Information Theory
Prof. Dr. Mohamed Nafee

Communication Systems Block Diagram

Introduction to Information Theory

Source Coding

Introduction to Source Coding

Definitions: Binary Symmetric Channel, Source Entropy, Compression Rate, Lossy vs. lossless compression

Huffman Coding

Fano Coding

Error Control Coding: Introduction

Objective of Error Control Coding

Fundamental Models and Concepts (Hard vs. Soft Decision, Capacity)

Repetition Coding

Introduction to Vector Space Concepts: Modulo-2 addition, Hamming Distance, Basis

Linear Block Codes: Definition

Generating Matrix

Parity Check Matrix

Systematic Codes

Minimum distance (dmin)

Max Likelihood Decoding,

Detectable and Correctable Errors

Syndrome Decoding

Standard Array Decoding

Probability of Error

Hamming Codes

Cyclic Codes

Generating Polynomial

Systematic Cyclic Codes

Generating Matrix and Parity Check Matrix of Cyclic Codes,

Syndrome Decoding of Cyclic Codes

Convolutional Codes: Introduction and Encoder Structure

Polynomial Representation of Convolutional Codes

State Diagram

Trellis Diagram

Minimum Distance (dmin)

Catastrophic Codes

Viterbi Algorithm