HPC - 1.6.1

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In this report, we examine the agreement between ΔV (a perceptual difference metric) and ΔE (a color difference metric) using the CIELAB and CIEDE2000 color-difference formulae. The dataset provided was used to compute these differences and evaluate the agreement using two statistical measures: STRESS (Standardized Residual Sum of Squares) and PF/3 (Procrustes Fit index). We use CIELAB and CIEDE2000 color difference formulae.

PF/3 is a goodness-of-fit measure for multidimensional scaling that assesses how well a configuration of points matches a reference, with lower values indicating a better fit:

$$PF/3 = \frac{100[(\gamma - 1) + V_{AB}] + CV}{3}$$

STRESS is a metric that measures the discrepancy between two sets of distances, with lower values indicating better agreement:

$$\text{STRESS} = 100 \left(\frac{\sum (\Delta V_i - FAE_i)^2}{\sum \Delta V_i^2} \right)^{1/2}$$

Here is the result of the color difference:

Metric	CIELAB	CIEDE2000
100 * STRESS	35.59	24.25
PF/3 (CIELAB)	63.42	44.45

The results indicate that CIEDE2000 has a lower STRESS value (24.25) compared to CIELAB (35.59). Similarly, the PF/3 value is lower for CIEDE2000 (44.45) than for CIELAB (63.42). This suggests that CIEDE2000 aligns better with the perceptual differences (ΔV) compared to CIELAB.

A lower STRESS value indicates that the distances computed by the color-difference formula are more consistent with the perceptual differences. CIEDE2000's lower STRESS value means it provides a closer match to how humans perceive color differences.
The PF/3 index further supports the findings from the STRESS analysis. The lower PF/3 value for CIEDE2000 shows that it has a better fit to the perceptual data, reinforcing its superiority over CIELAB in this context.