A U S H A N G

FREIE UNIVERSITÄT BERLIN
Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Mittwoch, 24. September 2014, 10.00 Uhr

Ort: Raum 108/109, Arnimallee 6, 14195 Berlin

Disputation über die Doktorarbeit von

Herrn Alexey Andreevich Shadrin

Thema der Dissertation:
Positional Information storage in sequence patterns

Thema der Disputation:
Information theory, channel capacity and error-correcting codes

Die Arbeit wurde unter der Betreuung von **Prof. Dr. Chr. Schütte** durchgeführt.

Abstract: In contrast with most of scientific theories, information theory (IT) has an identifiable beginning —it originated with Claude Shannon's paper "A mathematical theory of communication", which was published in 1948. It will be not an exaggeration to say that groundbreaking ideas developed in this publication launched the Digital Age. Nonetheless, the fate of IT was not easy: hindered by the lack of hardware capacity, IT was proclaimed "dead" in the mid-50's. However, in a couple of years tough demand in reliable deep-space communications together with breakthrough in hardware technologies have fostered rapid progress of IT and allowed to appreciate fully the meaning of Shannon's work. Nowadays we use the achievements of Shannon's theory in almost all spheres of our lives often not even realizing it.

In his seminal paper Shannon proposed a general paradigm for considering communication of information and established two fundamental principles: the limit for possible degree of data compression (Shannon's source coding theorem) and the limit on a speed of the error-free data transmission for a given level of noise (Shannon's noisy-channel coding theorem). The latter is called channel capacity. It became a benchmark that guides scientists and engineers telling them what can be done, and what remains to be done—compelling them to achieve it.

During the last 50 years coding schemes have been approaching this ultimate limit, evolving hand in hand with development of computers. Starting form naïve block codes, gradually introducing new refinements and complex algorithms of error correction, engineers eventually approached very close to Shannon's limit. Only about 20 years ago the theoretical channel capacity limit was closely approached on practice, using low density parity check codes and turbo codes.

In this talk I will briefly touch historical aspects of IT and error-correcting codes. Basic concepts of IT and fundamental principles of error correction will be presented. Next I will introduce some standard concepts of error correction (block codes, convolutional codes, interleaving and concatenated codes) which are essential for comprehension of turbo codes. The latter will be discussed in more details in the final part of the talk.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.
Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
Prof. Dr. Chr. Schütte