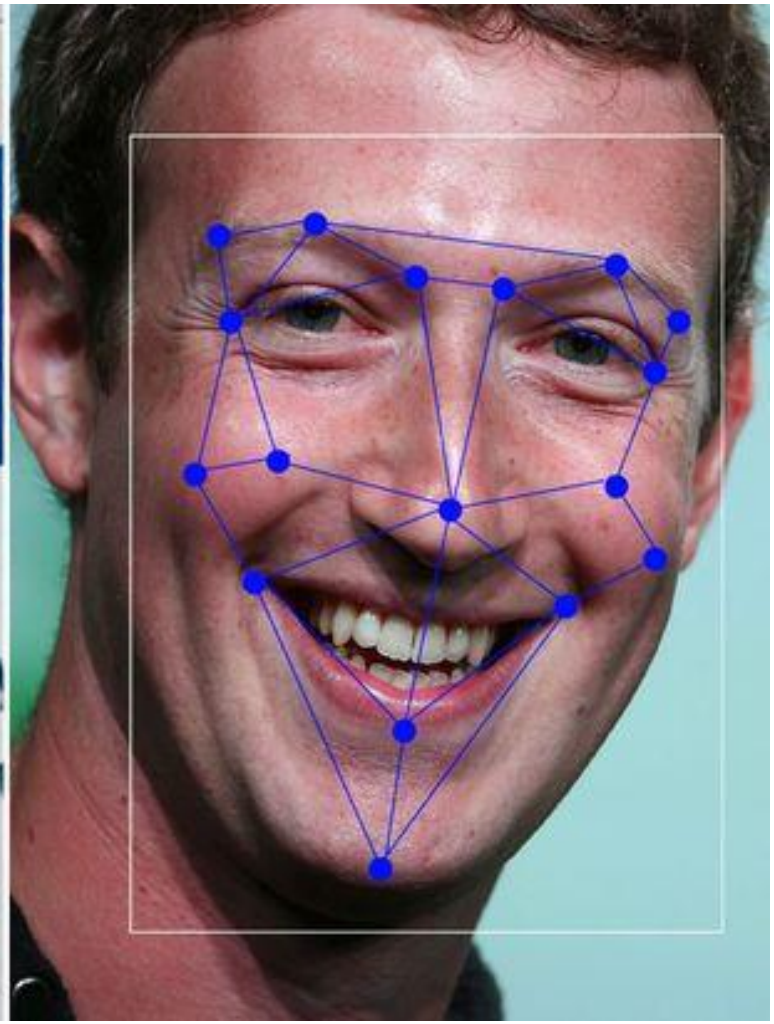
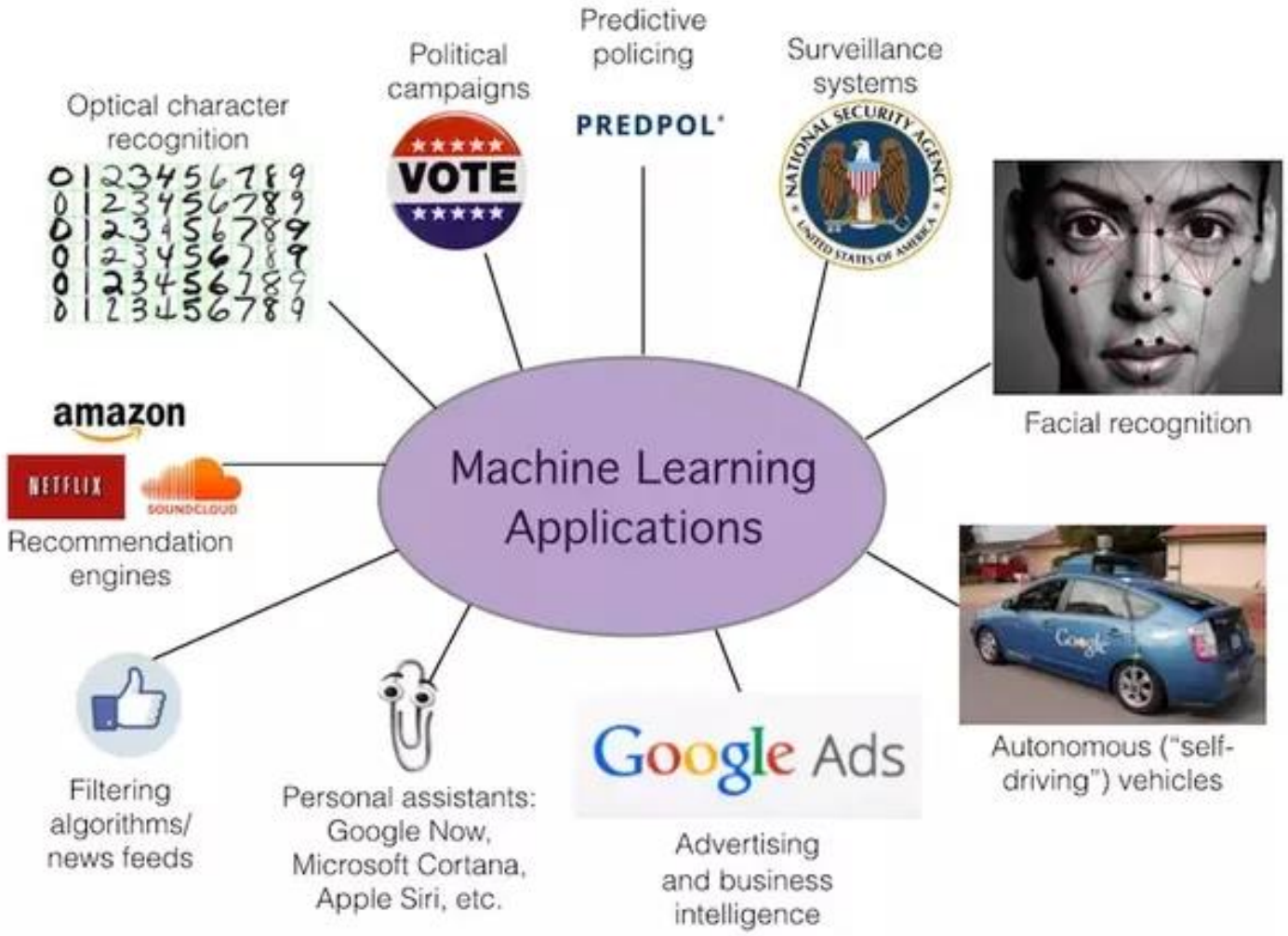
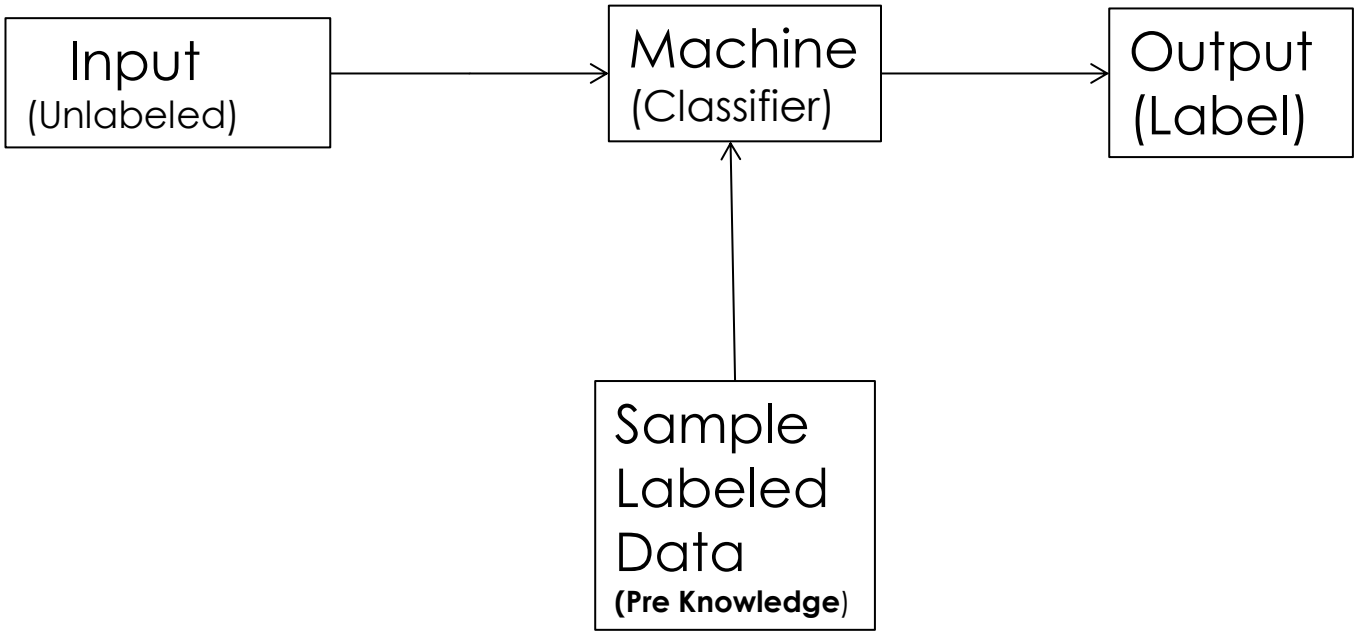
A Quick Guide to Machine Learning

facebook
Facebook helps
the people in yo




Machine Learning Applications
Optical character recognition
Political campaigns
VOTE
Predictive policing
PREDPOL
Surveillance systems
NATIONAL SECURITY AGENCY
Facial recognition
amazon
NETFLIX
SOUNDCLOUD
Recommendation engines
Filtering algorithms/ news feeds
Personal assistants: Google Now, Microsoft Cortana, Apple Siri, etc.
Google Ads
Advertising and business intelligence
Autonomous ("self-driving") vehicles

Machine Learning System

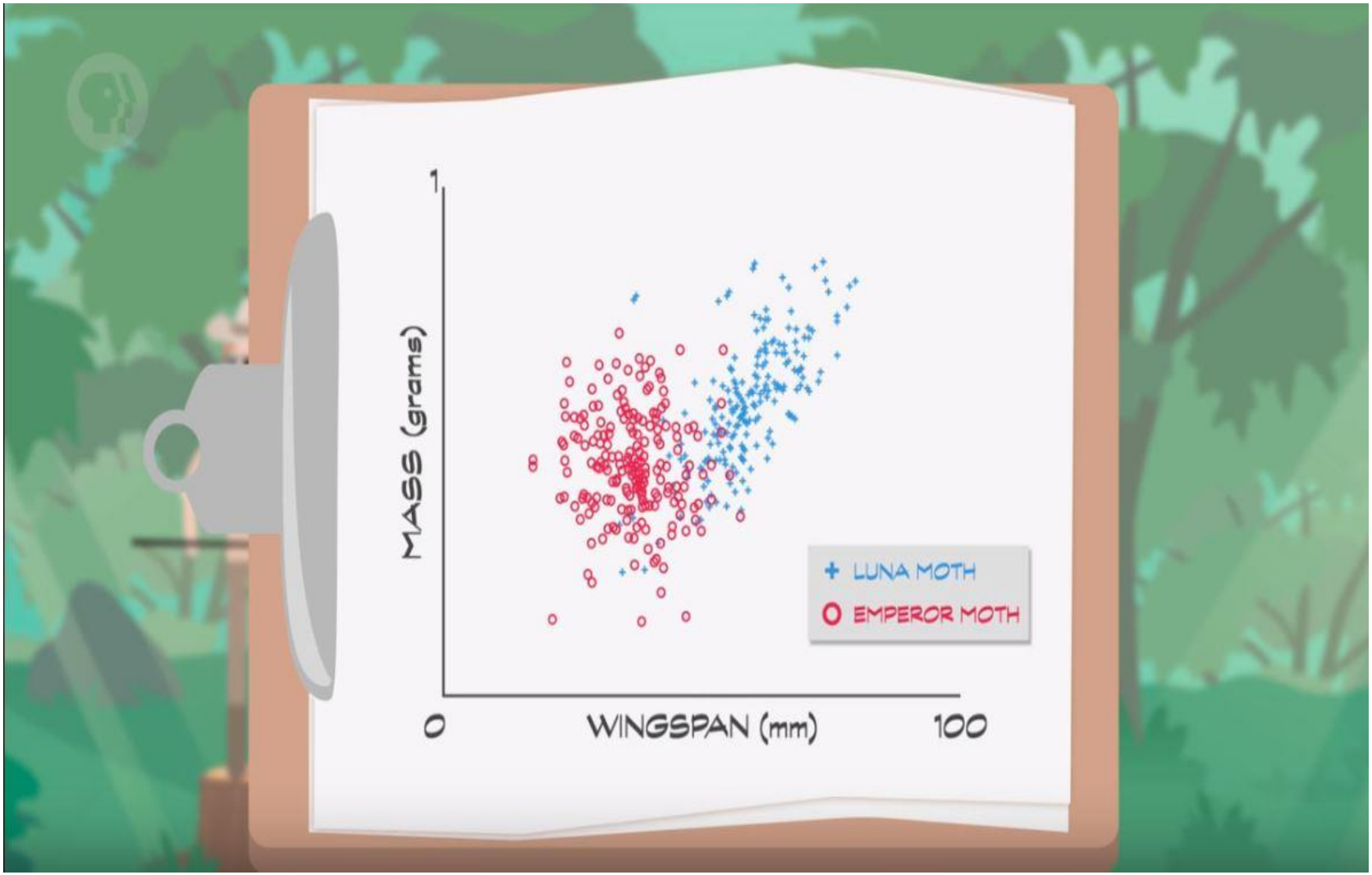


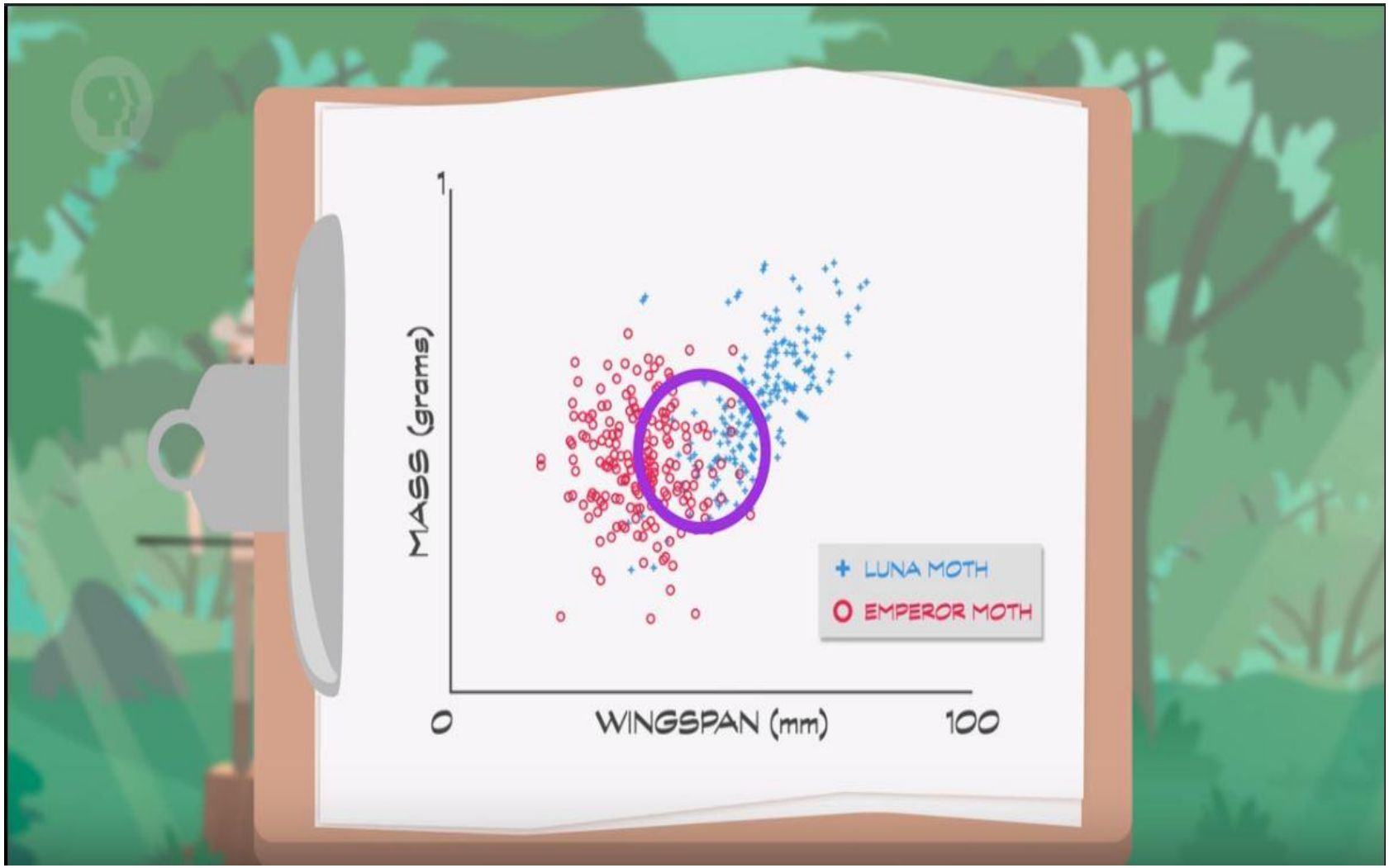
Emperor Moth

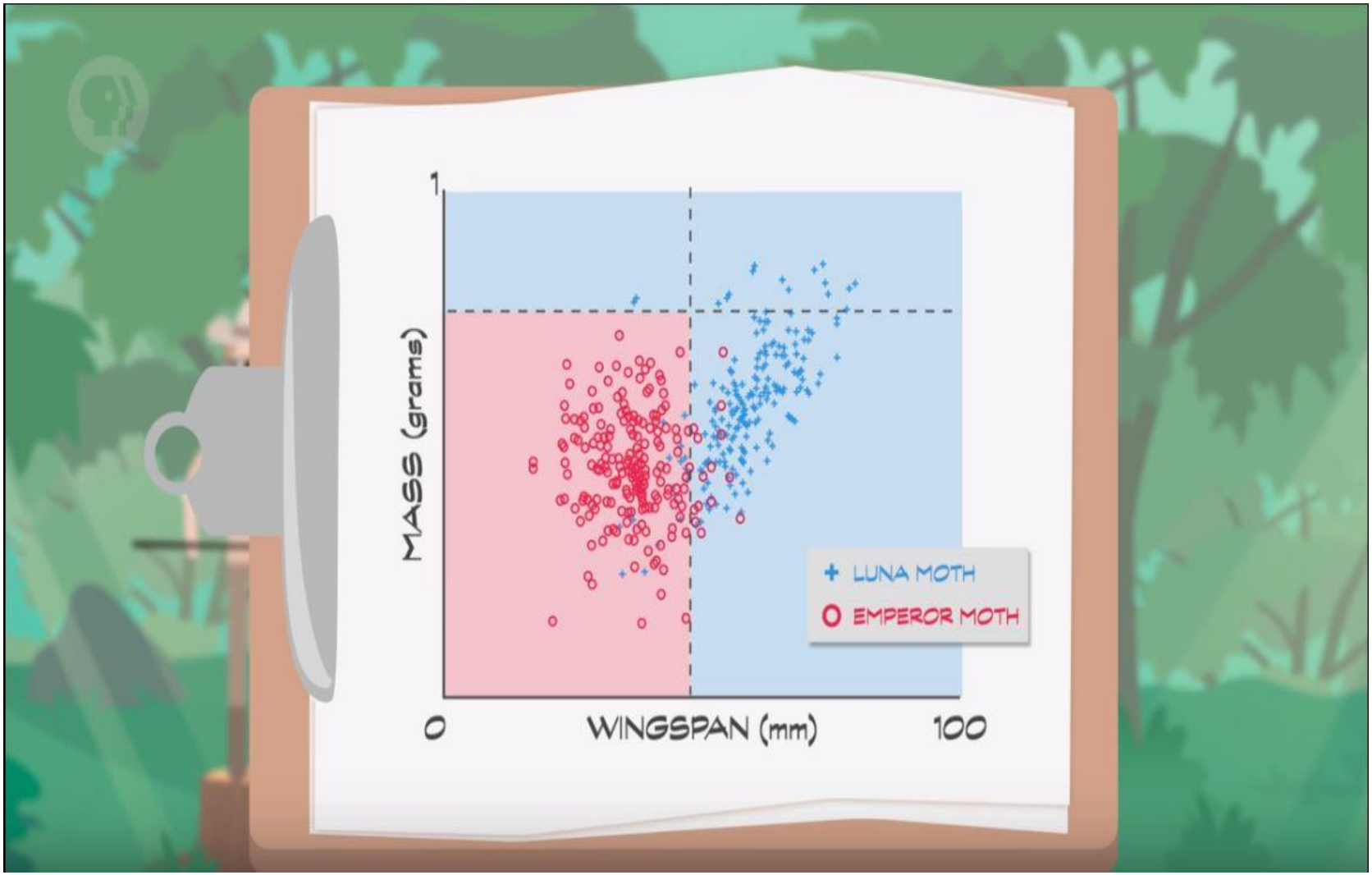
Luna Moth

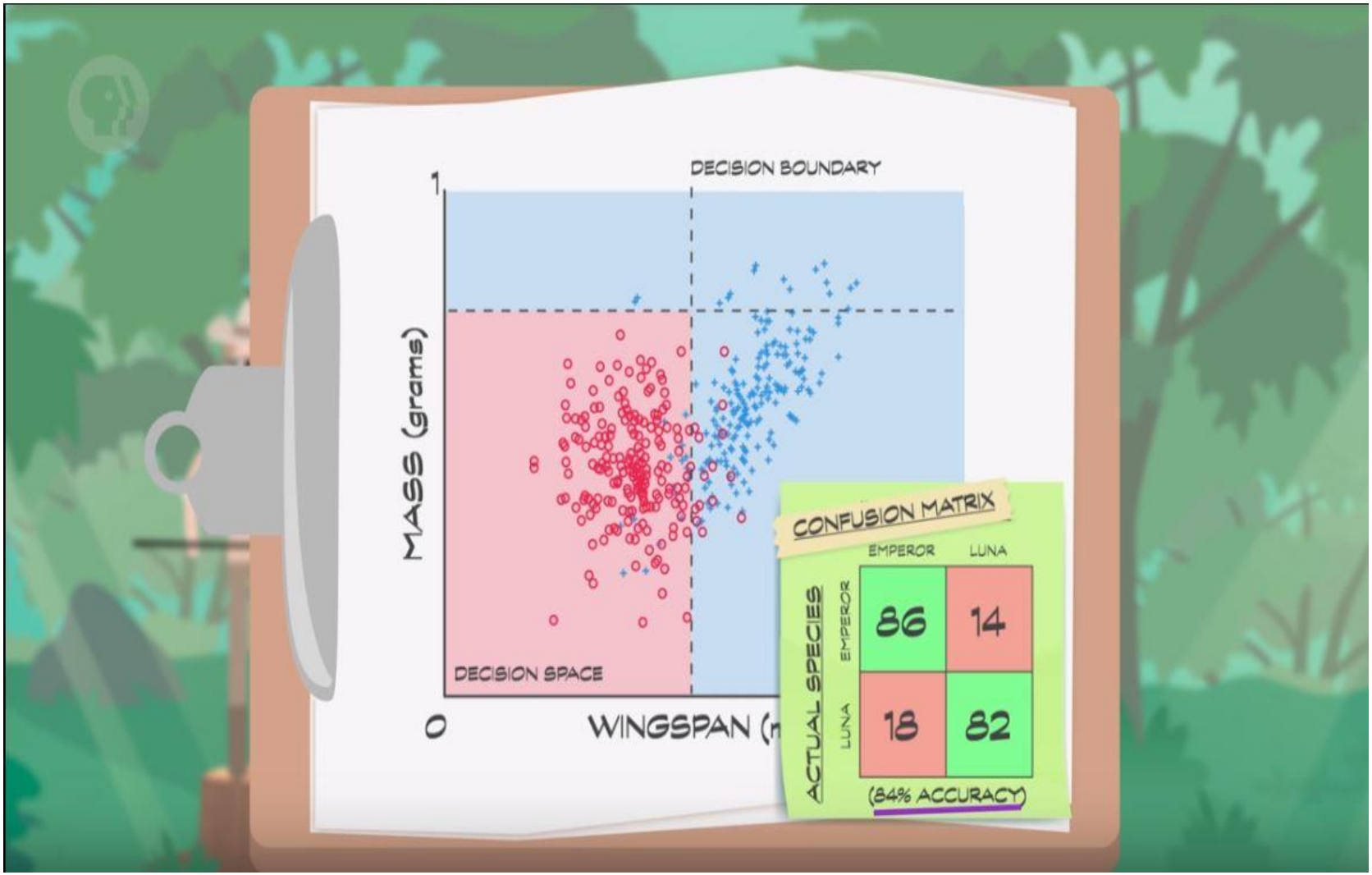
TRAINING DATA

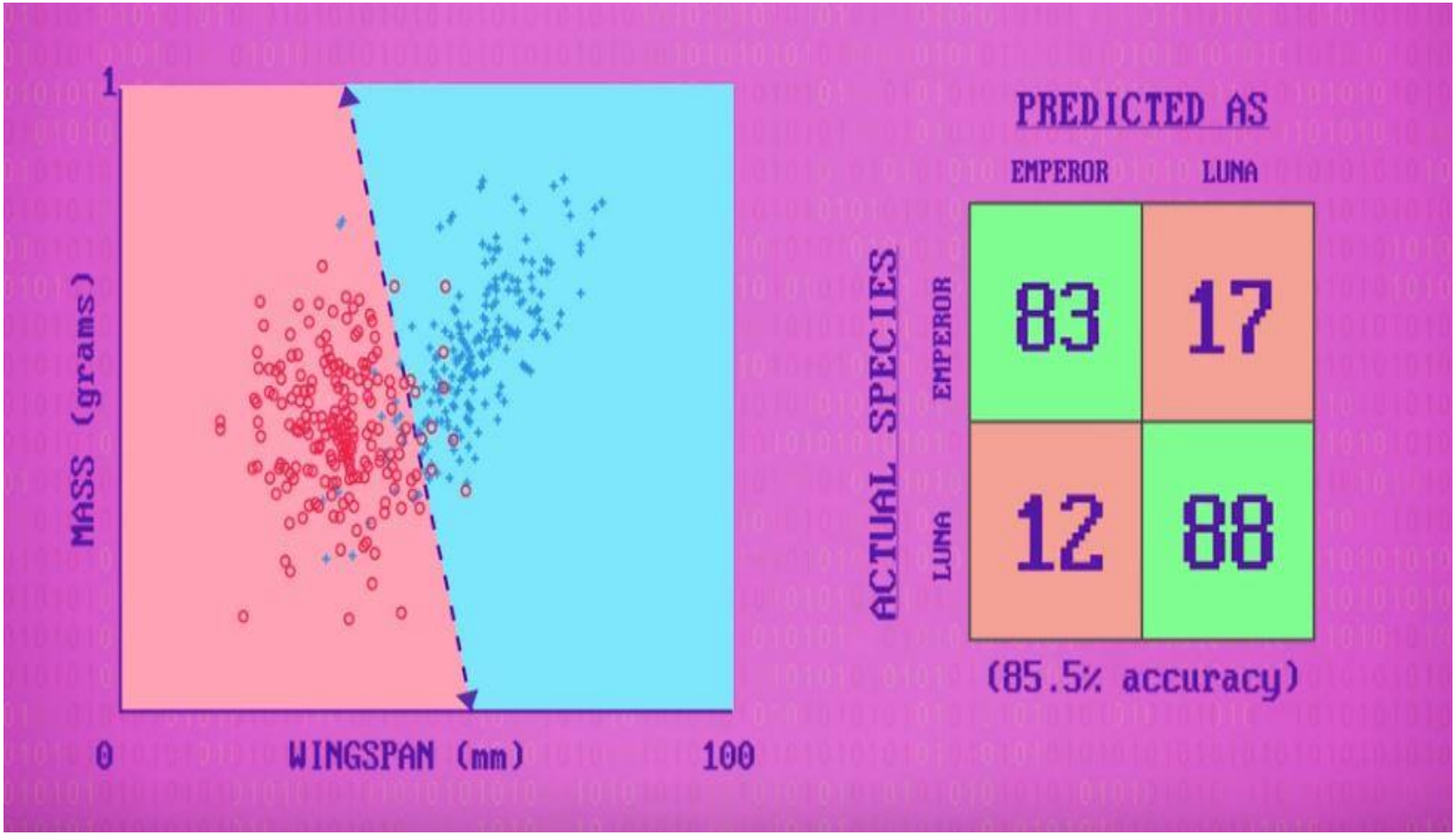
LABELED DATA
MASS
WINGSPAN
MOTH SPECIES (LABEL)
2.5
41
EMPEROR
3.7
36
EMPEROR
4.2
72
LUNA
3.2
27
EMPEROR
5.5
60
LUNA
5.1
51
EMPEROR
4.0
43
EMPEROR
3.6
40
EMPEROR
8.2
75
LUNA
7.6
82
LUNA
...
...
...

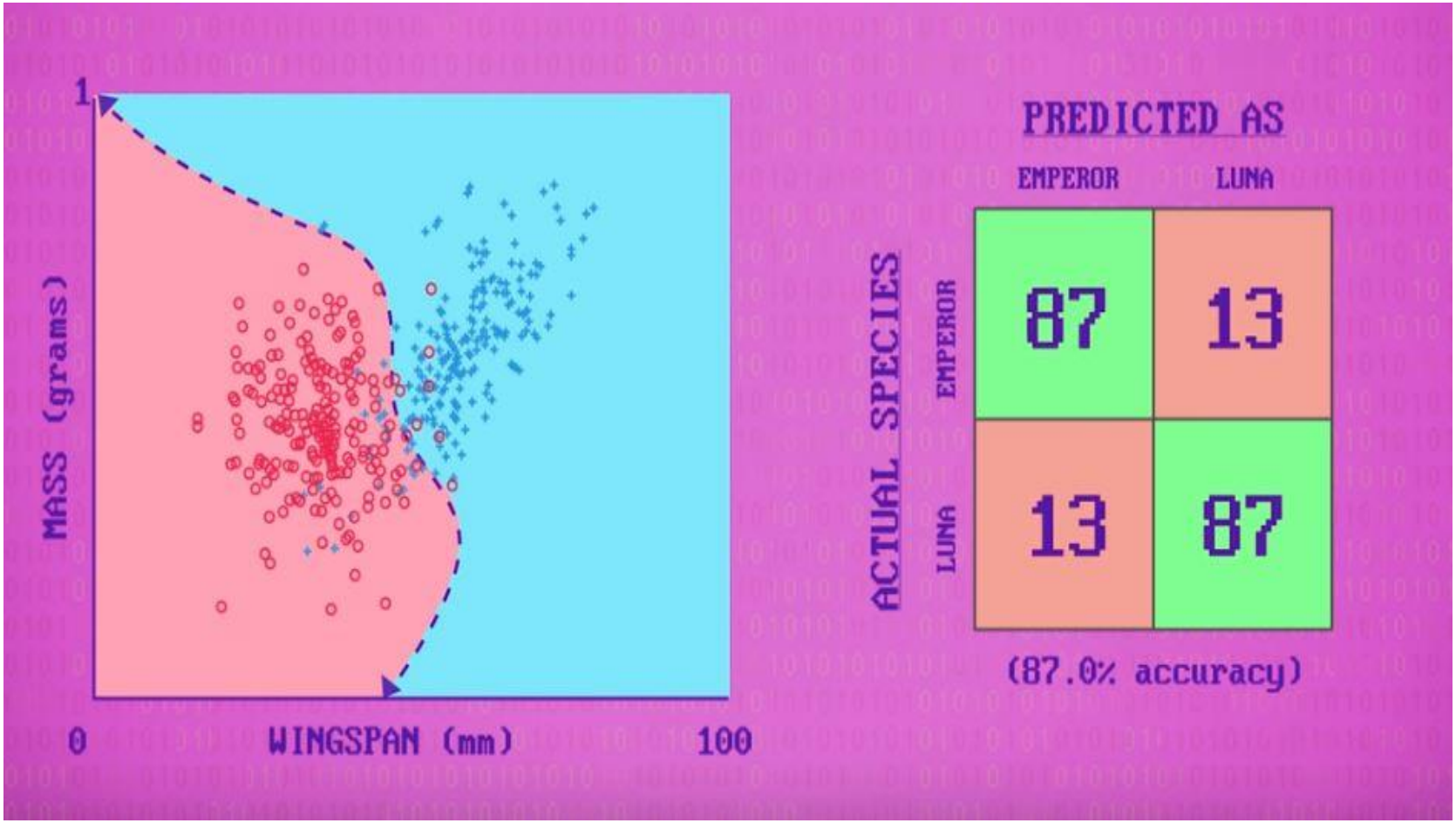

1
MASS (grams)
0
WINGSPAN (mm)
100
LUNA MOTH
EMPEROR MOTH


1
MASS (grams)
0
WINGSPAN (mm)
100
LUNA MOTH
EMPEROR MOTH


1
MASS (grams)
0
WINGSPAN (mm)
100
LUNA MOTH
EMPEROR MOTH


DECISION BOUNDARY
1
MASS (grams)
DECISION SPACE
0
WINGSPAN (m
CONFUSION MATRIX
EMPEROR
LUNA
ACTUAL SPECIES
EMPEROR
LUNA
86
14
18
82
(84% ACCURACY)


1
MASS (grams)
0
WINGSPAN (mm)
100
PREDICTED AS
EMPEROR
LUNA
ACTUAL SPECIES
EMPEROR
LUNA
83
17
12
88
(85.5% accuracy)


1
MASS (grams)
0
WINGSPAN (mm)
100
PREDICTED AS
EMPEROR
LUNA
ACTUAL SPECIES
EMPEROR
LUNA
87
13
13
87
(87.0% accuracy)

Classifier Evaluation Metrics

$$Accuracy = \frac{T_p + T_n}{T_p + T_n + F_p + F_n}$$

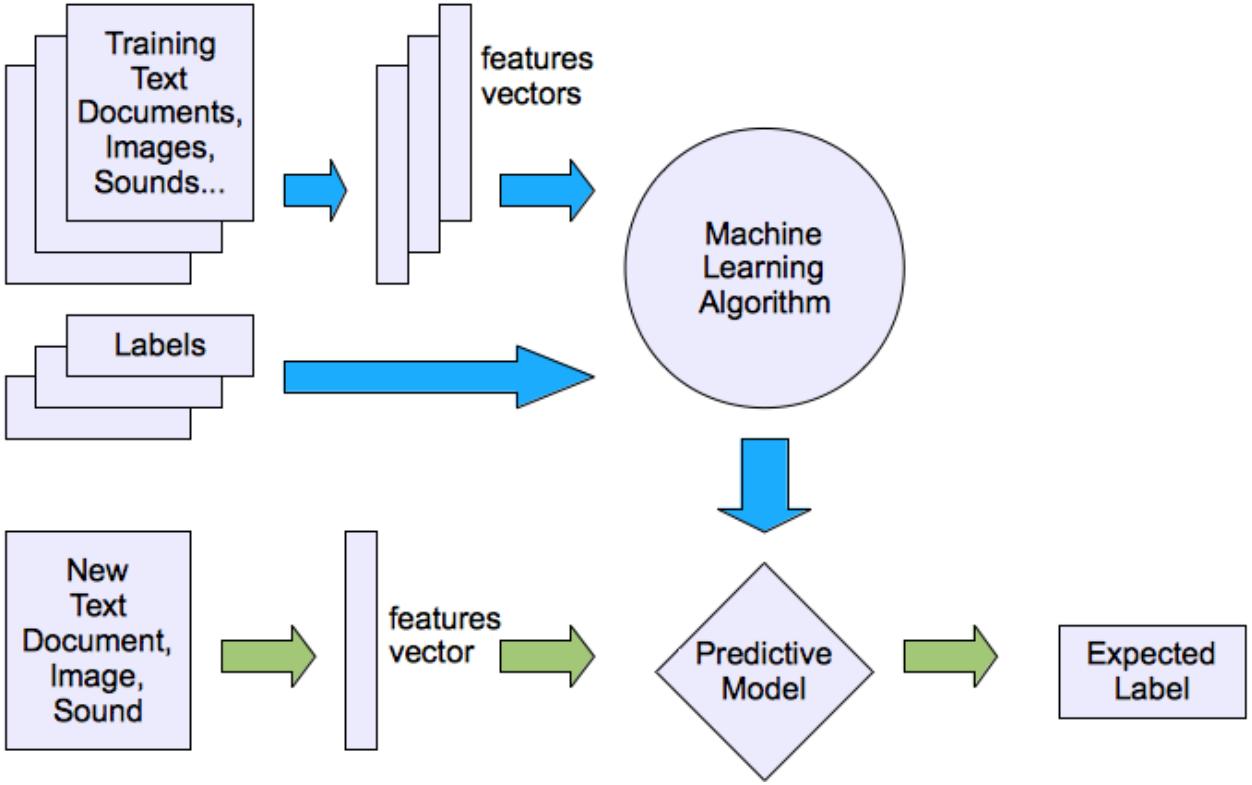
$$Precision = \frac{T_p}{T_p + F_p}$$

$$Recall = \frac{T_p}{T_p + T_n}$$

$$F_1 = 2 \cdot \frac{precision \cdot recall}{precision + recall}$$

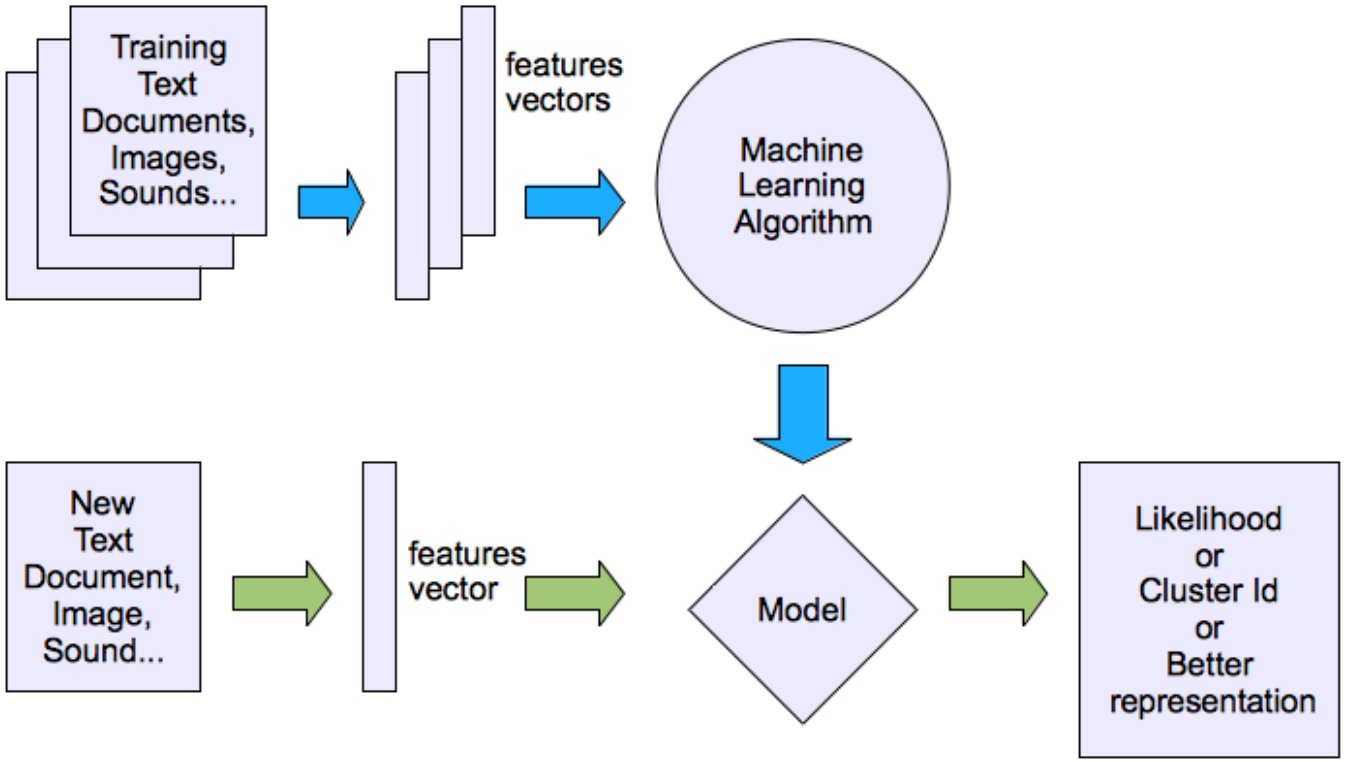
Machine learning structure

- Supervised learning



Machine learning structure

- Unsupervised learning



"A breakthrough in Machine Learning would be worth ten Microsofts." -Bill Gates