On the Fourth-Order Hybrid Beta Polynomial Kernels in Kernel Density Estimation

Authors : Benson Ade Eniola Afere

Abstract : This paper introduces a family of fourth-order hybrid beta polynomial kernels developed for statistical analysis. The assessment of these kernels' performance centers on two critical metrics: asymptotic mean integrated squared error (AMISE) and kernel efficiency. Through the utilization of both simulated and real-world datasets, a comprehensive evaluation was conducted, facilitating a thorough comparison with conventional fourth-order polynomial kernels. The evaluation procedure encompassed the computation of AMISE and efficiency values for both the proposed hybrid kernels and the established classical kernels. The consistently observed trend was the superior performance of the hybrid kernels when compared to their classical counterparts. This trend persisted across diverse datasets, underscoring the resilience and efficacy of the hybrid approach. By leveraging these performance metrics and conducting evaluations on both simulated and real-world data, this study furnishes compelling evidence in favour of the superiority of the proposed hybrid beta polynomial kernels. The discernible enhancement in performance, as indicated by lower AMISE values and higher efficiency scores, strongly suggests that the proposed kernels offer heightened suitability for statistical analysis tasks when compared to traditional kernels.

Keywords : AMISE, efficiency, fourth-order Kernels, hybrid Kernels, Kernel density estimation
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