Sri Lanka Institute of Information Technology

Lab Submission
Lab sheet No 10

IT24100652

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Probability and Statistics | IT2120

B.Sc. (Hons) in Information Technology

Exercise

1. A vending machine owner claims that customers choose the four snack types (A, B, C, D) with equal probability. To test this claim, a researcher records the number of purchases for each snack type during one week and results are given below.

Snack_Type	Count
A	120
B	95
C	85
D	100

i. State the null and alternative hypotheses for the test.

Null Hypothesis (H_0):

- The vending machine owner claims that customers choose each of the four snack types (A, B, C, D) with equal probability. Therefore, the null hypothesis is:
    - The probability of choosing snack A = The probability of choosing snack B = The probability of choosing snack C = The probability of choosing snack D = 0.25 (equal probability for all snack types).

Alternative Hypothesis (H_1):

- The alternative hypothesis is that the probabilities of selecting each snack type are not equal (i.e., at least one snack type is chosen with a different probability than the others).

ii. Perform a suitable chi-squared test to test the null hypothesis.

```r
#Set working Directory
setwd("C:\\Users\\User\\Desktop\\IT24100652_LAB 10")

#Question 1
#Null Hypothesis (H0):
#Customers choose snacks A, B, C, and D equally ? each snack has the same chance of being chosen.

#Alternative Hypothesis (H1):
#Customers do not choose all snacks equally ? at least one snack is more or less popular than the others.

#Question2
# Observed data (number of purchases)
observed <- c(120, 95, 85, 100)

# Expected probabilities (equal probability for all snacks)
expected_prob <- rep(0.25, 4)

# Total number of purchases
total_purchases <- sum(observed)

# Expected counts for each snack (total purchases * 0.25 for each)
expected <- expected_prob * total_purchases

# Perform the chi-squared test
chisq_result <- chisq.test(observed, p = expected_prob)
```

```r
# Output the chi-squared test result
chisq_result

#Question 3
#Since the p-value (0.08966) is more than 0.05, we do not reject the null hypothesis.
#This means there is no strong evidence that customers prefer one snack over another.
#So, we can accept the vending machine owner's claim that all four snack types (A, B, C, D) are chosen equally.
```

```r
> #Set working Directory
> setwd("C:\\Users\\User\\Desktop\\IT24100652_LAB 10")
>
> #Question 1
> #Null Hypothesis (H0):
> #Customers choose snacks A, B, C, and D equally ? each snack has the same chance of being chosen.
>
> #Alternative Hypothesis (H1):
> #Customers do not choose all snacks equally ? at least one snack is more or less popular than the others.
>
> #Question2
> # Observed data (number of purchases)
> observed <- c(120, 95, 85, 100)
>
> # Expected probabilities (equal probability for all snacks)
> expected_prob <- rep(0.25, 4)
>
> # Total number of purchases
> total_purchases <- sum(observed)
>
> # Expected counts for each snack (total purchases * 0.25 for each)
> expected <- expected_prob * total_purchases
>
> # Perform the chi-squared test
> chisq_result <- chisq.test(observed, p = expected_prob)
>
> # Output the chi-squared test result
> chisq_result
```

```
        Chi-squared test for given probabilities

data:  observed
X-squared = 6.5, df = 3, p-value = 0.08966
```

```r
>
> #Question 3
> #Since the p-value (0.08966) is more than 0.05, we do not reject the null hypothesis.
> #This means there is no strong evidence that customers prefer one snack over another.
> #So, we can accept the vending machine owner's claim that all four snack types (A, B, C, D) are chosen equally.
>
```

Data	
chisq_result	List of 9
Values	
expected	num [1:4] 100 100 100 100
expected_prob	num [1:4] 0.25 0.25 0.25 0.25
observed	num [1:4] 120 95 85 100
total_purchases	400

iii. Give your conclusions based on the results.

Since the p-value (0.08966) is greater than 0.05, we fail to reject the null hypothesis at the 5% level of significance.

This means there is not enough statistical evidence to conclude that customers prefer some snack types over others. Therefore, we accept the vending machine owner's claim that customers choose the four snack types (A, B, C, D) with equal probability.