Course Outline

The goal of this class is to introduce the students to the principles of information and coding theory. These include a fundamental understanding of data compression and reliable communication over noisy channels. The course introduces the concepts of entropy, mutual information, and channel capacity, which are the fundamental basis of the mathematical theory of communication.

The tentative course contents are given below.

(a) **Data Compression**

- Lossless data compression schemes: uniquely decodable codes.
- Entropy and typical sequences.
- Lossless data compression theorem.
- Universal lossless data compression.

(b) **Channel Coding**

- Error correcting codes.
- Mutual information and channel capacity.
- Noisy channel coding theorem.
- Gaussian channel capacity and waterfilling.

(c) **Lossy Data Compression**

- Quantization.
- Rate-distortion function.

(d) **Multi-terminal communication**

- Jointly typical sequences.
- Multiple-access channel.