



Programme of Course "Calcolo delle Probabilità e Statistica Matematica"

- Code: DT0003
- Type of course unit: Compulsory (Bachelor Degree in Computer Science curriculum General)
- Level of course unit: Undergraduate Degrees
- Semester: 1

Number of ects credits: (Bachelor Degree in Computer Science) 6 (workload 150 hours)

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1	Course objectives	An introduction to the theory of probability up to the weak law of large numbers
2	Course content and learning outcomes (dublin descriptors)	<p>Topics of the module include:</p> <ul style="list-style-type: none"> • BASIC PROBABILITY: probability space, sets and elementary operations, Venn diagrams, basic axioms, inclusion-exclusion formula, enumeration principle and generalized enumeration principle, uniform probability spaces, permutations and combinations, conditional probability, disintegration formula, Bayes Formula, independence. • RANDOM VARIABLES AND EXPECTED VALUE: discrete and continuous random variables, mass distribution and density, distribution function, joint and marginal distributions, expected value and its properties, variance and covariance, weak law of large numbers. • EXAMPLES OF RANDOM VARIABLES: random variables of the following type: Bernoulli, binomial, Poisson, uniform, Gaussian, exponential, geometric. • INTRODUCTION TO STATISTICAL INFERENCE: the inference problem, parametric and non parametric inference • ELEMENTS OF PARAMETRIC ESTIMATES: random samples, estimators, mean squared error. Estimators for finite samples and their properties (bias and efficiency). Estimators for large samples (consistency and asymptotic normality). maximum likelihood method, estimates for intervals. • ELEMENTS OF HYPOTHESIS VERIFICATION: the statistical test, general facts, first order error, significance level and the p value. The power function of a test. Hypothesis test on the average of a Gaussian sample with given variance. Hypothesis test on the average of Gaussian sample with unknown variance.
3	Course prerequisites	elementary mathematics and some notions of mathematical analysis
4	Teaching methods and language	frontal lectures Language: Italian Reference textbooks <ul style="list-style-type: none"> • S M Ross, <i>Probabilità e statistica</i>. Maggioli.
5	Assessment methods	written exam with exercises and theoretic questions