M.Sc. in ‚Transportation Systems'

Applied Statistics in Transport

Exercises: Confidence Intervals

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1. In what interval will the mean of a sample of 25 observations from a N(2, σ=4) population lie in 95 percent of the time in repeated sampling?

2. In how many units of the unknown mean the sample mean lies in 99% of the time if the sample size is 9 and the population is N(μ, σ=1.5)?

3. Find a 90% confidence interval for the population mean in a sample of size 25 from N(μ, σ=3) using the sample mean equal to 11.

4. Speed measurements for a random sample of 50 cars on a specific road section have shown an average speed of $\overline{x} = 80km/h$. The variance of speed on this road section is known from various studies that were done in the past: $\sigma^2 = 100km^2/h^2$. What is the 95% confidence interval for the expected value of speeds μ?

5. Continuation of 4: Speed measurements for a random sample of 50 cars on a specific road section have shown an average speed of $\overline{x} = 80km/h$. We assume now that the population variance is unknown and has to be estimated by the sample variance. The estimated sample variance is $s^2 = 100km^2/h^2$. What is the 95% confidence interval for the expected value of speeds μ? Compare the results with the answers from exercise 4.

6. 16 holes were bored to check the thickness of the road surface, they showed an average thickness of $\overline{x} = 3\ cm$; the sample standard deviation was $s = 0.5\ cm$. Does the requested value $\mu_r = 3.5\ cm$ lie in the confidence interval that includes the true mean thickness of the road surface with a 95% probability?

7. A random sample of 600 households resulted in 120 households with a monthly income of less than 800 Euro. What is the 99% confidence interval for this proportion of all households in the area under investigation?

8. The average speed on a highway in the morning peak hour should be determined. A preliminary study showed $\overline{x} = 91\frac{km}{h}; s = 28km/h$. What is the minimal sample size if the estimated average speed should not differ more than 5km/h (5 km/h less or 5 km/h more) from the true average speed with a probability of 0.955?