

Syllabus for Probability Theory
IT 971

1. Sets and Functions

1.1 Basics

1.2 Set Operations and Closure

1.3 σ -Fields and Borel Sets

1.4 Probability Spaces

1.4.1 Axioms

1.5 Probability Measures and Distribution Functions

2. Random Variables

2.1 Independence

2.2 Borel-Cantelli Lemma

2.3 Integration and Expectation

2.4 Properties of Expectations

2.5 Riemann and Lebesgue Integration

3. Convergence Concepts

3.1 Almost Sure Convergence

3.2 Convergence in Probability

3.3 L_p Convergence

4. Laws of Large Numbers

4.1 Weak Law of Large Numbers

4.2 Almost Sure Convergence of Sums of Independent Random Variables

4.3 Strong Law of Large Numbers

4.4 Convergence in Distribution

5. Characteristic Functions and the Central Limit Theorem

5.1 Moment Generating Functions

5.2 Characteristic Functions

5.3 Central Limit Theorem

5.4 Lindeberg-Feller CLT

6. Martingales

6.1 Conditional Expectations

6.2 Martingales and Some Examples

6.3 Martingale and Submartingale Convergence

7. Additional Materials as time permits