

Preface

Classical information processing consists of the main tasks **gaining** knowledge, **storage**, **transmission**, and **hiding** data.¹

The first named task is the prime goal of Statistics and for the two next Shannon presented an impressive mathematical theory, called Information Theory, which he based on probabilistic models.

Based on this theory are concepts of codes—lossless and lossy—with small error probabilities in spite of noise in the transmission, which is modeled by channels.

Another way to deal with noise is based on a combinatorial concept of error correcting codes, pioneered by Hamming. This leads to another way to look at Information Theory, which instead of being looked at by its tasks can be also classified by its mathematical structures and methods: primarily **probabilistic** versus **combinatorial**.

Finally, Shannon also laid foundations of a theory concerning hiding data, called Cryptology. Its task is in a sense dual to transmission and we therefore prefer to view it as a subfield of Information Theory.

Viewed by mathematical structures there is again already in Shannon's work a **probabilistic** and a combinatorial or **complexity**-theoretical model.

The lectures are suitable for graduate students in Mathematics, and also in Theoretical Computer Science, Physics, and Electrical Engineering after some preparations in basic Mathematics.

The lectures can be selected for courses or supplements of courses in many ways.

Rudolf Ahlswede

¹ This is the original preface written by Rudolf Ahlswede for the first 1,000 pages of his lectures. This volume consists of the first third of these pages.

Storing and Transmitting Data

Rudolf Ahlswede's Lectures on Information Theory 1

Ahlswede, R. - Ahlswede, A.; Althöfer, I.; Deppe, C.;

Tamm, U. (Eds.)

2014, X, 302 p. 6 illus., Hardcover

ISBN: 978-3-319-05478-0