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Sharp Constants in Normal an Edgeworth Approximation

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We all know and love the central limit theorem (CLT) but there is a lot more to wish for. The Berry-Esseen theorem overestimates the actual error in the CLT and truly sharp error bounds for specific distributions are, as far as we are aware, only known in binomial cases and can be found in Schulz (2016). Even less seems to be known for other distances and higher-order approximations.

In order to make progress here we consider it to be advisable to solve these problems for specific distributions such as the binomial and the uniform distribution first. These are interesting in their own right and hopefully our solutions via Fourier inversion can be generalized to a wider set of distributions.

To give an example we plan to present the following two results. We found that the optimal bound in the local CLT for the symmetric binomial distribution is
\begin{gather}
\frac{1}{2\sqrt{2\pi} n^{3/2}}
\end{gather}
and in the global CLT with simple continuity correction it is

\begin{gather}
2\Phi\bigg(-\frac{3}{\sqrt{2}}\bigg) \frac{1}{n}
\end{gather}

where Φ is the standard normal distribution function.

References

Schulz, J. (2016). The Optimal Berry-Esseen Constant in the Binomial Case. Dissertation, Universität Trier. http://ubt.opus.hbz-nrw.de/volltexte/2016/1007/.

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