

Topics

1 Probability spaces, events, conditioning

Key concepts.

- Probability spaces, events.

What is a probability space? What properties does the probability function satisfy? What is an event? What do the intersection, union and complement of events mean? What is the inclusion-exclusion principle and how does one use it?

- Conditioning.

What is the definition of a conditional probability? When are two events independent? How does one use the multiplication formula? What is the law of total probability, and how does one use it? What is a partition?

- Bayes' law.

How does one apply Bayes' law? In what situations is it useful? How does it work with the law of total probability?

Book sections.

- 1.1 Probability spaces
- 1.3 Conditional probability, independence and Bayes' formula

Sample of exercises.

- Book: 1 to 3, 5, 17 to 22, 24 to 27, 29, 39, 40, 42, 43, 45 to 49, 51 in Chapter 1.
- Homework: 1, 2, 3 in Homework 1; 1, 2 in Homework 2.
- Midterms and quizzes: 1, 2 in Quiz 1.

Application.

- PageRank.

2 Counting

Key concepts.

- Uniform probability.

How does one compute the probability of an event in a uniform probability space? What about conditional probabilities?

- Factorial, falling factorial, binomial and multinomial coefficients.

What are they? What do they count? How are they related? How does one recognise which of these can be used in a give situation?

Book sections.

- 1.2 Counting

Sample of exercises.

- Book: 6 to 16 in chapter 1.
- Homework: 1, 2, 3 in Homework 4.
- Midterms and quizzes: 3 in Quiz 1.