Basic probability theory

1. Probability spaces
2. Conditional probability
3. Independence

Random variables

1. Definition
2. Discrete random variables
3. Continuous random variables
4. Conditioning on an event
5. Functions of random variables
6. Generating random variables

Multivariate random variables

1. Discrete random variables
2. Continuous random variables
3. Joint distributions of discrete and continuous variables
4. Independence
5. Functions of several random variables
6. Generating multivariate random variables
7. Rejection sampling

Expectation

1. Expectation operator
2. Mean and variance
3. Covariance
4. Conditional expectation

Random processes

1. Definition
2. Mean and autocovariance functions
3. Independent identically-distributed sequences
4. Gaussian process
5. Poisson process
6. Random walk

Convergence of random processes

1. Types of convergence
2. Law of large numbers
3. Central limit theorem
4. Monte Carlo simulation

Markov chains

1. Time-homogenous discrete-time Markov chains
2. Recurrence
3. Periodicity
4. Convergence
5. Markov-chain Monte Carlo

Descriptive statistics

1. Histogram
2. Sample mean and variance
3. Order statistics
4. Sample covariance
5. Sample covariance matrix

Frequentist statistics

1. Independent identically-distributed sampling
2. Mean square error
3. Consistency
4. Confidence intervals
5. Nonparametric model estimation
6. Parametric model estimation

Bayesian statistics

1. Bayesian parametric models
2. Conjugate prior
3. Bayesian estimators

Hypothesis testing

1. The hypothesis-testing framework
2. Parametric testing
3. Nonparameteric testing: the permutation test
4. Multiple testing

Linear regression

1. Linear models
2. Least-squares estimation
3. Overfitting
4. Global warming