This study proposes a group of clusters of families of hybrid polynomial kernels, constructed via convex combinations of Beta polynomial kernel families, extending classical kernel density estimation through a flexible mixing parameter that generates smooth and adaptable kernel shapes. Theoretical analysis shows that the asymptotic performance of the resulting estimators is governed by kernel roughness and second-moment functionals through a canonical AMISE constant, yielding near-optimal efficiency with negligible loss relative to the Epanechnikov kernel. Extensive Monte Carlo simulations across symmetric, skewed, heavy-tailed, and multimodal distributions confirm the theoretical results, demonstrating consistent error reduction with increasing sample size and uniform convergence across kernel orders. Sensitivity analysis further reveals strong robustness to variations in mixture proportions, tail heaviness, and modal separation, with sample size identified as the dominant driver of accuracy. Real data applications to Old Faithful eruption durations and scar-length measurements show that the proposed estimators capture diverse distributional features effectively while maintaining stability. Overall, the hybrid kernels provide a flexible, efficient, and robust alternative for complex density estimation problems.