Recap

27 June 2023 18:48

1st Lecture

Basics

2 lecture

- Log prob
- Smoothing
- Types of NB
  - Gaussian
  - categorical
  - Multinomial
  - Bernoulli

logic

Out of Core NB

Compliment NB

Probability Distributions

27 June 2023 08:03

An engineering college has a placement rate of 0.3, meaning that any given student has a 0.3 chance of getting placed through campus recruitment. If you randomly select a student, what is the probability that the student is:

1. Placed? → 0.3
2. Not placed? → 0.7

p(placed) = 0.3

p(not placed) = 0.7

Bernoulli → (X) = {0, 1}

1 trial

1 - place

0 - not place

$P(x=k) = p^k + (1-p)^{(1-k)}$

k = 0, 1

p = prob of getting 1

(1-p) (p)

An engineering college has a placement rate of 0.3, meaning that any given student has a 0.3 chance of getting placed through campus recruitment. If you randomly select 10 students, what is the probability that:

1. 9 out of 10 students get placed? →
2. 3 out of 10 students get placed?

n trials = 1

Binomial distribution

→ P P P P . . . . . P N

0.3 0.3 0.3 0.3 0.7

n = 10

k = 3

↓

Bernoulli

$(0.3)^9 (0.7)^1$

$\boxed{10C_9 (0.3)^9 (0.7)^1}$

[N P P P P P P]

Small

$\boxed{10 \times 0.0000}$ small prun

$10 \times$ small

$$\boxed{p(x) = {}^{n}C_{k}\,(p)^{k}\,(1-p)^{n-k}}$$ pmf

An engineering college has a placement system where any given student has a 0.3 chance of getting placed through campus recruitment, a 0.05 chance of opting out of the placement process, and a 0.65 chance of trying but not getting placed. If you randomly select a student, what is the probability that the student:

trial = 1
n = 1

1. Gets placed?
2. Doesn't get placed but doesn't opt out either? → (0.65)
3. opts out of placement?

$P(\text{placed}) = 0.3$
$P(\text{optout}) = \boxed{0.05}$
$P(\text{not placed}) = 0.65$

not binary
categorical
↓
more than 2 category

↳ Distribution
↳ Categorical Distribution
↳ Multinoulli distribution

An engineering college has a placement system where any given student has a 0.3 chance of getting placed through campus recruitment, a 0.05 chance of opting out of the placement process, and a 0.65 chance of trying but not getting placed. If you randomly select 10 students, what is the probability that:

$\boxed{n = 10}$

1. 3 students get placed, 1 student opts out of placement, and 6 students try but do not get placed?
2. No student gets placed, 2 students opt out of placement, and 8 students try but do not get placed?

$P(\text{placed}) = 0.3$
$P(\text{optout}) = 0.05$

p(placed) = 0.3

p(optout) = 0.05

p(notplaced) = 0.65

3 placed 1 optout 6 notplaced

k = no of categ

PPP O NNNNNN

$(0.3)^3 (0.05)^1 (0.65)^6$

$$\frac{n!}{n_1!\, n_2!\, n_3! \ldots n_k!}$$

$$\boxed{\frac{10!}{3!\,1!\,6!}} (0.3)^3 (0.05)^1 (0.06)^6$$

$$\frac{10!}{0!\,2!\,8!} (0.3)^0 (0.05)^2 (0.65)^8$$

Multinomial distribution

Definitions

27 June 2023 08:35

The Bernoulli distribution is a discrete probability distribution that models the outcomes of a binary random variable.

The binomial distribution is a discrete probability distribution that models the number of successes in a fixed number of independent Bernoulli trials. $n \rightarrow$

The categorical distribution is a discrete probability distribution that models the probabilities of different outcomes in a categorical or discrete random variable.
Unlike the Bernoulli or binomial distributions that deal with binary outcomes, the categorical distribution accommodates multiple categories or outcomes. Each category has an associated probability, and the sum of the probabilities for all categories is equal to 1.

$$p(x=k) = P_k$$

die $\rightarrow$ 1 2 3 4 5 6

$p(X=1) = \frac{1}{6}$

$p(x=2) = \frac{1}{6}$

Multinomial distribution allows us to calculate the probability of observing a specific count or combination of counts for each category in a fixed number of trials.

50 50 5

r b g

$\boxed{n}$ balls

$\downarrow$

2 red 8 blue 2 green

$\downarrow$ general

$\boxed{\text{Multinomial}}$

K, n

$\boxed{K=2}$, n

Binomial

K, n=1

Multinoulli (categorical)

K=2 n=1

Bernoulli

Why did I teach these now?

27 June 2023 08:44

Naive Bayes

✓ Bernoulli NB → Bernoulli

✓ Categorical NB → Cat / Multinomial

✓ Multinomial NB → Multinomial

✓ Gaussian NB

× Complement NB → Multinomial