**Probability and Statistics for Engineers**  
Final Exam Review, Summer B 2024

**Definitions**

**Confidence interval:** An interval of plausible values of some target parameter (for example, ). For a confidence level, , of all samples will give an interval that includes the target parameter.

**Upper/lower confidence bound:** The boundaries of a confidence interval. Precision increases as these values become closer.

**Prediction interval:** An interval of plausible values of some future observation. For a confidence level, , of all samples will give an interval that includes the corresponding future values.

**Null value:** , If the test parameter is the mean of a population, represented by .

**Test statistic:** A quantity representing the difference between what is observed in the data and what would be expected if a certain null hypothesis were true. Determines whether is rejected or not.

**P-value:** The probability, assuming is true, of obtaining value of test statistic at least as contradictory to as the value calculated from the available sample data.

**Type I error:** Rejection of when it is true. Equal to the significance level, .

**Type II error:** Failure to reject when it is false.

**Model:** A line of best fit.

**Formulas**

*\*All confidence levels assumed to be > 50%  
\*\*In earlier revisions, was* If the is low, reject the !

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| --- | --- |
| Formula | Meaning |
| *7.1 – Confidence intervals of when is known* | |
|  | -critical value of a two-sided confidence interval |
|  | Significance level |
|  | Confidence level |
|  | Two-sided confidence interval of the mean of a population when is known or |
|  | Minimum sample size for a given two-sided confidence interval width, |
| *7.2 – Confidence intervals of and for large samples* | |
|  | -critical value of a one-sided confidence interval |
|  | Approximate population standard deviation for large samples |
|  | Lower/upper confidence bounds for when is known or |
|  |
|  | Center of a confidence interval of a population proportion |
|  | Bound on error of estimation of a population proportion |
|  | Confidence interval of a population proportion |
|  | Lower/upper confidence bounds for |
|  |
| *7.3 – Confidence intervals of when is unknown, prediction intervals, and tolerance intervals* | |
|  | Degrees of freedom, |
|  | Test statistic of the mean of a population when is unknown |
|  | Confidence interval of the mean of a population when is unknown |
|  | Lower/upper confidence bounds for when is unknown |
|  |
|  | Bound on error of estimation of a prediction |
|  | Prediction interval of a single observation |
|  | Lower/upper prediction bounds |
|  |
|  | Tolerance interval |

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| *7.4 – Confidence intervals of and* | |
|  | Confidence interval of the variance of a population |
|  | Confidence interval of the standard deviation of a population |
|  | Lower/upper confidence bounds for |
|  |
|  | Lower/upper confidence bounds for |
|  |
| *8.2 – -tests about a population mean* | |
|  | Test statistic of the mean of a population when is known or . If the latter is true, the population does not need to be normal |
|  | -value to test the mean of a population when is known or . If the latter is true, the population does not need to be normal |
|  | Rejection region under the standard normal curve for the mean of a population when is known or |
|  | Rejection region under the standard normal curve for the mean of a population when is unknown |
|  | |
|  | Sample size for which a hypothesis has error at the alternative value, |
|  | Test statistic of the mean of a population when is unknown |
|  | -value to test the mean of a population when is unknown |
| *12.2 – Simple linear regression models* | |
|  | Simple linear regression model of a dataset. Defines a line of best fit for the given data points using the random error, |
|  | An approximation of a model |
|  | -intercept of a model |
|  | Slope of a model |
|  | Fitted (estimated) -value |
|  | Error sum of squares. Represents the variation in left unexplained by the model. Measures how much cannot be explained by a linear relationship |
|  | Total sum of squares |
|  | Coefficient of determination |
|  | th residual of a model |
|  | Approximate standard deviation |

A table of a normal curve

Description automatically generated

A table of numbers with a number on it

Description automatically generated with medium confidence

A table of numbers and a curve

Description automatically generated with medium confidence

A table of numbers and a number of ones

Description automatically generated with medium confidence

A table of numbers with a white background

Description automatically generated

A math table with numbers and a triangle

Description automatically generatedA math graph with numbers and a triangle

Description automatically generated with medium confidence

A table of mathematical equations

Description automatically generated