

Topics for Exam 3**1. Likelihood Ratio Tests**

- 1.1. Likelihood ratio statistic.
- 1.2. Maximum likelihood estimators.
- 1.3. Simple hypotheses versus composite hypotheses
- 1.4. The Neyman–Pearson Lemma
- 1.5. Most powerful and uniformly most powerful tests

2. Evaluating Estimators

- 2.1. Mean squared error
- 2.2. Bias
- 2.4. Efficiency
- 2.5. Crámer–Rao inequality or information inequality

Relevant sections in the text: 6.3 and 6.2.

Relevant sections and chapters in notes: Sections 3.3, 3.4 and 3.5, and Chapter 4.

Relevant assignments: 11, 12, 13, 14 and 15.

Important Concepts

Likelihood function, likelihood ratio statistic, LRT rejection region, simple hypothesis, composite hypothesis, most powerful test, uniformly most powerful test, maximum likelihood estimators, mean squared error, bias, Fisher information, Crámer–Rao lower bound, and efficiency.

Important Skills

1. Know how to compute the likelihood function for a random sample.
2. Know how find maximum likelihood estimators.
3. Know how to determine LRT rejection regions.
4. Know how to compute bias and the mean squared error of an estimator.
5. Know how to compute the Fisher information and how to apply the Crámer–Rao inequality.
6. Know how to determine whether an unbiased estimator is efficient or not.