A spreadsheet with numbers and a few letters

Description automatically generatedA table with numbers and lines

Description automatically generatedA screenshot of a spreadsheet

Description automatically generatedTo smoothen out the data variability and differences in the three datasets and account for global outliers found, here is the recommendation on smoothing out the data:

Given the skewness in the data (ranging from -3.57 to 1.76), the Box-Cox transformation can be an appropriate method to normalize the data and make it more suitable for analysis. This transformation is effective when data is positively skewed, as it helps to reduce skewness and achieve a normal distribution. Since the outlier appears to be caused by a physical effect influencing structural behavior, it would be important to perform the transformation both with and without the outlier. If the Box-Cox transformation is heavily distorted by this outlier, alternative transformations like the Yeo-Johnson or log transformation could be explored to see if they yield better results.

After applying the Box-Cox transformation, if successful in normalizing the skewed data, Kernel Density Estimation (KDE) could be used to smooth the distribution further. This technique can help visualize the underlying distribution and address any irregularities in the data that might not be immediately apparent from histograms.

Another key observation from scatter plots is that the primary deviation between my data and the provided datasets is due to a hole positioned too close to the beam’s edge. This resulted in unrealistic deformation/resulting in unrealistic stress concentration in ABAQUS, which is unlikely to occur in a real-life scenario. In this case, removing the corresponding data point might be justified, as it appears to be an artifact of the simulation setup rather than a physically meaningful result.A blue and black rectangular object with circles

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Additionally, comparing different simulation runs, for example, those with and without voids, and Material A versus Material B—requires a fair comparison of stress and displacement results. Standardization is a useful approach here, as it eliminates differences in units and scales. This ensures that variations, such as changes in hole placement, can be analyzed more effectively without being influenced by differences in magnitude or units.