Supervised learning

Definition of supervised learning, Regression versus Classification

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Machine Learning

- was coined by Arthur Samuel in 1959 to describe the subfield of computer science.
- Involves the "programming of a digital computer to behave in a way which, if done by human beings or animals, would be described as involving the process of learning".
- Also him: "the field of study that gives computers the ability to learn without being explicitly programmed"

Figure: Arthur Samuel who coined the term 'Machine Learning' [Source]

Machine learning algorithms

1. Supervised learning ⟵ *We will be here soon!* ☺
2. Unsupervised learning
3. Reinforcement learning

Equally important: Practical advice for applying machine learning algorithms

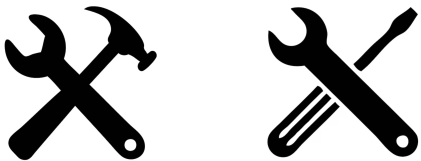
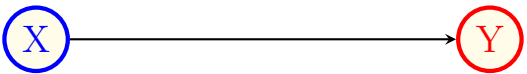
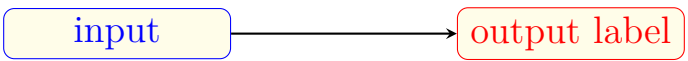


Figure: Not just the tools but also how to use them ☺

Supervised learning



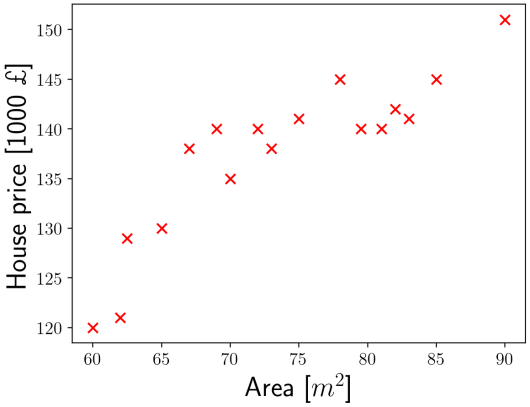


Learns from being given "right answers"

Supervised learning: Some applications

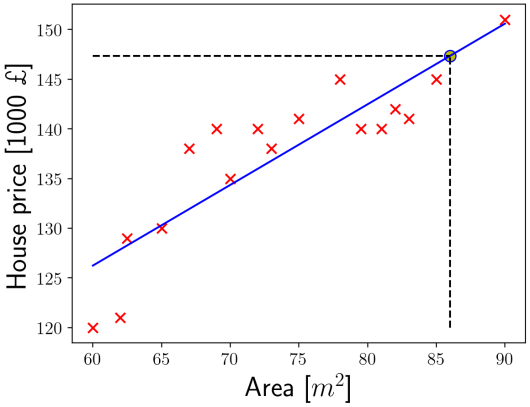
Input (X)	Output (Y)	Application
email	spam (0/1)	spam filtering
audio	text transcripts	speech recognition
English	Spanish	machine translation
ad, user info	click??? (0/1)	online advertising
image, radar info	position of other cards	self-driving car
image of phone	detect (0/1)	visual inspection

Regression problem



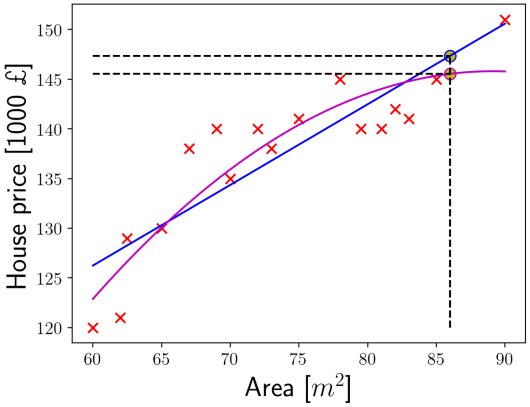
Fantasized price house in Glasgow (based on lecturer's experience)

Regression problem



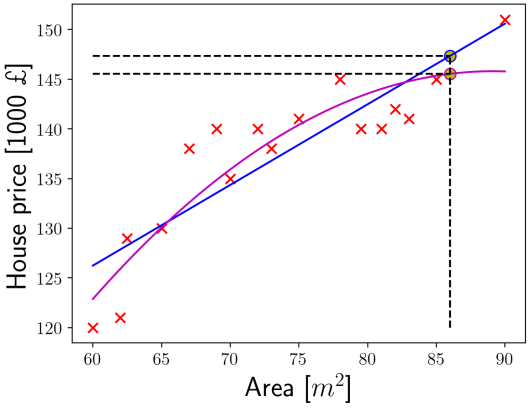
What is the price of house of area $= 86m^2$? $\rightarrow$maybe a linear line?

Regression problem



What is the price of house of area $= 86m^2$? $\rightarrow$maybe a curve?

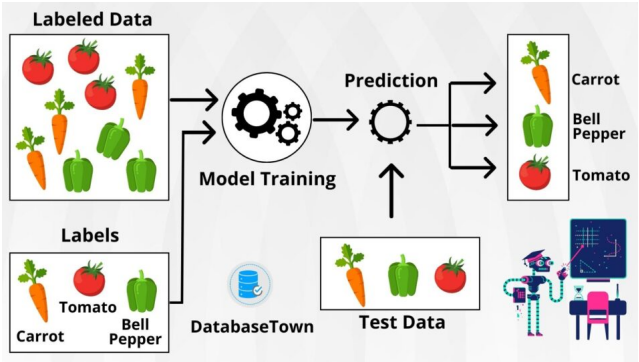
Regression problem



Regression: predict a number

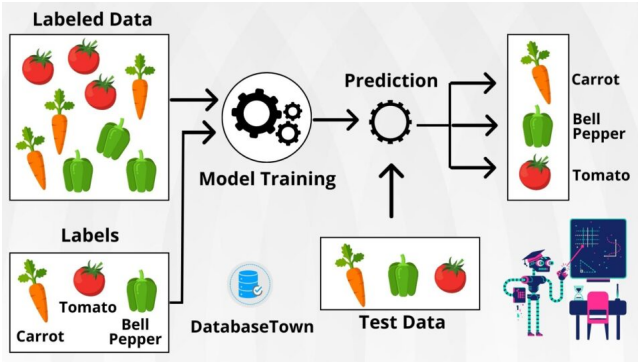
essentially, infinitely many possible outputs $\longleftrightarrow$ continuous output range

Classification problem



Given an image of a vegetable, can the machine tell whether it is carrot, paprika or tomato?

Classification problem



Classification: predict categories/classes

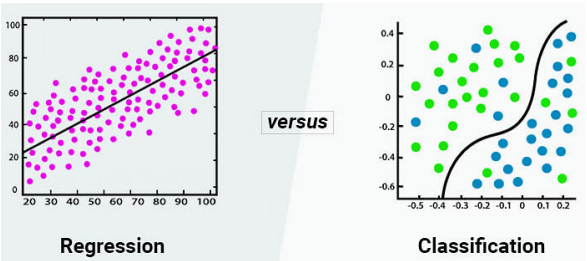
class and category are used interchangeably

small number of possible outputs $\longleftrightarrow$ finite set of outputs

Supervised learning: Regression vs Classification

Supervised learning: Learn from being given "right answers"

Regression	Classfication
predict a number	predict categories
infinitely many possible outputs	small number of possible outputs
find a curve fitting	find decision boundaries



The hype of AI and some criticisms

- In “Neural Networks and Statistical Models” Warren S. Sarle wrote “the most commonly used artificial neural networks, called multilayer perceptrons, are nothing more than nonlinear regression and discriminant models that can be implemented with standard statistical software.” [Source: Forbes]
- In 2019, Facebook’s top AI researcher and Turing Award-winner Yann LeCun declared that “Our best AI systems have less common sense than a house cat.” [Source: Forbes]
- AI researchers allege that machine learning is alchemy [Source: Science]
- The way we train AI is fundamentally flawed. [Source: MIT Technology Review]

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One of my favorite jokes

But is it Joke or Truth?

Machine learning = Statistics + Computer Science