

Semiparametric robust mean estimations based on the orderliness of quantile averages

Tuban Lee

This manuscript was compiled on June 8, 2023

semiparametric | mean-median-mode inequality | asymptotic | unimodal
| Hodges–Lehmann estimator

1 **Inequalities related to weighted averages**

2 So far, it seems plausible that the bias of a reasonable weighted
3 average should be monotonically related to its degree of robust-
4 ness in a semiparametric distribution, since it is a linear com-
5 bination of quantile averages. Analogous to the γ -orderliness,
6 the γ -trimming inequality for a right-skewed distribution is
7 defined as $\forall 0 \leq \epsilon_1 \leq \epsilon_2 \leq \frac{1}{1+\gamma}, TM_{\epsilon_1, \gamma} \geq TM_{\epsilon_2, \gamma}$. While
8 γ -orderliness is a sufficient condition for the γ -trimming in-
9 equality for all $\gamma \geq 0$, as proven in the SI Text, it is not a
10 necessary condition, as shown below.

11 **Data Availability.** Data for Figure ?? are given in SI Dataset
12 S1. All codes have been deposited in [GitHub](#).

13 **ACKNOWLEDGMENTS.** I sincerely acknowledge the insightful
14 comments from the editor which considerably elevated the lucidity
15 and merit of this paper.