Introduction to Machine Learning

Knowledge Sharing for CPE/SKE students

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Outline

What is Machine Learning?

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   - ▶ Recaptcha helps stop millions of spam a day.

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- This is Recaptcha.
    - Recaptcha helps stop millions of spam a day.
    - In some old days, we have to type Captcha texts to distinguish ourself from bots.
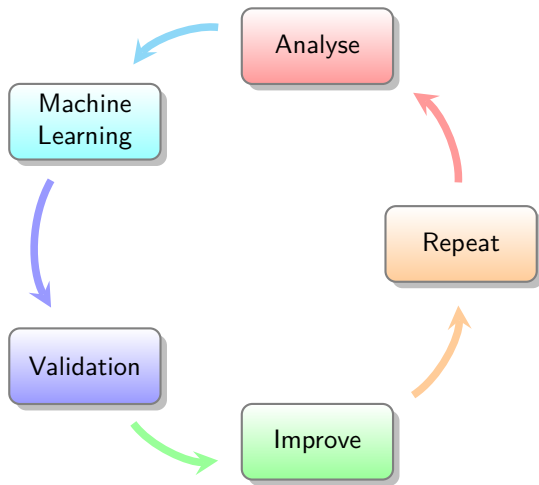
What is Machine Learning?

- This is Recaptcha.
    - Recaptcha helps stop millions of spam a day.
    - In some old days, we have to type Captcha texts to distinguish ourself from bots.
    - How is it possible that with a single click, an automated system can distinguish bots from humans?

Traditional programming approach
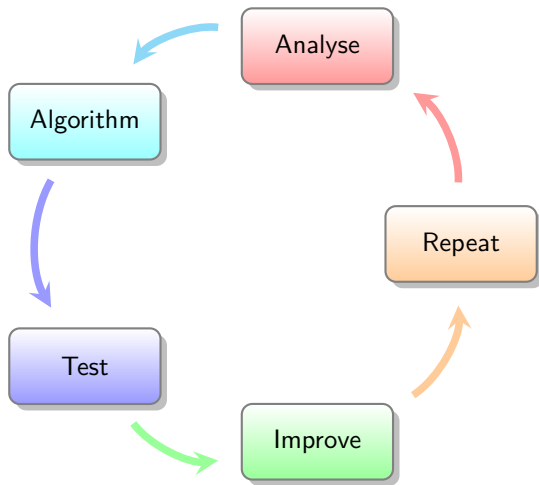
Machine learning approach

In other words...

Machine Learning

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Machine Learning
$$= \text{Data} + \text{Data analysis algorithm}$$

Machine Learning

$$= \text{Data} + \text{Data analysis algorithm}$$

$$= \text{Adapt to change}$$

Types of Machine Learning problems

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1. Supervised learning

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2. Unsupervised learning

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3. Reinforcement learning

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Determined by

Labels

Supervised learning

Unsupervised learning

Reinforcement learning

Model

Model

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- A result of the combination between...

Model

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  - a **method** to recognise the data, and

Model

- A result of the combination between...
  - a **method** to recognise the data, and
  - **sample datas** for such the method

Model

Model

Determine which group should the purple dot be in (red/green/blue) by **checking the colour of its nearest dot.**

Model

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Data

Model

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the purple dot be in
(red/green/blue) by **checking
the colour of its nearest dot.**

Data   Method

Good model?

How should we *draw* the line to predict this data?

Good model

Blue, red, or green line?

Overfitting and underfitting

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   - Our model **fails to know the data's trends**

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   - Resulting in failure to predict further data
2. Overfitting
   - Our model **memorise instead of generalise**
   - Resulting in failure to catch the trend

Good model

Good model
must generalise