



Successful candidates of the MSc “Statistics in Smart Data” degree will have a solid background in the following statistical, mathematical and IT subjects:

Probability and Statistics

- **Combinatorics:** Cardinality of a set. Factorial of an integer, binomial coefficients. Binomial expansion.
- **Probability space:** Random experiments, events and probability measures. Basic properties of a probability measure. Conditional probabilities. Bayes formula. Formula of total probability. Independent events.
- **Random variables:** Discrete or continuous random variables. Usual discrete probability distributions (Bernoulli, Poisson, uniform, exponential, normal). Independence of random variables. Expectation of a random variable. Variance and covariance. Conditional distribution and conditional expectation.
- **Convergence and limit theorems:** convergence in probability, convergence in law, law of large numbers, central limit theorem.
- **Exploratory Statistics and Data analysis:** Mean, median, mode, range, standard deviation, interquartile range, quartiles and percentiles; interpretation of data in tables and graphs (line graphs, bar graphs, circle graphs, boxplots, scatterplots and frequency distributions); principal components analysis.
- **Statistical inference:** statistical model, likelihood, method of moments, point estimation, bias, mean square error, confidence intervals, tests, p-value, chi-squared tests, Student’s t-test, Kolmogorov-Smirnov test.
- **Regression analysis and Time series:** linear regression, analysis of variance, logistic regression, regression trees, autoregressive linear process, moving averages.