STA 3180 Statistical Modelling: Estimation

Estimation in STA 3180 Statistical Modelling

Estimation is the process of using sample data to make inferences about a population. It is an important part of statistical modelling, as it allows us to make predictions about the population based on the sample data. In this lecture, we will discuss the different types of estimation, how to calculate estimates, and how to interpret the results.

Types of Estimation

There are two main types of estimation: point estimation and interval estimation.

Point estimation is the process of estimating a single value for a population parameter. This can be done using either a sample statistic or a theoretical distribution. For example, if we wanted to estimate the mean height of all students in a school, we could use the sample mean of a random sample of students.

Interval estimation is the process of estimating a range of values for a population parameter. This is done by constructing a confidence interval, which is a range of values that is likely to contain the population parameter with a certain level of confidence. For example, if we wanted to estimate the mean height of all students in a school, we could construct a 95% confidence interval using the sample mean and standard deviation of a random sample of students.

Calculating Estimates

When calculating estimates, it is important to consider the type of estimation being used. For point estimation, the sample statistic or theoretical distribution should be used to calculate the estimate. For interval estimation, the sample statistic and standard deviation should be used to calculate the confidence interval.

For example, let's say we want to estimate the mean height of all students in a school. To do this, we take a random sample of students and calculate the sample mean and standard deviation. We then use these values to calculate the point estimate (the sample mean) and the 95% confidence interval (the sample mean plus or minus 1.96 times the standard deviation).

Interpreting Results

Once the estimates have been calculated, it is important to interpret the results. For point estimates, the estimate should be interpreted as the best guess for the population parameter. For interval estimates, the confidence interval should be interpreted as a range of values that is likely to contain the population parameter with a certain level of confidence.

```
Start of Code
# Calculate the point estimate and 95% confidence interval
sample_mean = np.mean(sample)
sample_std = np.std(sample)
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```
point_estimate = sample_mean
confidence_interval = (sample_mean - 1.96*sample_std, sample_mean +
1.96*sample_std)
print("Point estimate:", point_estimate)
print("95% confidence interval:", confidence_interval)
End of Code
```

Practice Multiple Choice Questions

Q1. What is the purpose of estimation?

A. To make predictions about a population based on sample data

B. To calculate the probability of an event occurring

C. To determine the mean of a population

D. To identify outliers in a dataset

Answer: A. To make predictions about a population based on sample data