Find it ▦ HKBU   **Full text at publisher**   **Full Text Links** ˅   ◆

Export ˅   **Add To Marked List**

‹   1   of 1   ›

Optimally estimating the sample standard deviation from the five-number summary

By: Shi, JD (Shi, Jiandong) [1] ; Luo, DH (Luo, Dehui) [1] ; Weng, H (Weng, Hong) [2] ; Zeng, XT (Zeng, Xian-Tao) [2] ; Lin, L (Lin, Lu) [3] , [4] ; Chu, HT (Chu, Haitao) [5] ; Tong, TJ (Tong, Tiejun) [1]

View Web of Science ResearcherID and ORCID (provided by Clarivate)

Abstract

When reporting the results of clinical studies, some researchers may choose the five-number summary (including the sample median, the first and third quartiles, and the minimum and maximum values) rather than the sample mean and standard deviation (SD), particularly for skewed data. For these studies, when included in a meta-analysis, it is often desired to convert the five-number summary back to the sample mean and SD. For this purpose, several methods have been proposed in the recent literature and they are increasingly used nowadays. In this article, we propose to further advance the literature by developing a smoothly weighted estimator for the sample SD that fully utilizes the sample size information. For ease of implementation, we also derive an approximation formula for the optimal weight, as well as a shortcut formula for the sample SD. Numerical results show that our new estimator provides a more accurate estimate for normal data and also performs favorably for non-normal data. Together with the optimal sample mean estimator in Luo et al., our new methods have dramatically improved the existing methods for data transformation, and they are capable to serve as "rules of thumb" in meta-analysis for studies reported with the five-number summary. Finally for practical use, an Excel spreadsheet and an online calculator are also provided for implementing our optimal estimators.

Keywords

Author Keywords: interquartile range; five-number summary; range; sample mean; sample size; SD

Author Information

Corresponding Address: Tong, Tiejun (corresponding author)
▼   Hong Kong Baptist Univ, Dept Math, Hong Kong, Peoples R China
Addresses:
▼ 1   Hong Kong Baptist Univ, Dept Math, Hong Kong, Peoples R China
▼ 2   Wuhan Univ, Ctr Evidence Based & Translat Med, Zhongnan Hosp, Wuhan, Peoples R China
▼ 3   Shandong Technol & Business Univ, Sch Stat, Yantai, Peoples R China
▼ 4   Shandong Univ, Zhongtai Secur Inst Finance Studies, Jinan, Peoples R China
▼ 5   Univ Minnesota, Sch Publ Hlth, Div Biostat, Minneapolis, MN 55455 USA
E-mail Addresses: tongt@hkbu.edu.hk

Citation Network

In Web of Science Core Collection

64
Citations

🔥 Hot Paper

🔔 Create citation alert

66 Times Cited in All Databases
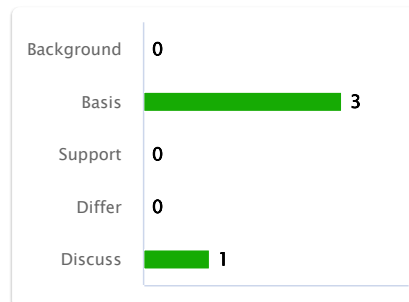Times Cited in All Databases

19
Cited References
View Related Records

+   See more times cited

Citing items by classification   New

Breakdown of how this article has been mentioned, based on available citation context data and snippets from 4 citing item(s).

Background	0
Basis	3
Support	0
Differ	0
Discuss	1

You may also like...

Liang, JJ; Tang, ML; Chan, PS;
A generalized Shapiro-Wilk W statistic for testing high-dimensional normality
COMPUTATIONAL STATISTICS & DATA ANALYSIS

Shauly, M; Parmet, Y;
Comparison of Pearson Distribution System and Response Modeling Methodology (RMM) as Models for Process Capability Analysis of Skewed Data
QUALITY AND RELIABILITY ENGINEERING INTERNATIONAL

Zhang, Y; Gui, WH;

44

?