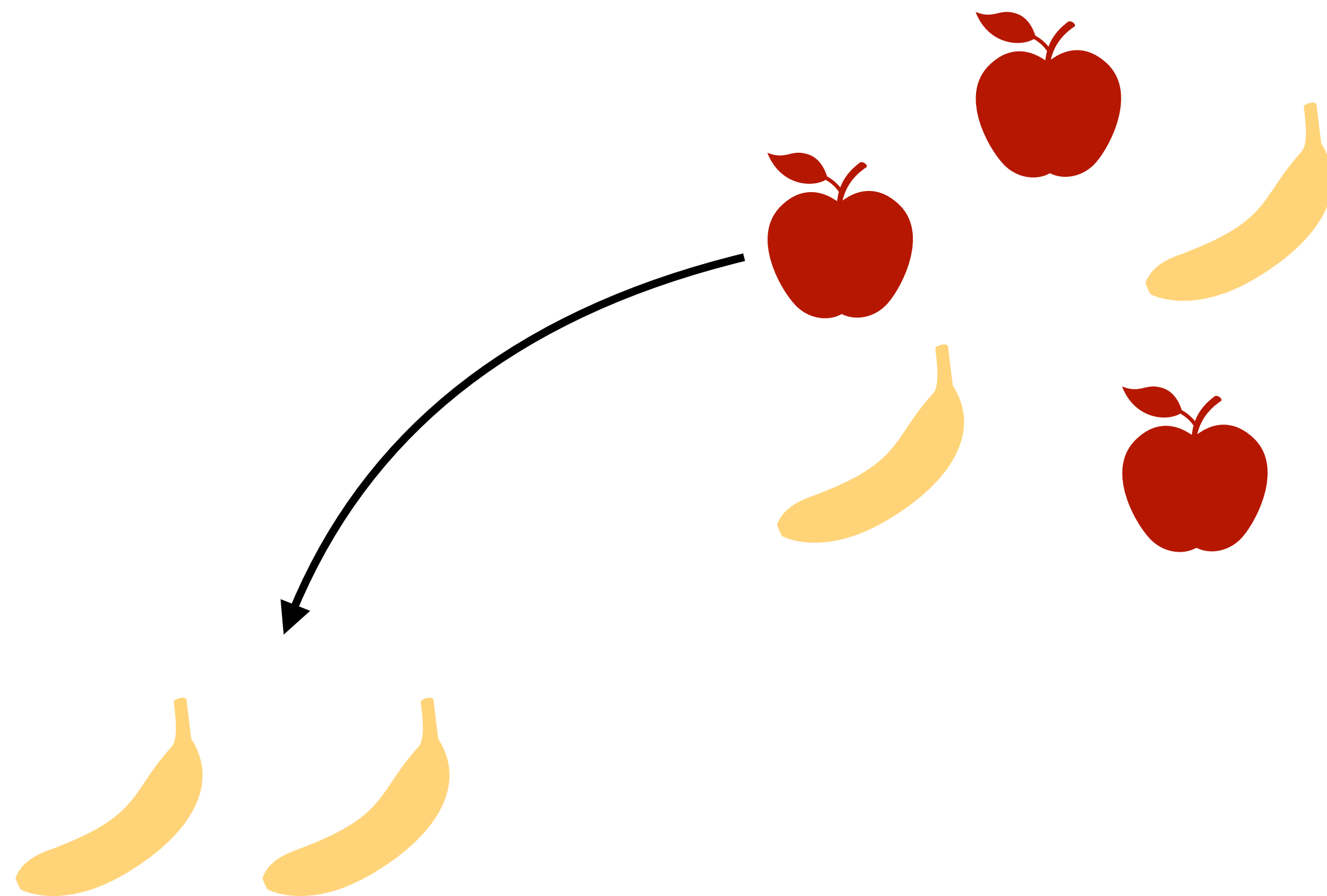


Unsupervised ML

Unsupervised ML

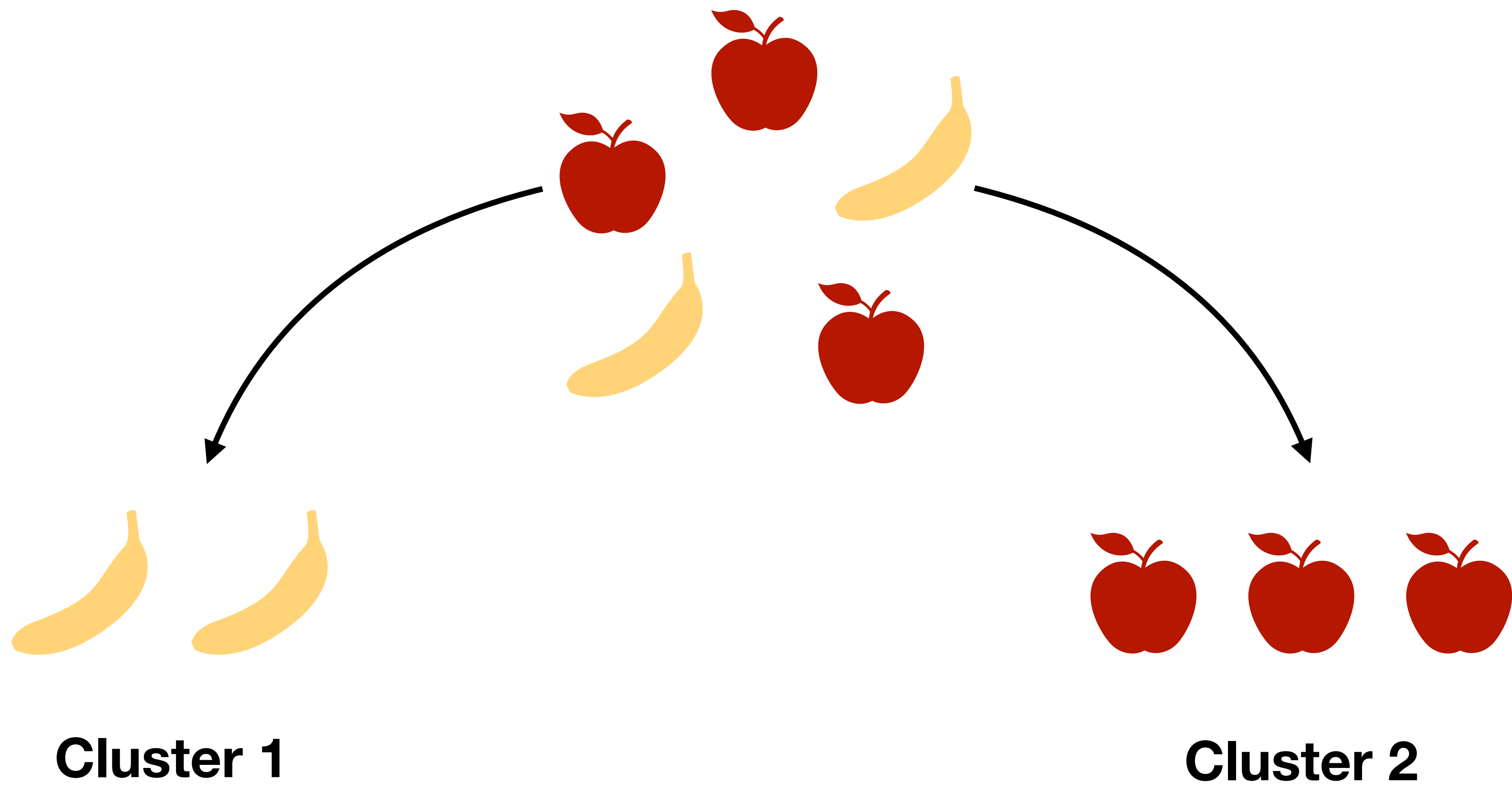


Unsupervised ML

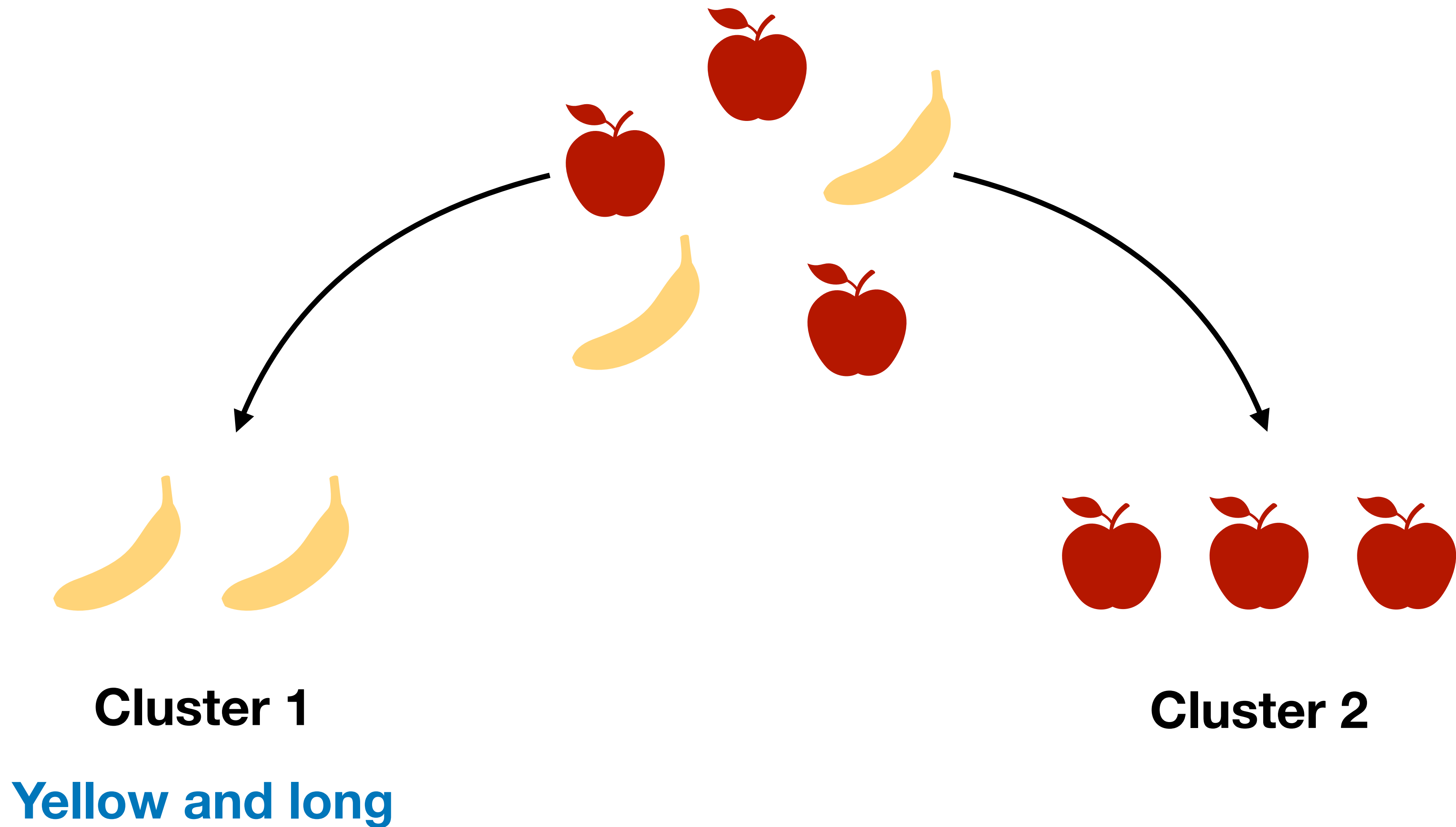


Cluster 1

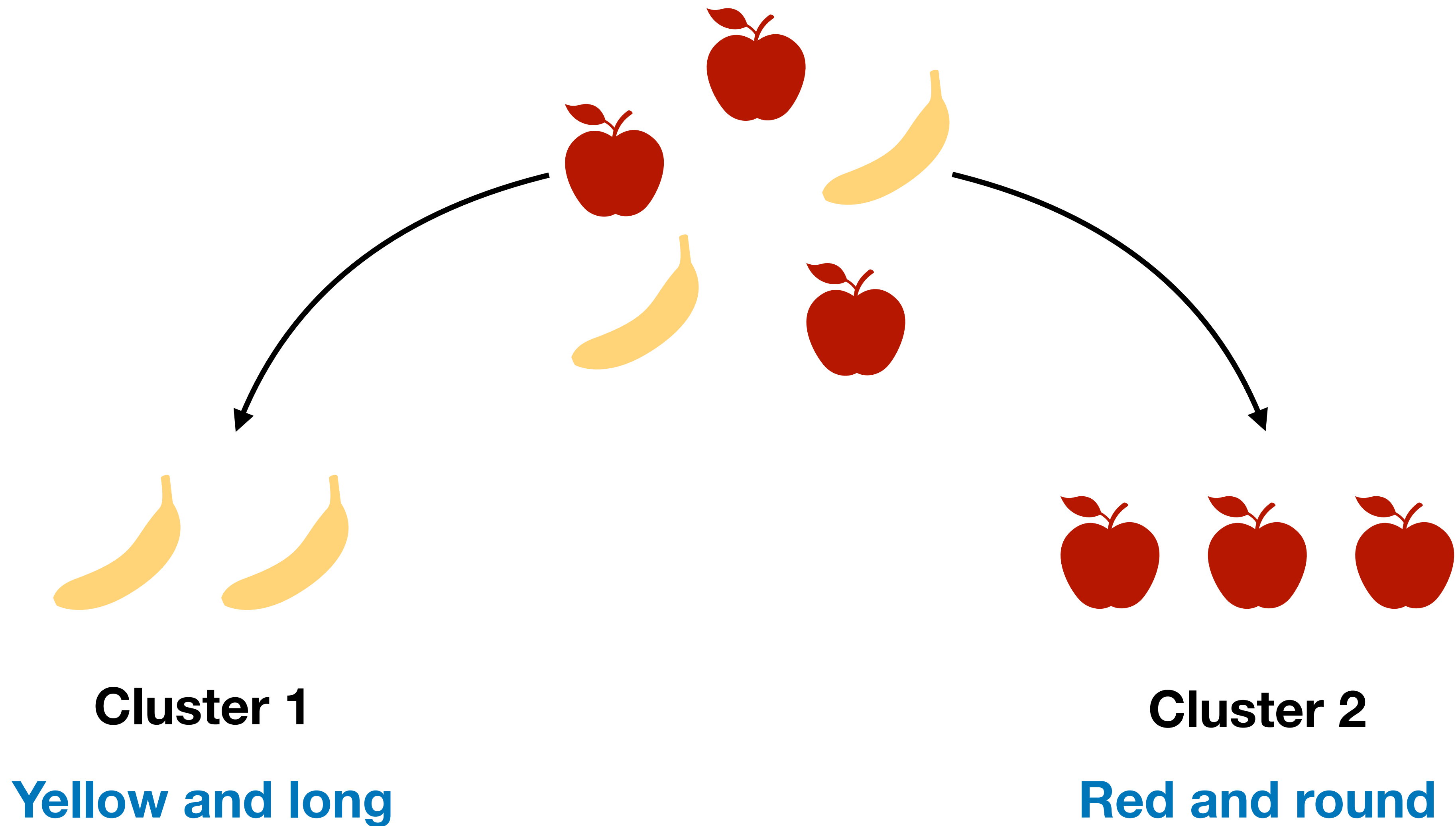
Unsupervised ML



Unsupervised ML



Unsupervised ML



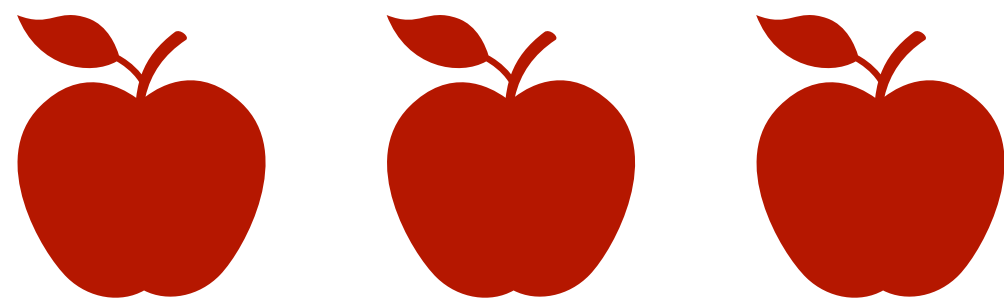
Supervised ML

Supervised ML

Learn



Banana



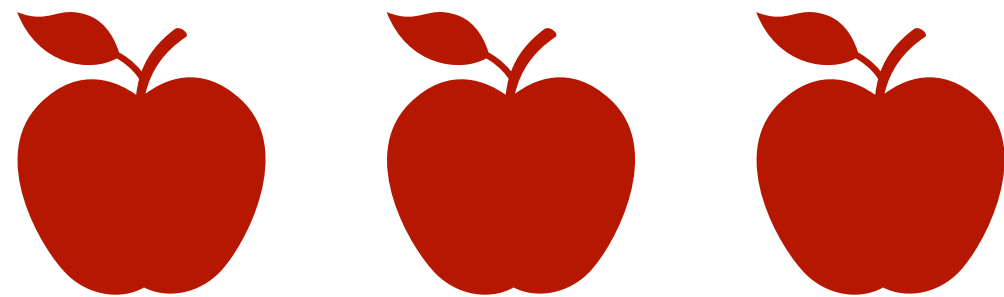
Apple

Supervised ML

Learn



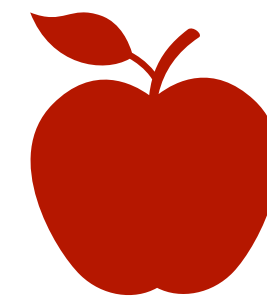
Banana



Apple



Classify/Predict

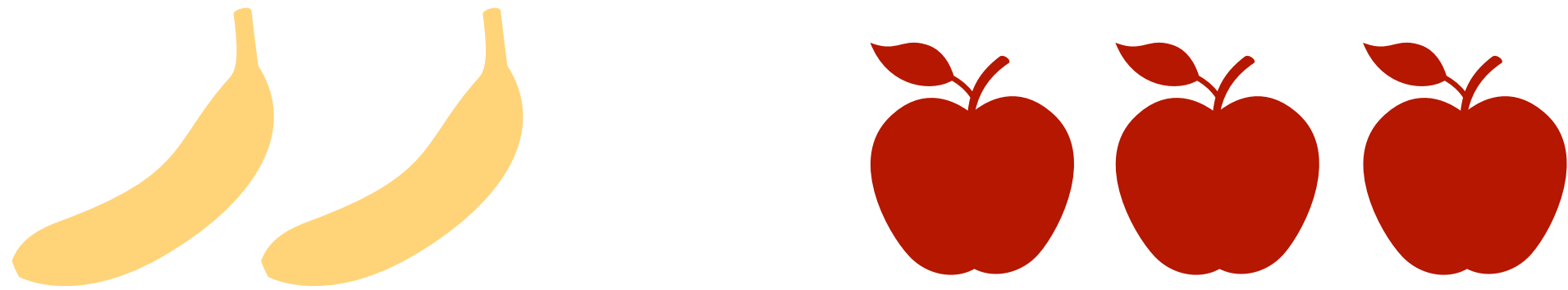


This is a banana

Learning = Optimization

Learning = Optimization

Unsupervised

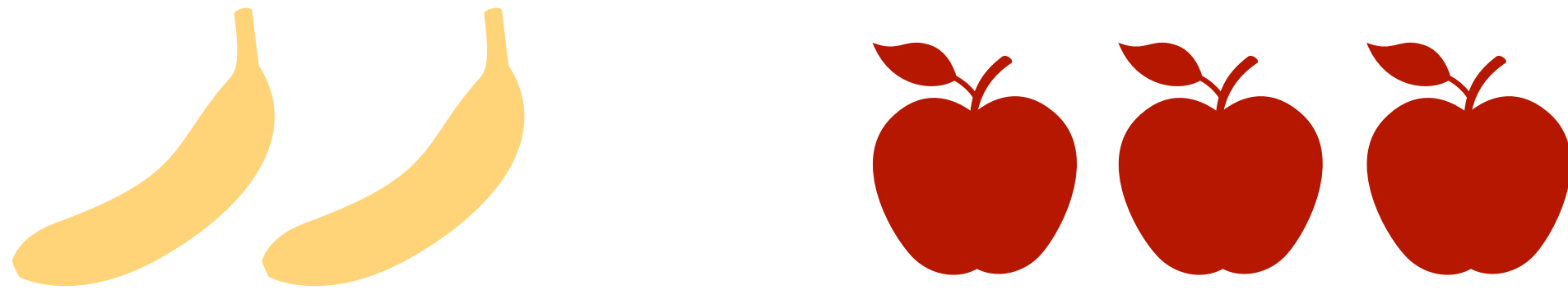


Optimization Goal

As separate as possible

Learning = Optimization

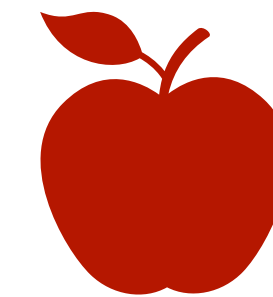
Unsupervised



Optimization Goal

As separate as possible

Supervised



This is an apple

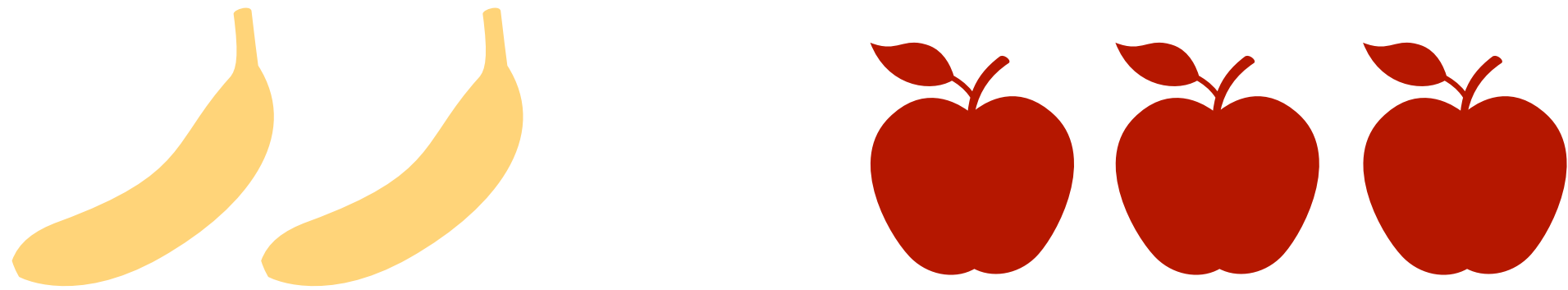
Optimization Goal

As accurate as possible

Validation & Adjustment

Validation & Adjustment

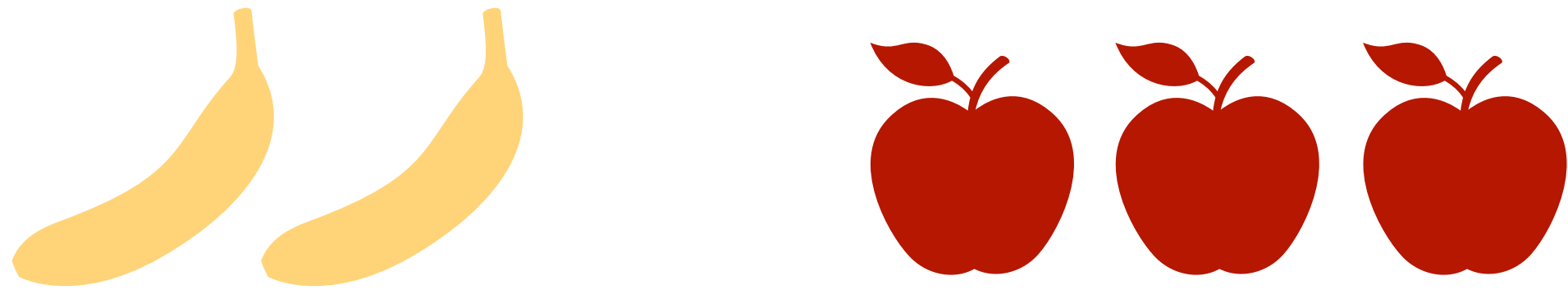
Unsupervised



- **Distance metrics**
- **Visualization**
- **Domain knowledge**

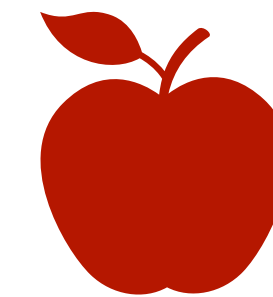
Validation & Adjustment

Unsupervised



- **Distance metrics**
- **Visualization**
- **Domain knowledge**

Supervised

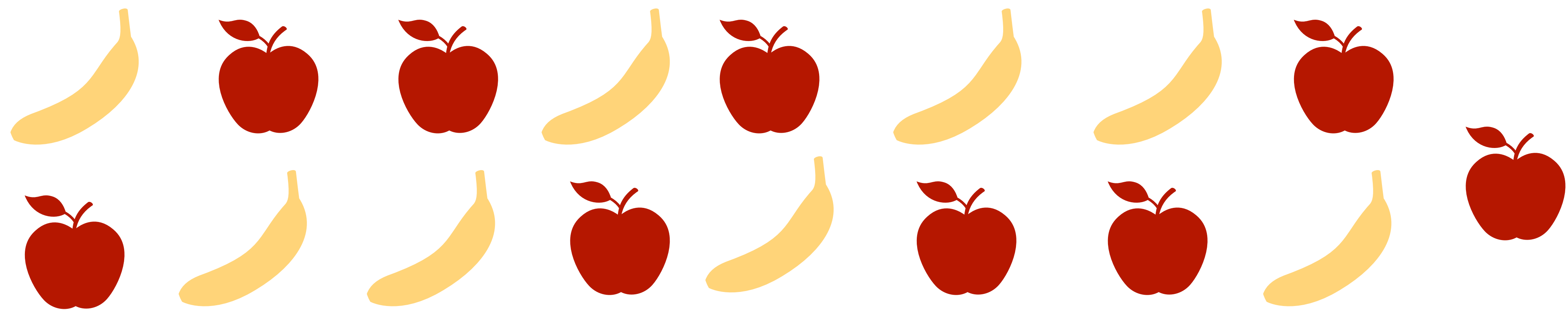


This is an apple

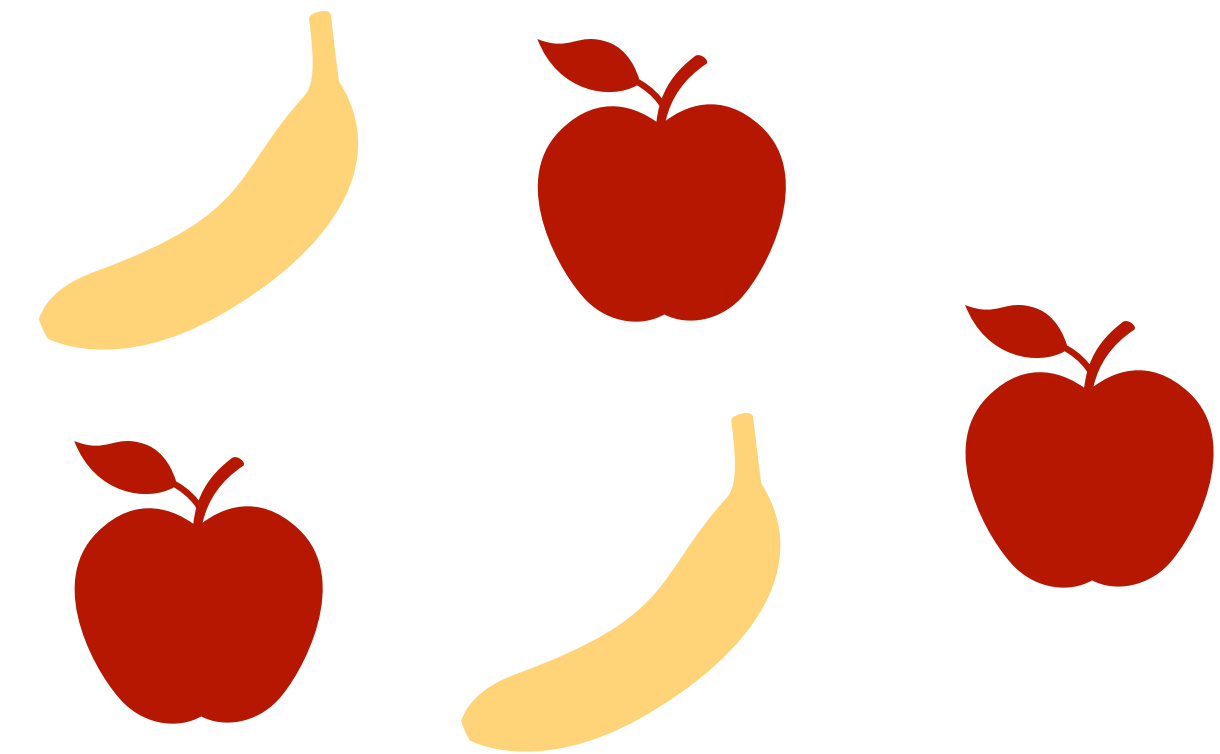
- **Accuracy metrics**
- **Train/test split**
- **Cross validation**

Train/Test Split

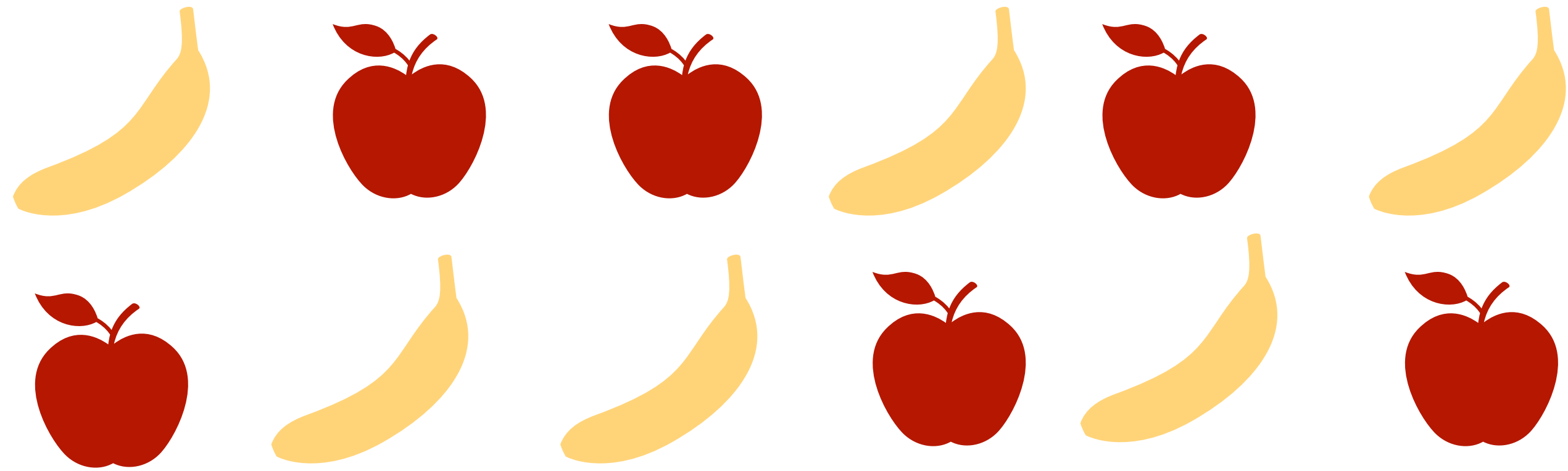
Train/Test Split



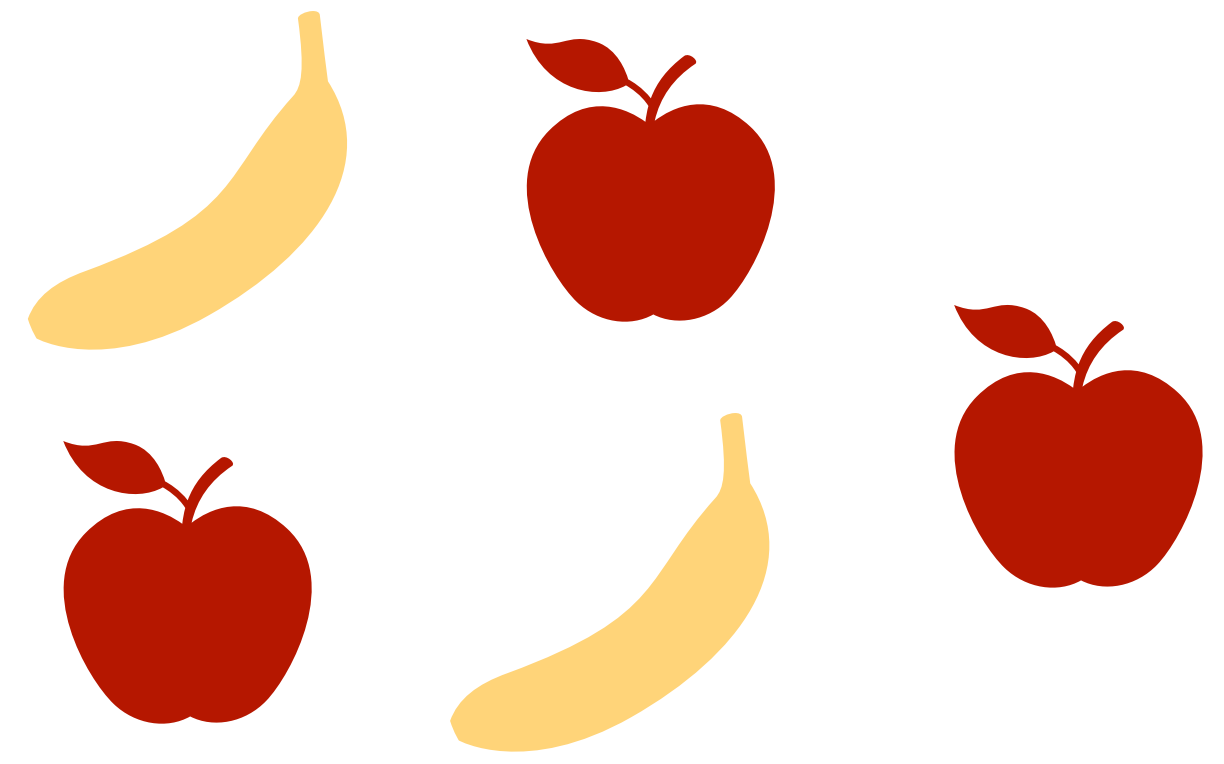
Train/Test Split



Train/Test Split



Training Set



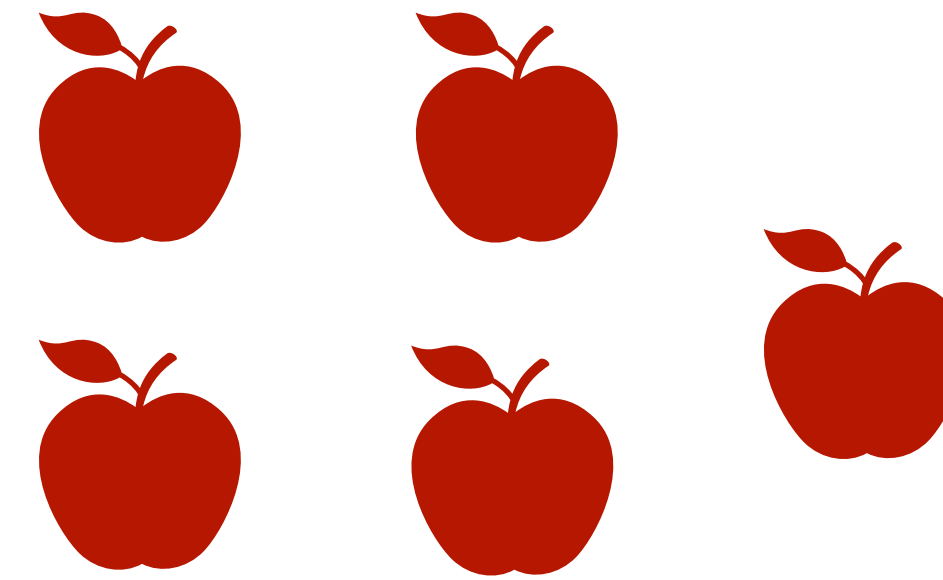
Testing Set

Overfitting

Overfitting

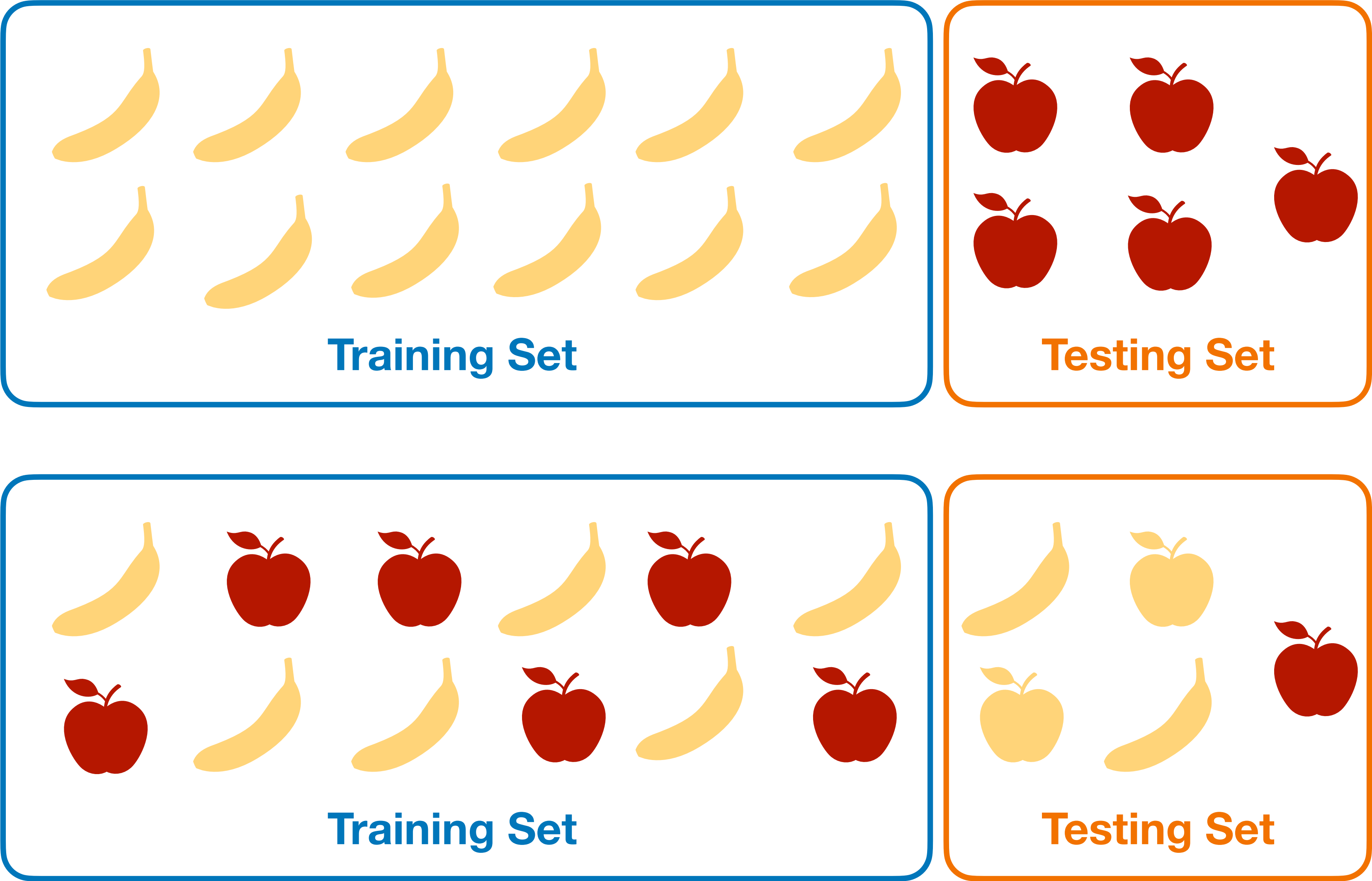


Training Set



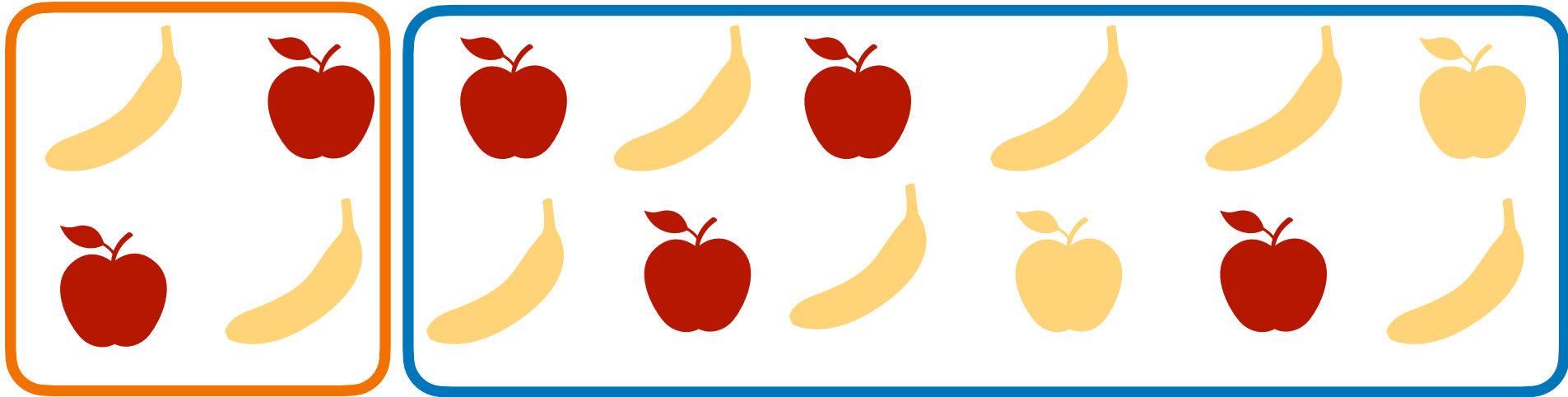
Testing Set

Overfitting

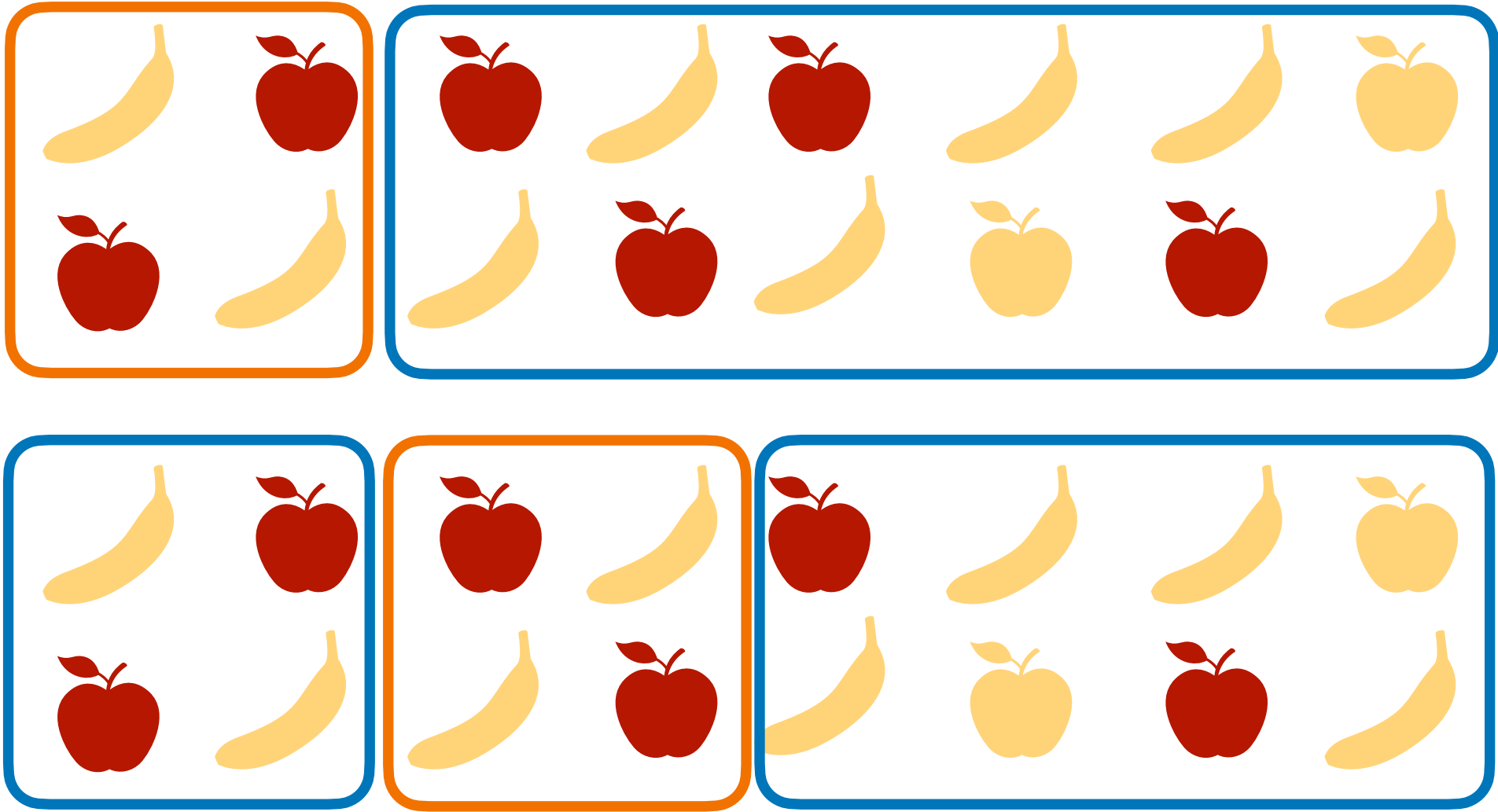


Cross Validation

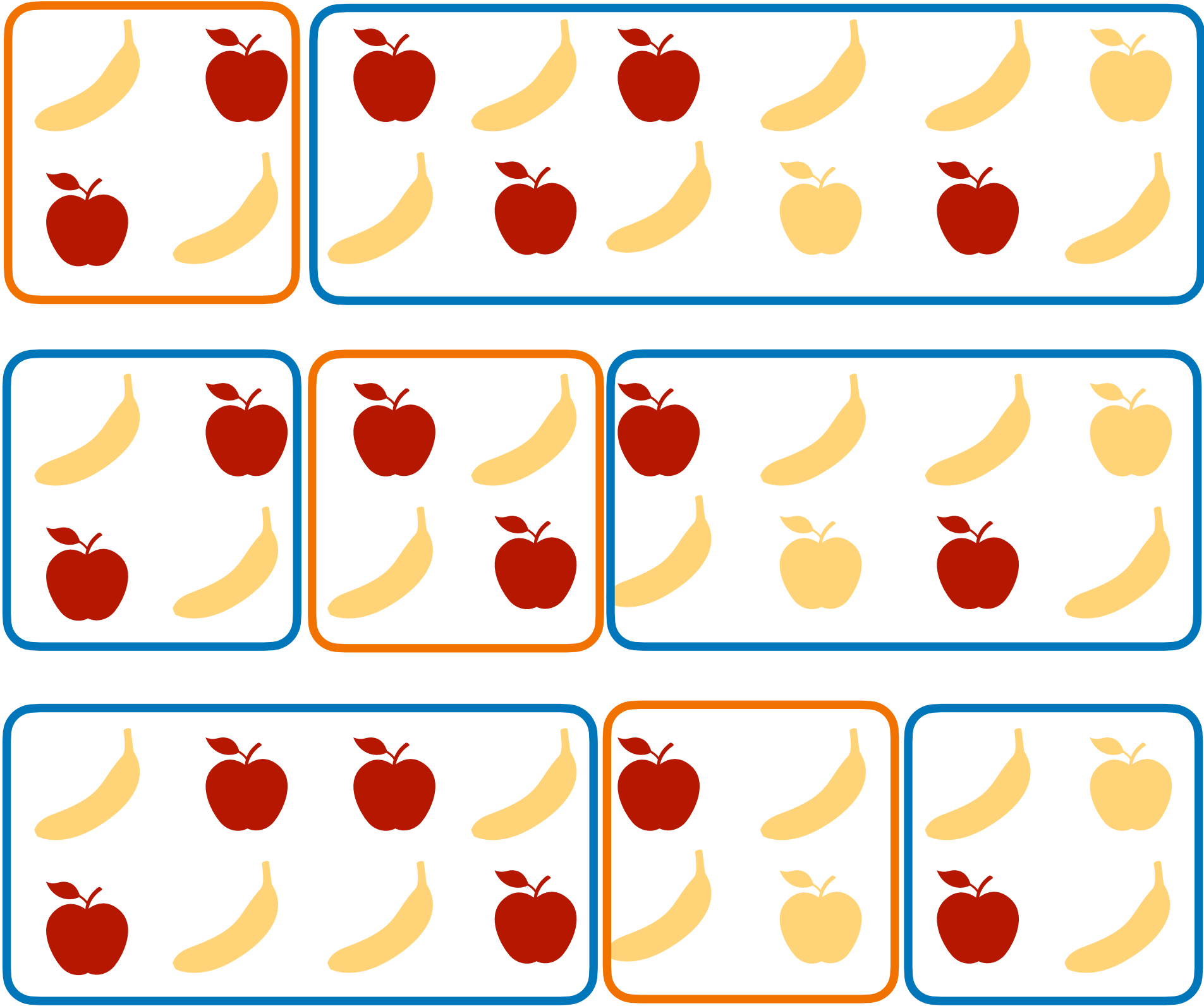
Cross Validation



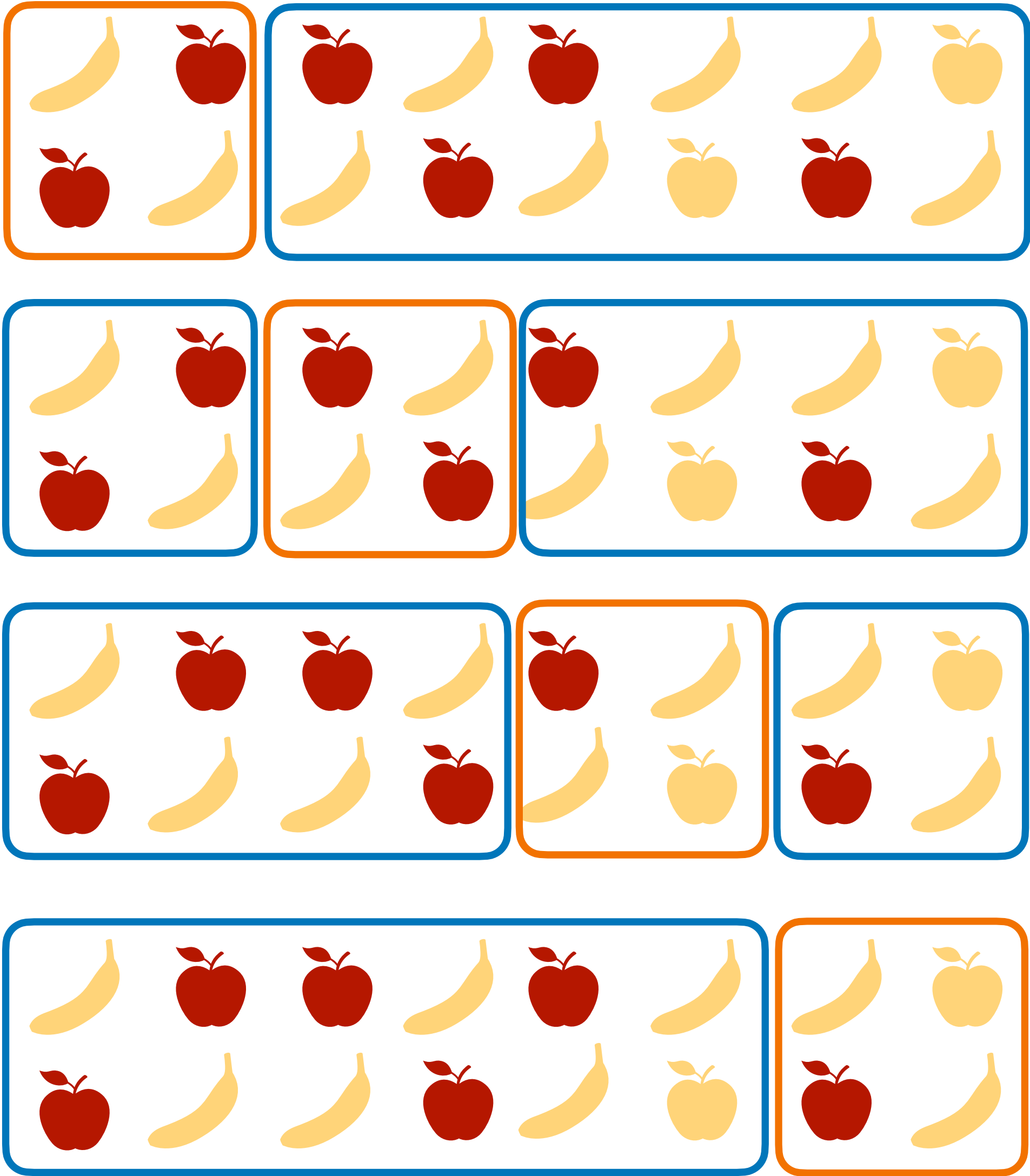
Cross Validation



Cross Validation



Cross Validation



Cross Validation

