

In their 1996 paper published in *Statistical Science*, Efron and DiCiccio introduced a new approach for constructing bootstrap confidence intervals. The paper titled “Bootstrap Confidence Intervals” presents a novel algorithm that overcomes issues associated with traditional bootstrap methods and provides more accurate and reliable confidence intervals.

Bootstrap methods have become widely used in statistical inference due to their ability to estimate the sampling distribution and calculate standard errors without making assumptions about the underlying distribution. However, the construction of confidence intervals using bootstrap methods can be challenging and often produces intervals with poor coverage probabilities.

Efron and DiCiccio proposed a new methodology called “bias-corrected accelerated (BCa) bootstrap” to address these issues. The BCa bootstrap takes into account both bias and skewness in the distribution of bootstrap estimates, resulting in improved confidence interval coverage.

The BCa algorithm involves three key steps: bootstrap resampling, bias correction, and acceleration. First, bootstrap resampling is performed to generate a large number of bootstrap samples. Then, the bias correction is applied to the estimates obtained from the bootstrap samples to reduce the bias associated with the original estimate. Finally, the acceleration adjustment is made to account for skewness in the distribution, improving the accuracy of the confidence interval bounds.

Efron and DiCiccio showed through theoretical arguments and simulations that the BCa bootstrap method produces confidence intervals with better coverage probabilities compared to traditional percentile-based or normal approximation methods. They also demonstrated that the BCa method performs well even in situations with small sample sizes or when the underlying distribution is non-normal.

The paper provides detailed explanations of the BCa bootstrap algorithm and its implementation. It also discusses the theoretical foundations of the method and highlights its advantages over other bootstrap approaches.

Efron and DiCiccio’s paper on Bootstrap Confidence Intervals has had a significant impact on the field of statistics and has been widely cited. The BCa method introduced in the paper has become a standard and preferred tool for constructing bootstrap confidence intervals due to its improved accuracy and reliability.

To access the full paper, please visit the following URL: <https://doi.org/10.1214/ss/1032280214>