Abstract and Keywords

The main objectives of the present research work are concerned with the study on some discrete distributions and integer-valued autoregressive processes. It also concentrates on studying various generalizations of discrete distributions like discrete Mittag-Leffler, discrete stable-Linnik, geometric discrete semi stable-Linnik, Lüders Formel I, Delaporte, discrete Poisson-Laplace, Katz Family of distributions, etc. Characteristic properties of the new models are investigated, the advantages of these models over the base models are established and finally various applications of the newly developed models are explored.

The thesis consists of 7 Chapters. Chapter 1 serves as an introduction, which gives a survey of literature relating to the subject matter of the present study, the basic concepts and notations used in the thesis and finally a summary of the work executed as part of the study.

Generalization of discrete Mittag-Leffler distribution is introduced and studied in Chapter 2. We introduce and study the properties of a new distribution called geometric generalized discrete Mittag-Leffler distribution. Autoregressive processes with geometric generalized discrete Mittag-Leffler distributions are developed and studied. The distributions are further extended to develop a more general class called the geometric generalized discrete semi Mittag-Leffler distributions. An application with respect to an empirical data on customer arrivals in a bank counter is also given.

Chapter 3 deals with the integer valued autoregressive processes with a convolution of discrete stable and discrete Linnik distributions and their generalization as marginals. The joint distribution and the regression behaviour of the processes are studied. Generalizations of the discrete stable-Linnik distribution and processes, including geometric versions are developed. Chapter 4 introduces a new stationary integer valued time series model with a special form of the negative binomial marginal distribution, which has received much attention during recent years. We obtain some properties of the distribution and estimate the moments of the innovation processes.

Chapter 5 concentrates on the Delaporte distribution. An integer-valued autoregressive process called Delaporte autoregressive process with Delaporte distribution as stationary marginal distribution is introduced. The chapter also deals with many properties of the processes developed. The geometric Delaporte distribution is introduced and studied. Higher order generalizations are also discussed.

Chapter 6 reviews various entropy measures in information theory. The importance of discrete Laplace distribution and the key concept of information theory namely, Shannon entropy and other generalizations are discussed. Using discrete Laplace distribution, we develop a geometric discrete Laplace distribution and use it in the construction of integer-valued time series models. Using the concept of convolution, an extension of discrete Laplace distribution named discrete Poisson-Laplace distribution is introduced and its properties are established.

Chapter 7 proposes a new class of stationary first order integer-valued autoregressive processes with Katz family of marginal distributions using the binomial thinning operator. A few properties of the family are pointed out, including the Fisher dispersion index, skewness, kurtosis, discrete self-decomposability, etc. In this chapter, we derived results concerning the INAR models including, its geometric generalization. We have developed INAR process with Katz family as stationary marginal distribution. Finally, the relevance of the Katz family and its potential applications are also demonstrated using real-data.

Keywords: Autoregressive Processes, Count data models, Delaporte distribution, Discrete Laplace distribution, Discrete self-decomposability, Discrete stable-Linnik distribution, Geometric Delaporte distribution, Geometric discrete Poisson-Laplace distribution, Generalized discrete semi-Mittag-Leffler distribution, Infinite divisibility, Integer valued time series modeling, Katz Family of distributions, Probability generating function, Simulation studies, Shannon entropy, Statistical modelling.