

A B S T R A C T

This dissertation deals with functional equations in Information Theory. Specifically, we deal with the problem of characterizing entropy through functional equations.

Chapter I gives some background material on Functional Equations as well as on Information Theory, dealing with Shannon's Entropy, its interpretations, some of its properties, its connection with Noiseless Coding and some of its generalizations.

Chapter II deals with three characterizations of Shannon's Entropy, namely those by Shannon, Khinchin and Faddeev. In this chapter we discuss the branching property which is used extensively in subsequent chapters.

Chapter III deals with the fundamental equation of Information first given by Tverberg. We give characterizations of Shannon's Entropy due to Tverberg, Kendall, Daróczy and Lee, which all use the fundamental equation but different regularity conditions. Then there is the general solution of the fundamental equation given by Aczél and Daróczy.

Chapter IV deals with Havrda and Charvát's characterization of type β -entropy, which makes use of a generalized form of the branching property. We also discuss Daróczy's characterization of type β -entropy which uses the fundamental equation of information of type β . Different approaches to this problem, taken by Forte and Ng are also given. Thereafter, other generalizations of the fundamental equation and the branching property have been discussed, in particular

those given by Sharma and Singh.

Chapter V considers the functional equation of Chaundy and McLeod, and Daróczy's characterization of Shannon's Entropy using this functional equation. We then give some generalizations of this functional equation, due to Sharma and Taneja. This leads to three generalized additive entropies.

Finally in Chapter VI we study the entropy equation given by Kaminski and Mikusinski, as well as their characterization of Shannon's Entropy. A different approach due to Aczél is also given. Generalizations studied by Sharma and Singh, obtained by relaxing homogeneity, are then reported.

The dissertation contains concluding remarks and references.