



# Entropy properties of certain record statistics and some characterization results

Jafar Ahmadi

Department of Statistics and 'Ordered and Spatial Data Center of Excellence',  
Ferdowsi University of Mashhad, P.O. Box 91775-1159, Mashhad, Iran  
ahmadi-j@um.ac.ir

## Abstract

In this paper, the largest and the smallest observations are considered, at the time when a new record of either kind (upper or lower) occurs based on a sequence of independent random variables with identical continuous distributions. We prove that sequences of the residual or past entropy of the current records characterizes  $F$  in the family of continuous distributions. The exponential and the Frechet distributions are characterized through maximizing Shannon entropies of these statistics under some constraint.

**Keywords:** Exponential distribution, Frechet distribution, Completeness property, Order statistics, Record values, Residual and past entropies.

*MSC:* 62G30; 62B10, 62E10, 94A17

## 1 Introduction

Let  $\{X_i, i \geq 1\}$  be a sequence of independent and identically distributed (iid) continuous random variables each distributed according to cumulative distribution function (cdf)  $F$  with probability density function (pdf)  $f$ . An observation  $X_j$  will be called an upper record value if its value exceeds that of all previous observations. Thus,  $X_j$  is an upper record if  $X_j > X_i$  for every  $i < j$ . An analogous definition can be given for lower record