

## Modeling of Maximum Rainfall Using Poisson-Generalized Pareto Distribution in Kigali, Rwanda

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**Abstract :** Extreme rainfall events have caused significant damage to agriculture, ecology, and infrastructure, disruption of human activities, injury, and loss of life. They also have significant social, economic, and environmental consequences because they considerably damage urban as well as rural areas. Early detection of extreme maximum rainfall helps to implement strategies and measures, before they occur, hence mitigating the consequences. Extreme value theory has been used widely in modeling extreme rainfall and in various disciplines, such as financial markets, the insurance industry, failure cases. Climatic extremes have been analyzed by using either generalized extreme value (GEV) or generalized Pareto (GP) distributions, which provides evidence of the importance of modeling extreme rainfall from different regions of the world. In this paper, we focused on Peak Over Thresholds approach, where the Poisson-generalized Pareto distribution is considered as the proper distribution for the study of the exceedances. This research also considers the use of the generalized Pareto (GP) distribution with a Poisson model for arrivals to describe peaks over a threshold. The research used statistical techniques to fit models that used to predict extreme rainfall in Kigali. The results indicate that the proposed Poisson-GP distribution provides a better fit to maximum monthly rainfall data. Further, the Poisson-GP models are able to estimate various return levels. The research also found a slow increase in return levels for maximum monthly rainfall for higher return periods, and further, the intervals are increasingly wider as the return period is increasing.

**Keywords :** exceedances, extreme value theory, generalized Pareto distribution, Poisson generalized Pareto distribution

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