機器學習
Naive Bayes

授課老師：林彥廷

貝氏定理（Bayes' theorem）

- 貝氏定理是機率論中的一個定理，描述在已知一些條件下，某事件的發生機率。


大家不要紧张
我本身是一个汽车维修员

貝氏定理（Bayes' theorem）

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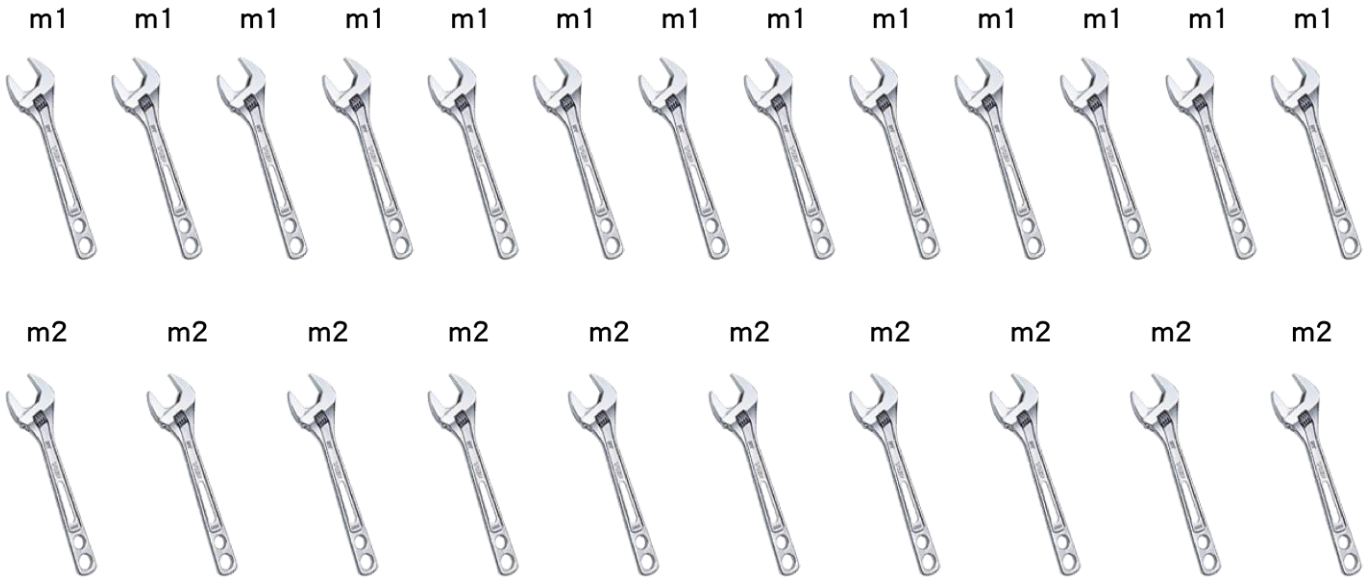
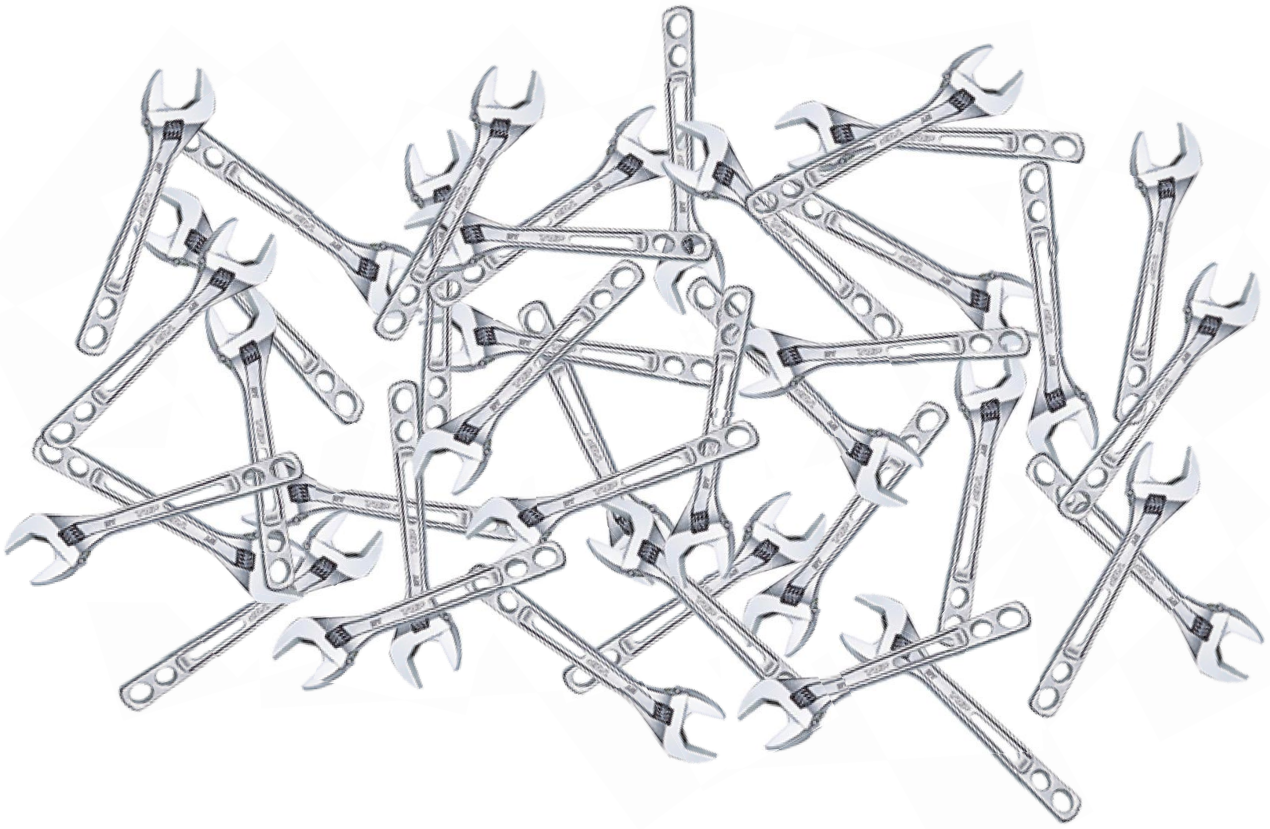


貝氏定理（Bayes' theorem）



貝氏定理（Bayes' theorem）

What's the probability?

m2

貝氏定理（Bayes' theorem）

$$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$$

貝氏定理（Bayes' theorem）

Mach1: 30 wrenches/hr
Mach2: 20 wrenches/hr

Out of all produced parts:
We can SEE that 1% are defective

Out of all defective parts:
We can SEE that 50% came from mach1
And 50% came from mach2

Question:
What is the probability that a part
produced by mach2 is defective = ?

貝氏定理（Bayes' theorem）

Mach1: 30 wrenches/hr **→P(Mach1) = 30/50 = 0.6**
Mach2: 20 wrenches/hr **→P(Mach2) = 20/50 = 0.4**

Out of all produced parts:
We can SEE that 1% are defective **→P(Defect) = 1%**

Out of all defective parts:
We can SEE that 50% came from mach1 **→P(Mach1|Defect) = 50%**
And 50% came from mach2 **→P(Mach2|Defect) = 50%**

Question:
What is the probability that a part produced by mach2 is defective = ? **→P(Defect|Mach2) = ?**

貝氏定理（Bayes' theorem）

Mach1: 30 wrenches/hr ~~→P(Mach1) = 30/50 = 0.6~~
Mach2: 20 wrenches/hr →P(Mach2) = 20/50 = 0.4

Out of all produced parts:
We can SEE that 1% are defective →P(Defect) = 1%

Out of all defective parts:
We can SEE that 50% came from mach1 ~~→P(Mach1|Defect) = 50%~~
And 50% came from mach2 →P(Mach2|Defect) = 50%

Question:
What is the probability that a part produced by mach2 is defective = ? →P(Defect|Mach2) = ?

貝氏定理（Bayes' theorem）

Mach1: 30 wrenches/hr
Mach2: 20 wrenches/hr
Out of all produced parts:
We can SEE that 1% are defective
Out of all defective parts:
We can SEE that 50% came from mach1
And 50% came from mach2
Question:
What is the probability that a part produced by mach2 is defective = ?

→P(Mach2) = 20/50 = 0.4
→P(Defect) = 1%
→P(Mach2|Defect) = 50%
→P(Defect|Mach2) = ?

$$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$$

$$\mathbf{P(Defect|Mach2) = \frac{P(Mach2|Defect) * P(Defect)}{P(Mach2)}}$$

貝氏定理（Bayes' theorem）

Mach1: 30 wrenches/hr
Mach2: 20 wrenches/hr
Out of all produced parts:
We can SEE that 1% are defective
Out of all defective parts:
We can SEE that 50% came from mach1
And 50% came from mach2
Question:
What is the probability that a part produced by mach2 is defective = ?

→P(Mach2) = 20/50 = 0.4
→P(Defect) = 1%
→P(Mach2|Defect) = 50%
→P(Defect|Mach2) = ?

$$P(\text{Defect}|\text{Mach2}) = \frac{0.5 * 0.01}{0.4} = 0.0125 = 1.25\%$$

$$P(\text{Defect}|\text{Mach2}) = \frac{P(\text{Mach2}|\text{Defect}) * P(\text{Defect})}{P(\text{Mach2})}$$

貝氏定理（Bayes' theorem）

$$P(Defect|Mach2) = \frac{P(Mach2|Defect) * P(Defect)}{P(Mach2)} = 1.25\%$$

Let's look at an example:

- **1000 wrenches**
- **400 came from Mach2**
- **1% have a defect = 10**
- **of them 50% came from Mach2 = 5**
- **% defective parts from Mach2 = 5/400 = 1.25%**

貝氏定理（Bayes' theorem）

$$P(\text{Defect}|\text{Mach2}) = \frac{P(\text{Mach2}|\text{Defect}) * P(\text{Defect}) * 1000}{P(\text{Mach2}) * 1000} = 1.25\%$$

Let's look at an example:

- 1000 wrenches
- 400 came from Mach2
- 1% have a defect = 10
- of them 50% came from Mach2 = 5
- % defective parts from Mach2 = 5/400 = 1.25%

貝氏定理（Bayes' theorem）

P(Defect|Mach1) = ？

THE END

ytlin@mail.nptu.edu.tw