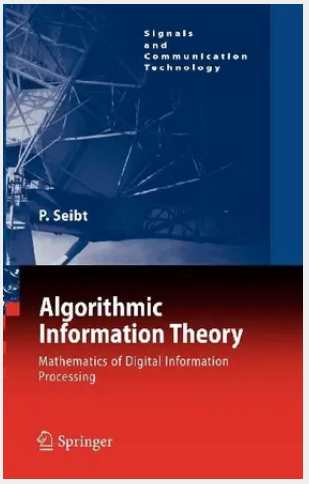
Seibt

Algorithmic Information Theory

Mathematics of Digital Information Processing

Shall we be destined to the days of eternity, on holy-days,as well as working days, to be shewing the RELICKS OF LEARNING, as monks do the relicks of their saints – without working one – one single miracle with them? Laurence Sterne, Tristram Shandy This book deals with information processing; so it is far from being a book on information theory (which would be built on description and estimation). The reader will be shown the horse, but not the saddle. At any rate, at the very beginning, there was a series of lectures on “Information theory, through the looking-glass of an algebraist”, and, as years went on, a steady process of teaching and learning made the material evolve into the present form. There still remains an algebraic main theme: algorithms intertwining polynomial algebra and matrix algebra, in the shelter of signal theory. A solid knowledge of elementary arithmetic and Linear Algebra will be the key to a thorough understanding of all the algorithms working in the various bit-stream landscapes we shall encounter. This priority of algebra will be the thesis that we shall defend. More concretely: We shall treat, in ?ve chapters of increasing di?culty, ?ve sensibly di?erent subjects in Discrete Mathem- ics. The?rsttwochaptersondatacompaction(losslessdatacompression)and cryptography are on an undergraduate level – the most di?cult mathematical prerequisite will be a sound understanding of quotient rings, especially of- nite ?elds (mostly in characteristic 2).

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