

# INTRODUCTION TO MACHINE LEARNING

KNOWLEDGE SHARING FOR CPE/SKE STUDENTS

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STUDENT, KASETSART U.

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## 1 Introduction to Machine Learning

- What is Machine Learning?

  - Traditional programming approach

  - Machine learning approach

## 2 Types of Machine Learning Problems

- Supervised learning

- Unsupervised learning

- Reinforcement learning

## 3 Model

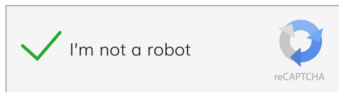
- A good model

  - Overfitting and underfitting

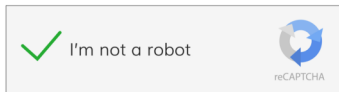
# **INTRODUCTION TO MACHINE LEARNING**

# WHAT IS MACHINE LEARNING?

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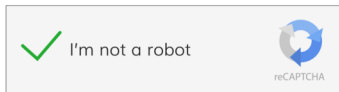


# WHAT IS MACHINE LEARNING?



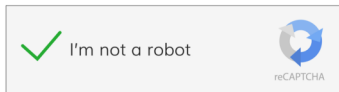
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# WHAT IS MACHINE LEARNING?



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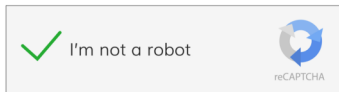


## ■ This is Recaptcha.

- ▶ Recaptcha helps stop millions of spam a day.
- ▶ In some old days, we have to type Captcha texts to distinguish ourself from bots.



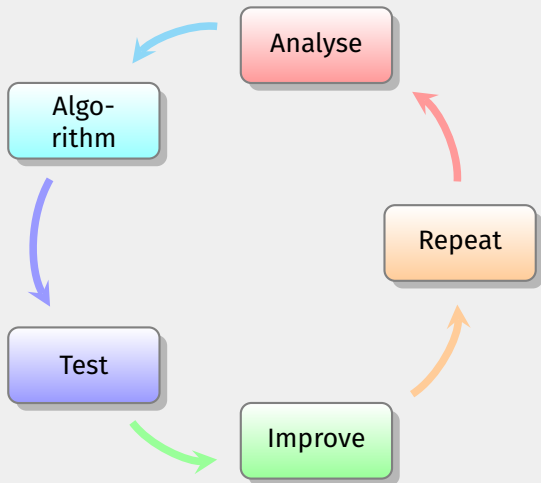
# WHAT IS MACHINE LEARNING?



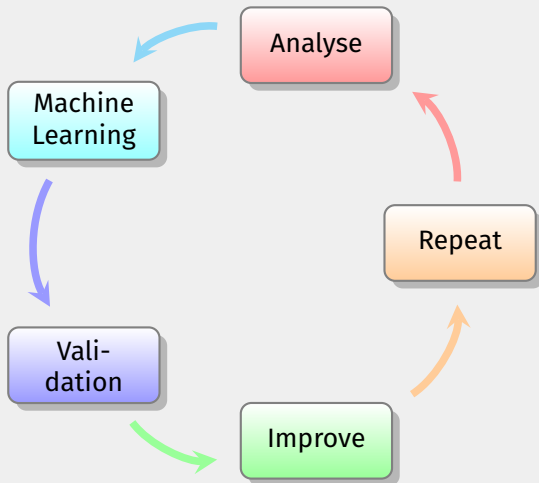
## ■ This is Recaptcha.

- ▶ 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



Machine Learning

Machine Learning

= Data + Data analysis algorithm

Machine Learning

= Data + Data analysis algorithm  
= Adapt to change

# **TYPES OF MACHINE LEARNING PROBLEMS**

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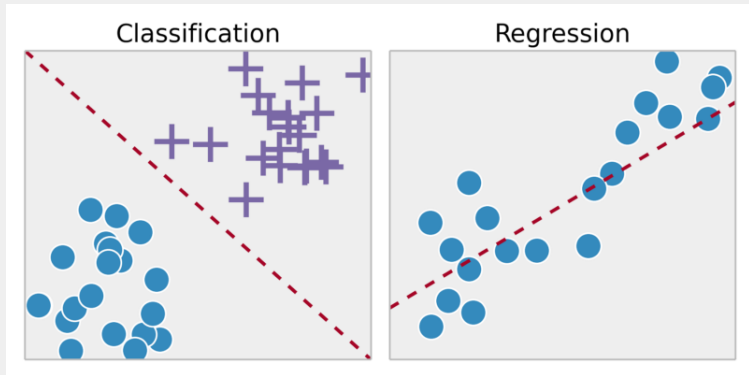
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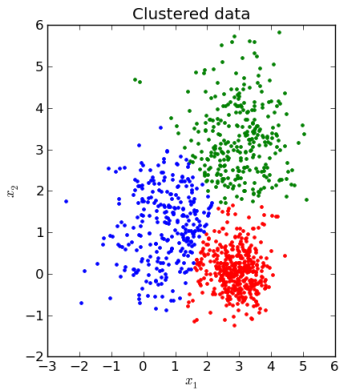
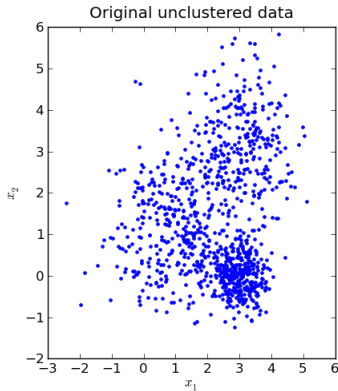
Determined by

**Labels**

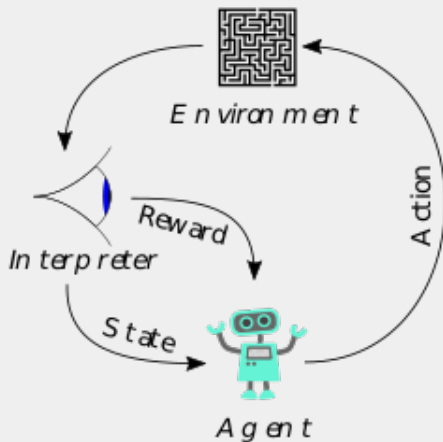
# SUPERVISED LEARNING



# UNSUPERVISED LEARNING



# REINFORCEMENT LEARNING



**MODEL**





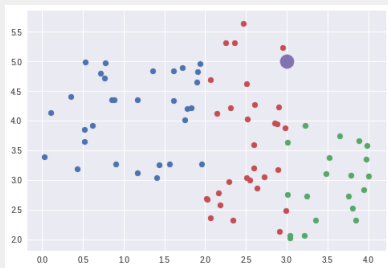
- A result of the combination between...

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

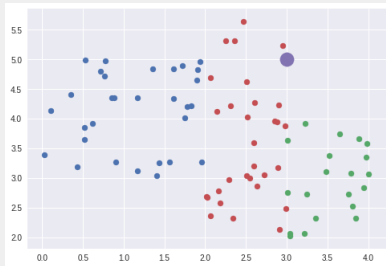
- A result of the combination between...
  - ▶ a **method** to recognise the data, and
  - ▶ **sample datas** for such the method



# MODEL

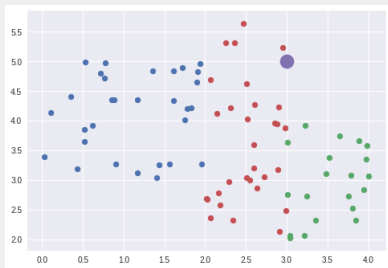


# MODEL



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

# MODEL

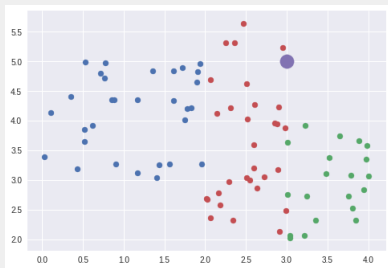


Determine which group should the purple dot be in (red/green/blue) by **checking the colour of its nearest dot.**

Data



# MODEL



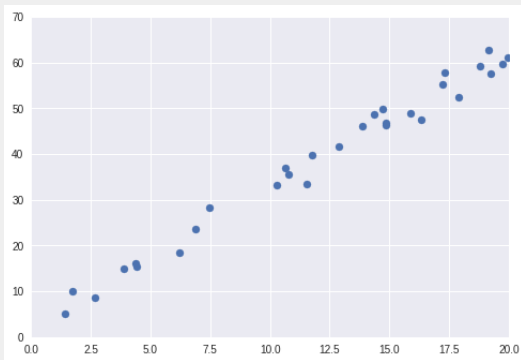
Data

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

Method

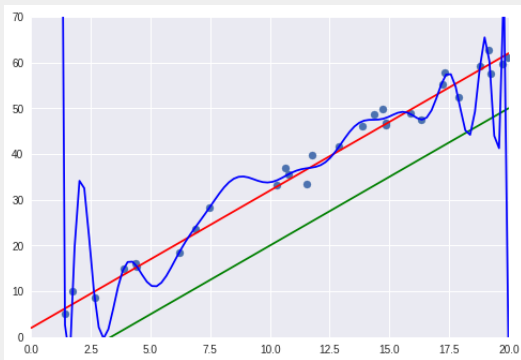
Good model?

# GOOD MODEL



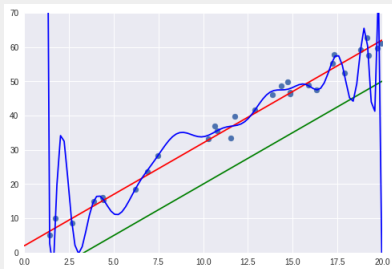
How should we *draw* the line to predict this data?

# GOOD MODEL



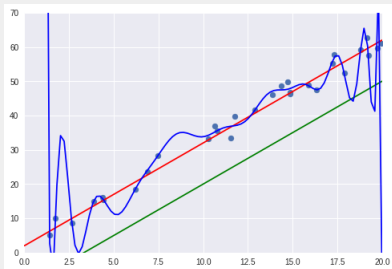
Blue, red, or green line?

# OVERFITTING AND UNDERFITTING

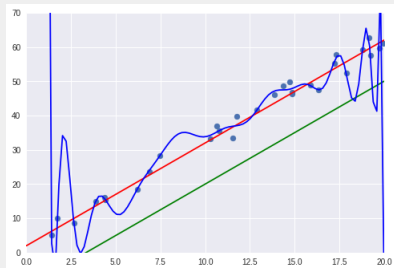


# OVERFITTING AND UNDERFITTING

## 1. Underfitting



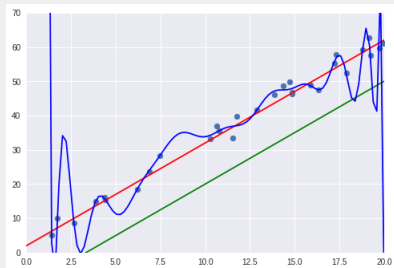
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## 1. Underfitting

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

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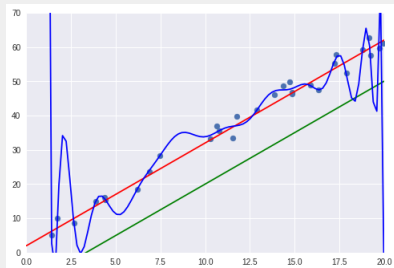


## 1. Underfitting

- ▶ Our model **fails to know the data's trends**
- ▶ Resulting in failure to predict further data



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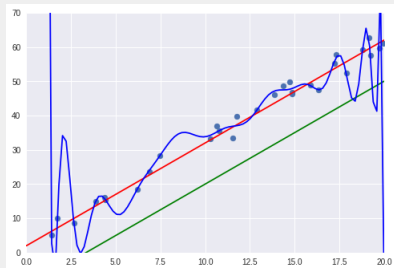


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## 2. Overfitting

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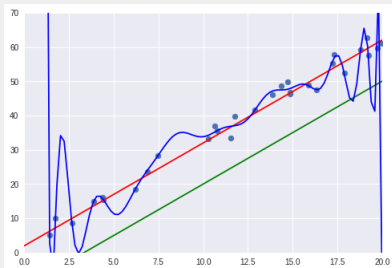
## 1. Underfitting

- ▶ Our model **fails to know the data's trends**
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## 2. Overfitting

- ▶ Our model **memorise instead of generalise**

# OVERFITTING AND UNDERFITTING



## 1. Underfitting

- ▶ Our model **fails to know the data's trends**
- ▶ Resulting in failure to predict further data

## 2. Overfitting

- ▶ Our model **memorise instead of generalise**
- ▶ Resulting in failure to catch the trend

Good model must **generalise**