Robust Statistical Methods for Applications in Quality Control

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Abstract

In this article it is presented some approaches to the theory of robust estimation, particularly useful in quality control area, field in which they are potentially useful. The idea of robustness is associated with insensitivity to small deviations from the assumptions, guaranteeing the same efficiency than conventional methods if they are satisfied. In this paper it is described and compared the position classical estimator: sample mean, and robust estimators: Median, Trimmed Mean, Huber M-estimator, Bisquare M-estimator. The disadvantages entailed by the classical approach are shown when the optimal conditions are not given, demonstrating the advantages of robust estimators in a practical quality control application dataset from a metallurgical company of Gran Rosario, through the calculation of different estimators. Moreover, in the processes that meet the assumptions required for a classical statistical analysis, it is proved that the use of robust estimators have the same status as the classics. In addition, in both subprocesses studied, the confidence intervals obtained with the classical estimator are wider. So, if a quality control study is performed a posteriori considering these limits, it would be much more liberal in terms of precision of the chosen method, implying a risk of missing some observations which might suggest that the process is no longer under control. In these situations, it was proved that robust estimators provide a more appropriate notion of habitual behavior of data. It is expected that future productivity observations will be evaluated in control charts where the limits will be determined based on robust estimators. The importance of these proposed methods is the great potential of application they have, because, although there are substantial methodological contributions, their use in the exercise of statistical analysis is not yet widespread.

Keywords: Robust Methods, Statistical Inference, Statistical Quality Control.