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**Some Probability Distributions: Properties
and Estimation Methods**

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## **Abstract**

The probability distribution is one of the most important topics in the field of statistics and probabilities because of its importance in the analysis and modeling of data in many sciences. In recent years, the importance of the methods of generalization, especially the new families, has increased as a basis for deriving new probability distributions used to analyze data in the fields of reliability, Business, meteorology, quality control, statistical process monitoring and other fields to suit these modern distributions of different types of data.

There is no doubt that the two distributions mentioned in this thesis are of great importance in the study and analysis of the reliability of data associated with distributions of life and this led the researcher to use these families as a basis to derive new distributions in the same field to bridge the gap in the analysis of life data and despite the great efforts in the development and conclusion of new distributions, but there are still many important problems, which are Its data does not match any of the existing distributions.

The aim of this thesis is to present two new probability distributions called:

1. The Generalized Odd Log-Logistic Log-Logistic “GOLL-LL” Distribution.
2. The Pareto Type II Exponentiated Weibull “PaII-EW” Distribution.

By using two new families as a basis in their conclusion

1. The Generalized Odd Log Logistic-G (GOLL-G) Family.
2. The Pareto Type II-G (PaII-G) Family.

Some statistical properties are discussed for each distribution and maximum likelihood estimators (MLEs), Cramer-von mises estimators (CVMEs), Ordinary least square estimators (OLEs) and weighted least square estimators (WLEs) are studied for each distribution. A simulation study is performed in to compare the classical estimation methods; the results show that the MLE produces the best results for estimating the parameters of GOLL-LL and PaII-EW distribution. In addition to, an applied study using a real data is presented for comparison between the new distributions and other distributions; it is observed that the new distributions give better results than the others, where
the G-O-F statistics (AIC-BIC-HQIC-CAIC) values were smaller than the G-OF statistic values of the compared distributions.