Sigma Estimation from Lower-Tail Median Absolute Deviation after Iterative Trimming of Upper Tail (the MADTUT method)

Inputs / parameters / assumptions

data array: $\{p_i\}$;

N_u = initial upper-tail trim threshold in #σ (e.g., 5);

ΔN_u = decrement in N_u for iterative trims (e.g., 0.1);

f_L = lower trim fraction (e.g., ≤0.1%).

Assumption: upper tail contaminated by sources that biases mean μ and median and gives μ > median.

Loosely trim lower-tail of $\{p_i\}$ using f_L to guard against very low extremes.

Compute:

arithmetic mean = μ;

median = med$\{p_i\}$;

σ_{MAD} = 1.4826 med$\{|\, p_k - \text{med}\{p_i\}\,|\}$,

where $p_k = \{p_i \leq \text{median}\}$ (=low tail),

1.4826 ≈ correction for asymptotic normality.

Reduce threshold:
$N_u \leftarrow N_u - \Delta N_u$

Is $\mu \leq$ med$\{p_i\}$?

YES → **Return:** σ_{MAD}, median

NO → Trim upper tail:
$\{p_i\} \leftarrow \{p_i \leq med + N_u \sigma_{MAD}\}$