هوش مصنوعی
و
یادگیری عمیق

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CLASS.VISION

What is Deep Learning?!

Some terms …

Backpropagation

Convolutional Nets

Deep Belief Nets

non-linearity

What is Deep Learning?!

Big Deep Learning researchers…

Andrew Ng

Geoffrey Hinton

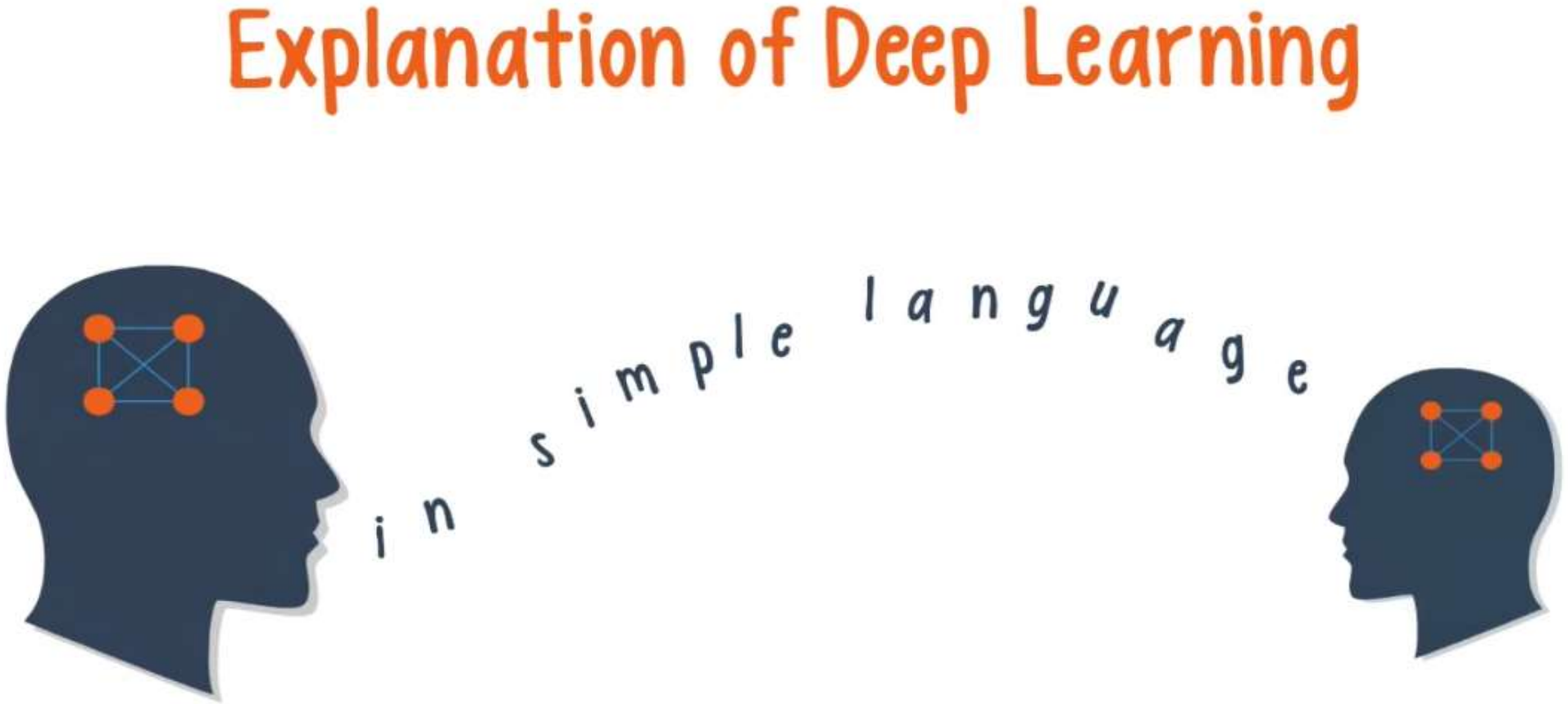
Yoshua Bengio

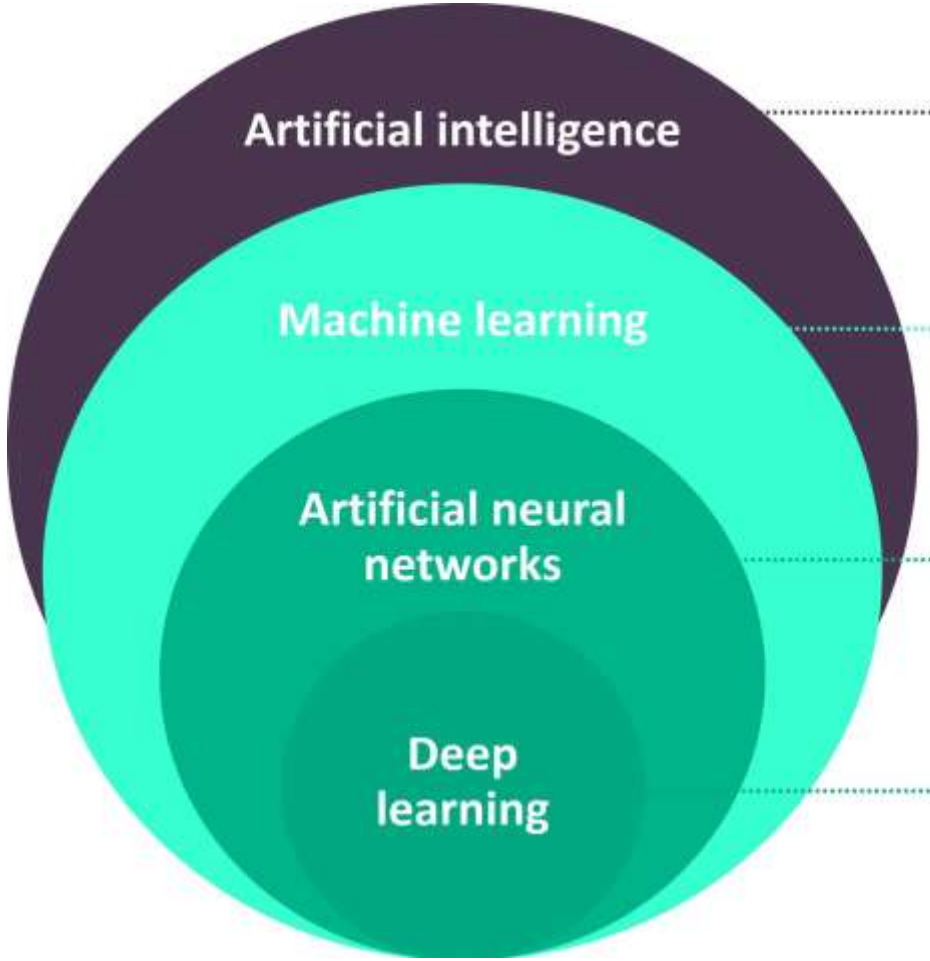
Andrej Karpathy

Yann LeCun

Ian Goodfellow

Explanation of Deep Learning



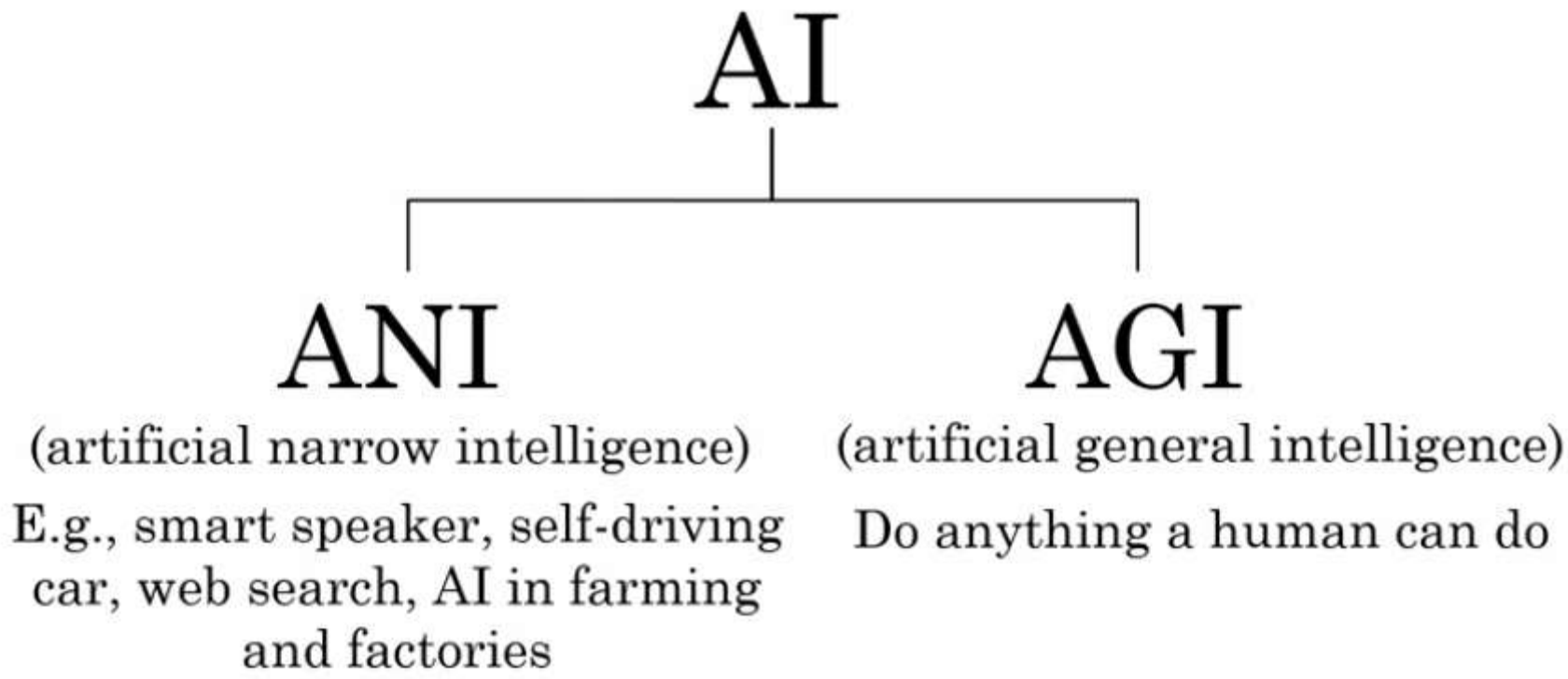


Artificial intelligence (AI)
Any techniques that enable machines to solve a task in a way like humans do

Machine learning (ML)
Algorithms that allow computers to learn from examples without being explicitly programmed

Artificial neural networks (ANN)
Brain-inspired machine learning models

Deep learning (DL)
A subset of ML which uses deep artificial neural networks as models and automatically builds a hierarchy of data representations


AI
ANI
(artificial narrow intelligence)
E.g., smart speaker, self-driving car, web search, AI in farming and factories
AGI
(artificial general intelligence)
Do anything a human can do

François Chollet
@fchollet

Training ever bigger convnets and LSTMs on ever bigger datasets gets us closer to Strong AI -- in the same sense that building taller towers gets us closer to the moon.

مقدمه‌ای بر یادگیری ماشین

Introduction to Machine Learning

یادگیری ماشین چیست؟

[Machine Learning is the] field of study that gives computers the ability to learn without being explicitly programmed.

—Arthur Samuel, 1959

Image Classification: a core task in Computer Vision

(assume given set of discrete labels)
{dog, cat, truck, plane, ...}

→ **cat**

Challenges: Illumination

Challenges: Deformation




Challenges: Occlusion

Challenges: Background clutter

Challenges: Intraclass variation

An image classifier

```
def predict(image):
    # ????
    return class_label
```

Unlike e.g. sorting a list of numbers,

no obvious way to hard-code the algorithm for recognizing a cat, or other classes.

Data-driven approach:

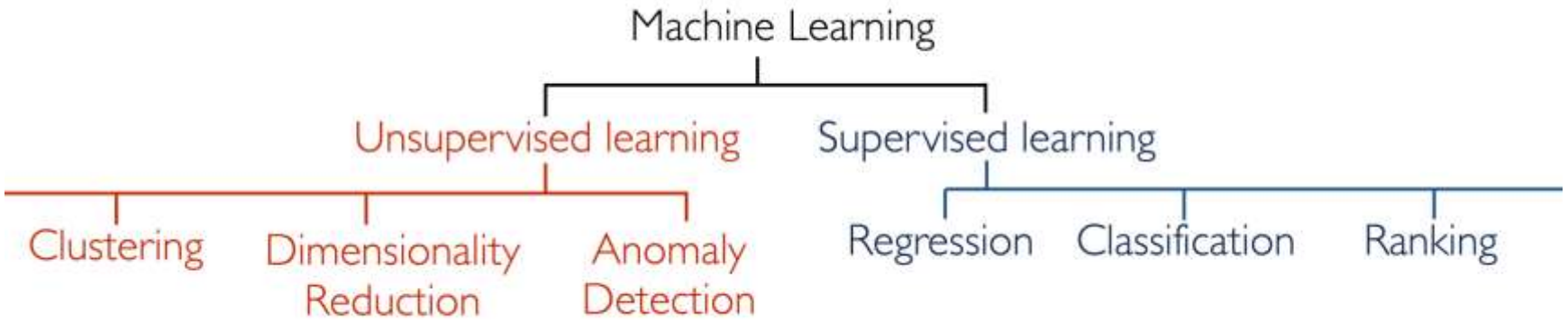
1. Collect a dataset of images and labels
2. Use Machine Learning to train an image classifier
3. Evaluate the classifier on a withheld set of test images

```
def train(train_images, train_labels):
  # build a model for images -> labels...
  return model

def predict(model, test_images):
  # predict test_labels using the model...
  return test_labels
```

انواع الگوریتم‌های یادگیری ماشین

- Supervised Learning – یادگیری نظارت شده
- Unsupervised Learning – یادگیری بدون ناظر
- Reinforcement Learning – یادگیری تقویتی



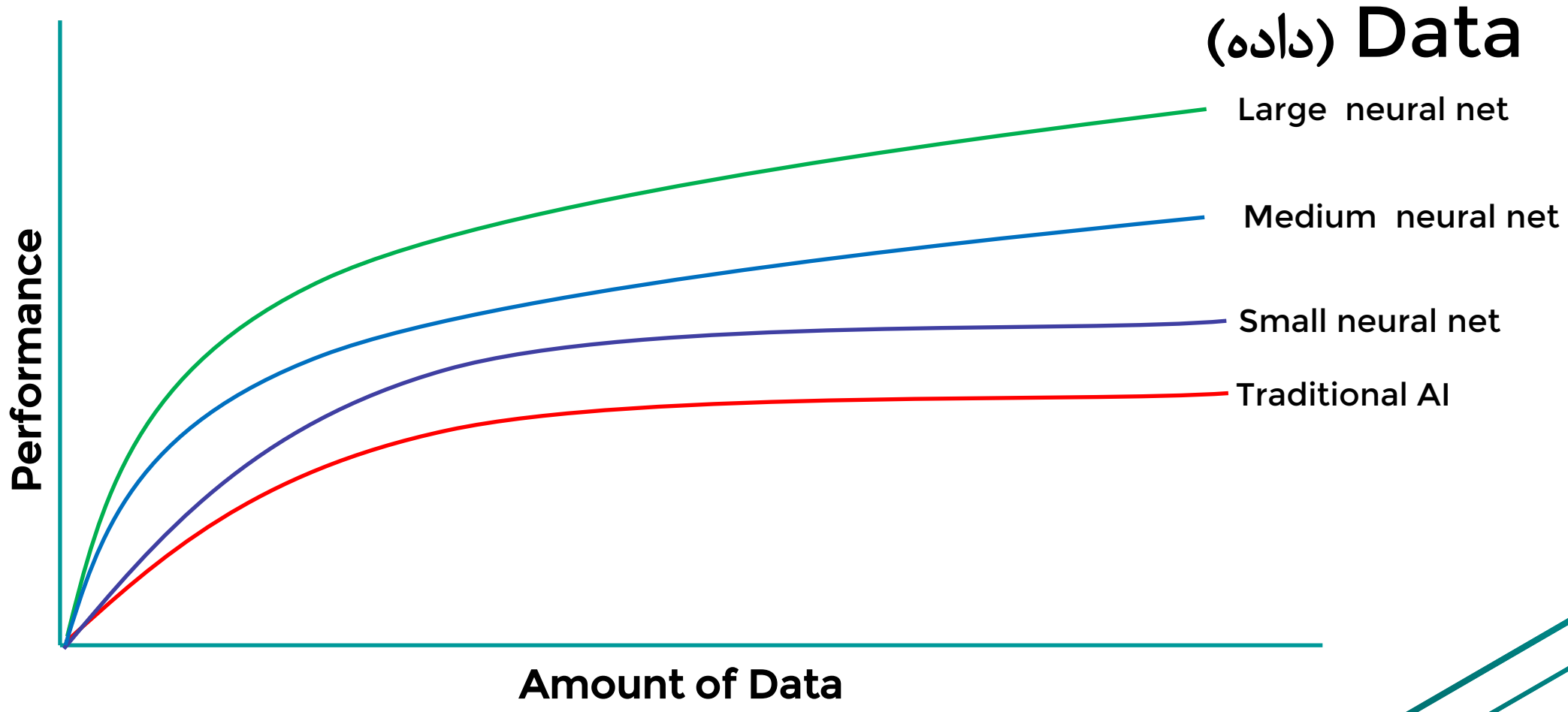
Supervised Learning (یادگیری نظارت شده)

Input

Output

Supervised Learning (یادگیری نظارت شده)

Input(A)	Output(B)	Application
email	Spam(0/1)	Spam filtering
audio	Text transcript	Speech recognition
English	Persian	Machine Translation
Add/User Info	Click?(0/1)	Online advertising
Image/radar info	Position of other cars	Self-driving car
Image of phone	Defect?(0/1)	Visual inspection


Data (داده)
Large neural net
Medium neural net
Small neural net
Traditional AI
Performance
Amount of Data

Data (داده)

size of house (square feet)	# of bedrooms	price (1000$)
523	1	115
645	1	150
708	2	210
1034	3	280
2290	4	355
2545	4	440

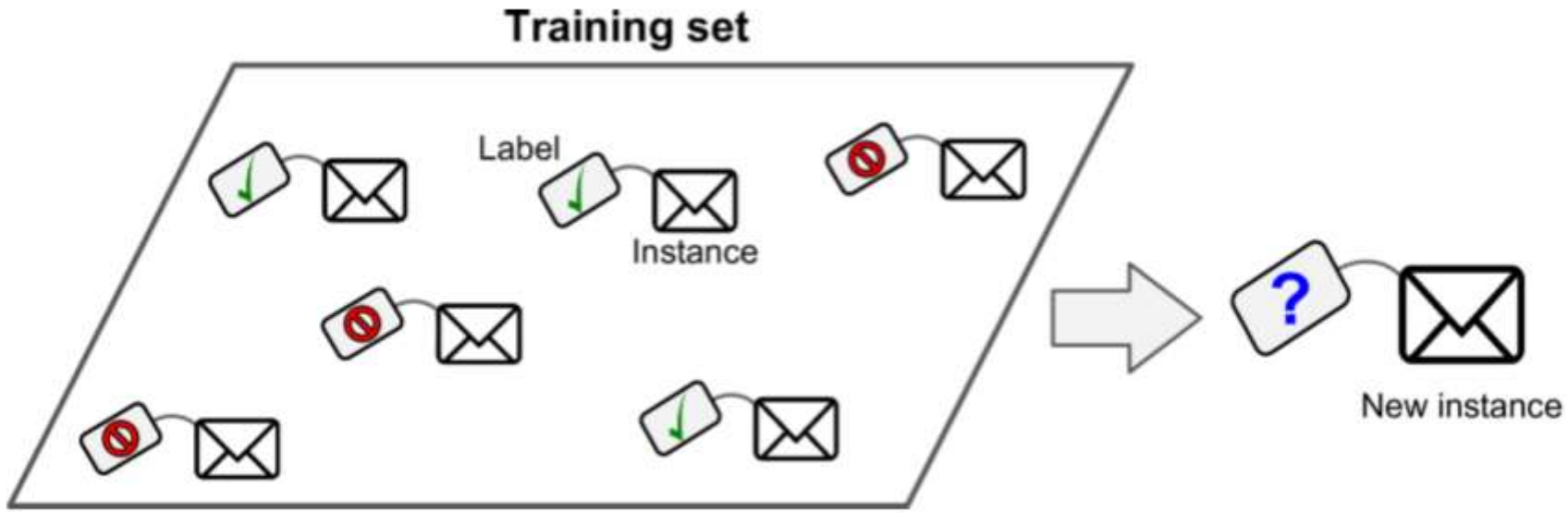
image	label
	cat
	not cat
	cat
	not cat

Supervised Learning (یادگیری نظارت شده)

- Supervised Learning uses **labeled** data to predict a label given some features.
- If the label is continuous its called a **regression** problem, if its categorical it is a **classification** problem.

classification (طبقه بندی)

- In supervised learning, the training data you feed to the algorithm includes the desired solutions, called **labels**



A labeled training set for supervised learning (e.g., spam classification)

https://twitter.com/doomie/status/1139249234891329536