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## Statistical Analysis of Test Data in Microelectronics Industry



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**Introduction:** The process capability index ( $C_{pk}$ ) is used to determine the quality of a process. A problem is its low precision on non-normal distributions. This study aims for a better method to calculate  $C_{pk}$  or an alternate algorithm to classify the quality of test data. For this the study was divided into three parts. Distribution detection, outlier detection and  $C_{pk}$  optimization and our own algorithm respectively.

**Approach:** For the distribution and outlier detection standard statistical methods were applied. For the optimization of the process capability index we worked together with our customer to provide an algorithm optimized for their data. We could evaluate some well-known statistical methods for distribution detection, and we could prove the suitability to use Rosner's test for our outlier detection. Our key result is that discrete distributions are hard to detect purely from a statistical standpoint. We propose a method for detection that works with percentage of unique values over the whole dataset. Unfortunately, this results in a low but significant number of false positives. The detection of normal, skewed and multimodal distributions works very well. Therefore, the biggest part of the remaining manual test supervision process is dealing with discrete distributions. The rest is dealing with bad  $C_{pk}$  or our own developed severity value that classifies test in 1 (worst) to 10 (best). We also propose ideas for further optimization.