

Probabilités et Statistique pour PH : Plan 2024

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December 17, 2024

1. Motivation, random experiment, probability space. (10/9/2024) (Slides 1–31)
 - Introduction and motivation. Random experiment. Sample space. (1–26)
 - Event space. Probability distribution and its properties. (27–31)
 - Exercises (séance du 9/9/2024): computer practicals
 - Exercises (séance du 16/9/2024): 1, 2, 4 6 (suggested); 3, 5 (optional).
2. Combinatorics, Conditional probability (17/9/2024) (Slides 31–43)
 - Theorem 8. Inclusion-exclusion formula. (31–33)
 - Combinatorics. Conditional probability (34–36, 38–43)
 - Exercises (séance du 23/9/2024): 8, 10, 11, 12 (suggested); 7, 9 (optional).
3. Independence/Intro to random variables (24/9/2024) (Slides 44–56, not 48)
 - Prediction decomposition. Matchings (Example 22). (44–47)
 - Independence. Types of independence. Introduction to random variables (49–56)
 - Exercises (séance du 30/9/2024): 13–16 (suggested); 17, 18 (optional)
4. Discrete random variables (1/10/2024) (Slides 57–72)
 - Intro to random variables (57–62)
 - Discrete random variables: Bernoulli, binomial, geometric, negative binomial, hypergeometric, uniform, Poisson. (63–72)
 - Exercises (séance du 7/10/2024): 17, 19, 21 (suggested); 20, 23 (optional)
5. More on random variables (8/10/2024) (Slides 71–76)
 - Hypergeometric distribution. Expectation (71–74)
 - Properties of expectation. (75–76)
 - Exercises (séance du 14/10/2024): 22, 24, 25 (suggested)
6. Moments/Continuous random variables (15/10/2024) (Slides 77–89)
 - Moments, variance. Conditional distributions, expectation. Choice of model (77–84)
 - Continuous random variables; basic definitions. (85–89)
 - Exercises (séance du 28/10/2024) 26, 29, 30 (suggested)
7. Continuous random variables II (29/10/2024) (Slides 90–95)
 - Moments and quantiles. Conditional densities. (90–91)
 - Transformations. Generating functions. (92–95)

8. Generating functions/Midterm (5/11/2024) (Slides 96–100)
 - Lundi 4 novembre: Generating functions II. Discrete random vectors. (96–100)
 - Mardi 5 novembre: Midterm
9. Random vectors (12/11/2024) (Slides 101–107)
 - Random vectors. Marginal and conditional distributions. (101–103)
 - Conditional moments, transformations. (104–107)
 - Exercises (séance du 11/11/2024) 31, 33, 34, 35 (suggested); 36 (optional)
10. Multivariate normal distribution/Convergence (19/11/2024) (Slides 108–135, skipping slides 117–125)
 - Joint moments. Generating functions. Multivariate normal distribution (not all proofs). (108–114)
 - Height/weight example. Inequalities. Notions of convergence. (115–116, 126–135)
 - Exercises (séance du 18/11/2024) 36, 37 (suggested); 32 (optional)
11. Laws of large numbers (26/11/2024) (Slides 136–149)
 - Convergence (quick revision). Laws of large numbers. CLT (136–142).
 - Delta method; quantiles. (143–149)
 - Exercises (séance du 25/11/2024) 38, 39, 40, 41 (suggested),
12. Basic statistics (2/12/2024) (Slides 150–176)
 - Basic statistics. (150–157)
 - Numbers and graphs (158–176)
 - Exercises (séance du 2/12/2024): 42, 44 (suggested), 45 (a)–(c) (optional)
13. Estimation (9/12/2024) (Slides 177–184, 187)
 - Types of estimator. Properties of estimators: Consistency. (177–180)
 - Bias, MSE, efficiency. Properties of the MLE. (181–184, 187)
 - Exercises (séance du 9/12/2024): 46, 47, 54, 55 (suggested); 45 (for devotees)
14. Estimation (16/12/2024) (Slides 190–203)
 - Confidence intervals and their interpretation. (190–196)
 - Statistical tests. Relation to confidence intervals. (197–203)
 - Exercises (séance du 16/12/2024): 55, 57, 58 (suggested), 59 (optional).