Universität Mannheim

Lehrstuhl VI für Mathematik

Wolfgang K. Seiler

Course in fall 2018:

Mathematics and Information

Monday $13^{45} - 15^{15}$ and thursday $10^{15} - 11^{45}$, C 015, exercises thursday $12^{00} - 13^{30}$, C 015

While everybody agrees on the importance of information, there is no universally accepted definition of information and how to measure it. For an engineer who is only interested in transmission and storage of information, SHANNON's theory is a good starting point; the first part of the course will present his approach and applications to data compression, error correcting codes and cryptography.

1956 J.L. KELLY found a new approach to SHANNON's theorem about the maximal capacity of a noisy channel via the commercial value of information; his work was later generalized to a theory of optimal betting and investment strategies. This will be the subject of the second part.

The third part deals with mathematical algorithms, mostly based on Linear Algebra, used by search engines and knowledge bases.

Prerequisites: Analysis, Linear Algebra and Statistics

References:

THOMAS M. COVER, JOY A. THOMAS: Elements of Information Theory, *Wiley,* ²2006

MICHAEL W. BERRY, MURRAY BROWNE: Understanding Search Engines: Mathematical Modeling and Text Retrieval, *SIAM,* ²2005

AMY N. LANGVILLE, CARL D. MEYER: Google's PageRank and Beyond – The Science of Search Engine Rankings, *Princeton,* 2006

There will also be course notes (in german).

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