

## **61958 Information Theory**

**Credits:** 3, 3 lecture hours

**Prerequisites:** 11069 Applied English  
61760 Probability for Software Engineering

### **Course Description and Objectives**

This course is about how to measure, represent, and communicate information effectively. The first part of the course introduces basic concepts in the field. What are entropy and mutual information, and why are they so fundamental to data? The second part of the course focuses on representation and communication applications of the information theory in different areas, such as gambling and data compression, error detection and error correction, channel capacity and Shannon channel coding theorem, stock market. Relations to probability and statistics, algebraic coding theory and neural networks are considered.

### **Lecturer**

Dr. Beniamin Mounits

**Presence in the course:** The presence is mandatory.

### **Course grade**

Home assignments 10%

Final project 70%

Final exam 20%

### **Course Contents**

1. Entropy and Information
2. Data compression and gambling.
3. Kolmogorov complexity.
4. Channel capacity.
5. Information theory and statistics.
6. Network information theory.

### **Learning outcomes**

At the end of the course, students are expected to:

1. Have understood the notion of information in the quantitative sense.
2. Have understood how the quantity of information could be measure
3. Have understood the concept and properties of entropy and mutual information as it applied to information
4. Have understood the notions of channels, different classes of channel, and channel capacity.

### **Bibliography**

1. Thomas M. Cover and Joy A. Thomas, Elements of Information Theory(Wiley Series in Telecommunications and Signal Processing) Wiley-Interscience; 2 edition, 2006, ISBN: 0471241954
2. David J. C. MacKay, Information Theory, Inference & Learning Algorithms, Cambridge University Press; 1st edition, 2002, ISBN: 0521642981
3. Hubert P. Yockey, Information Theory, Evolution, and The Origin of Life, Cambridge University Press, 2005, ISBN: 0521802938

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