Tutorial 7 (Wk8): Probability Distributions & Linear Regression

1. Binomial Distribution Model Example

In a computer science module, suppose you take a multiple-choice question test with 10 questions, and each question has 5 answer choices (a, b, c, d, e). What is the probability you get exactly 4 questions correct? Use the **Binomial Distribution Model formula**.

- N (trials) = 10
- K = get exactly 4 questions correct

Use p (success) = $\frac{1}{5}$
Use p (failure) = $\frac{4}{5}$

2. Poisson Distribution Model Examples

Example (i)

A manufacturer produces light-bulbs that are packed into boxes of 100. If quality control studies indicate that 0.5% of the light-bulbs produced are defective, what percentage of the boxes will contain:

(a) no defective bulbs?

(b) 2 or more defective bulbs?

Example (ii)

Suppose it has been observed that, on average, 180 cars per hour pass a specified point on a particular road in the morning rush hour. Due to impending roadworks, it is estimated that congestion will occur closer to the city centre if more than 5 cars pass the point in any one minute. What is the probability of congestion occurring?

3. Multiple Linear Regression

Unlike simple linear regression, multiple linear regression allows more than two independent variables to be considered. The goal is to estimate a variable based on several other variables. The variable to be estimated is called the response or dependent variable. The variables that are used for the prediction are called explanatory, or independent variables (predictors).

Go through this excellent introduction to Multiple Linear Regression:

https://www.investopedia.com/terms/m/mlr.asp

Multiple Linear Regression

and then try to solve the following example:
Suppose the following houses are for sale:

- A 2-bedroom house with 1 bathroom costs £150,000
- A 3-bedroom house with 1 bathroom costs £200,000
- A 2-bedroom house with 2 bathrooms costs £180,000

Build a multilinear prediction model for the house price based on its number of bedrooms and bathrooms.
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