



STATISTICS MATHEMATICAL NOTIONS

Enrollment year	2020/2021
Academic year	2020/2021
Regulations	DM270
Academic discipline	MAT/06 (PROBABILITY AND MATHEMATICAL STATISTICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica delle tecnologie quantistiche
Year of study	1°
Period	1st semester (05/10/2020 - 20/01/2021)
ECTS	6
Lesson hours	56 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	DOLERA EMANUELE (titolare) - 6 ECTS
Prerequisites	The course is intended as a first course in mathematical statistics. Students in this course are assumed to have a good knowledge of the fundamental material taught in the first course in probability theory, in addition to that of advanced calculus.
Learning outcomes	Introduction to mathematical statistics, Bayesian and frequentistic.
Course contents	<ul style="list-style-type: none">- Statistics in inductive logic : brief historical survey.- Bayes-Laplace paradigm. Conditional law of a sequence of observations given an unknown random parameter ; initial distribution .- Final and predictive distributions : their deducrion and use to solve hypothetical and predictive problems within the theory of statistical decisions.- Asymptotics for the above distributions, as the number of observations goes to infinity, in connection with the frequentistic interpretation of probability and statistics.

	<ul style="list-style-type: none"> - The Fisherian criticism to the Bayes-Laplace paradigm, and the rise of objective methods based on the likelihood random function. - Sufficient statistic: definition and characterization (factorization theorem); the likelihood as example of minimal sufficient statistic. - Fisher information; ancillary statistic and Basu theorem. A concise analysis of the exponential statistical model. - Point estimation. Maximum likelihood estimators: definition, examples and asymptotic properties. Uniformly minimum variance unbiased estimators: Kolmogorov-Rao-Blackwell and Lehmann-Scheffé theorems. - Testing statistical hypotheses. Fisherian criteria : spirit and applications to Gaussian samples and to nonparametric settings. The Neyman-Pearson approach ; fundamental lemma for simple hypotheses and its use also for composite hypotheses in a remarkable kind of statistical models. Estimation by confidence sets. - Linear statistical model. Estimation and testing statistical hypotheses in distinguished forms of the linear statistical model.
Teaching methods	Lectures
Reccomended or required readings	-Bickel, P.J. and Doksum, K. A. Mathematical statistics, Holden-Day Inc.
Assessment methods	Written and oral examinations.
Further information	
Sustainable development goals - Agenda 2030	\$Ibl legenda sviluppo sostenibile