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Inferential statistics and test theory (3ST2002)

Filières concernées	Nombre d'heures	Validation	Crédits ECTS
Master en statistique	Cours: 4 ph	écrit: 2 h	6

ph=période hebdomadaire, pg=période globale, j=jour, dj=demi-jour, h=heure, min=minute

Période d'enseignement:

- Semestre Automne

Equipe enseignante:

Professeur : Jean-Yves Dauxois
INSA Toulouse, Dpt de Génie mathématique,
135 av. de Ranguiel,
31077 Toulouse Cedex 4, FRANCE
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Objectifs:

Introducing the theoretical background of Mathematical Statistics. Learning how to build, judge the performance, improve and compare the statistical procedures of point estimation, interval estimation and hypotheses testing.

Contenu:

1. Statistical model
 - a. Definition, parametric and nonparametric models
 - b. Sampling models
 - c. Exponential families
 - d. Location-scale families
2. Point estimation
 - a. Statistics and estimators
 - b. Classical methods of obtaining estimators: empirical estimation, method of moments, maximum likelihood method
 - c. Criteria to judge the performance of estimators: consistency, bias, risk, Fisher information, Cramer-Rao inequality
 - d. Improving estimators: sufficient statistic, Rao-Blackwell and Lehmann-Scheffé theorems
 - e. Asymptotic behaviour: Asymptotic normality, delta-method, the particular cases of the empirical estimators, the maximum likelihood estimators and method of moments estimators
3. Interval estimation
 - a. Exact confidence intervals
 - b. Asymptotic confidence intervals
4. Testing statistical hypothesis
 - a. Introduction and definition : hypothesis, test statistics and critical regions, type I and type II errors, level of significance, power, p-value, bias, UMP tests, asymptotic tests
 - b. Parametric tests: Neyman-Pearson Lemma, nonrandomized and randomized tests
 - c. The particular case of gaussian samples: Hypothesis about the mean, hypothesis about the variance
 - d. Nonparametric tests: Kolmogorov test, χ^2 tests, Kolmogorov-Smirnov test, Mann-Whitney test

Forme de l'évaluation:

2 hours written exam during the session

Documentation:

J. Shao, Mathematical Statistics, 2nd edition, Springer, 2003
R. Bartoszyński and M. Niewiadowska-Bugaj, Probability and Statistical Inference, Wiley series in Probability and Statistics, 1996.

Pré-requis:

Probability Theory

Forme de l'enseignement:

- 6 ECTS credits
- Compulsory course for master in statistics

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- Autumn Semester
- Course : 2 hours / Exercises : 2 hours