Title: New Advances in Multiple Statistical Comparison and Its Applications in Medicine

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PROPOSAL

INTRODUCTION

Multiple statistical comparison methods are essential in medical research for analyzing patient groups, treatments, and biological data. Traditional methods like ANOVA have been foundational, but modern datasets with high dimensionality and small sample sizes demand innovative approaches. This proposal explores recent advancements and their applications in medicine.

OBJECTIVES

1. Review recent advances in multiple comparison methods, including high-dimensional solutions.
2. Investigate applications in medical research, such as gene expression analysis, drug trials, and imaging studies.
3. Evaluate integration with machine learning and Bayesian inference for enhanced medical decision-making.

METHODOLOGY

1. Literature Review: Focus on advancements like FDR control, exact solutions to the Behrens-Fisher problem, and clustering-based methods.

2. Case Studies: Explore applications in:

- *Gene expression*: Identifying biomarkers with advanced methods.
- *Drug trials*: Evaluating efficacy using novel post-hoc techniques.
- *Imaging*: High-dimensional comparisons in fMRI studies.

3. Evaluation: Assess performance using simulated and real-world datasets.

Significance: Advances in statistical methods address key challenges in medical research, enhancing robustness and power. For example, high-dimensional techniques solve problems in genomics, and dimension-reduction-based approaches test goodness-of-fit analyses in multiple comparison. Integrating these with machine learning enables precision medicine.

EXPECTED OUTCOMES

- A framework for modern multiple comparison methods.
- Practical application guidelines for complex medical datasets.
- Insights into emerging methodologies for improved research outcomes.

Conclusion: This proposal aims to enhance medical analyses through innovative statistical methods, supporting better research outcomes and patient care.

GUEST EDITORS SHORT BIO

Dr. Jiajuan Liang, Associate Professor in statistics, BNU-HKBU United International College, Zhuhai, China, has been doing research in multivariate statistical inference, methodologies in dimension reduction in high-dimensional data analysis, and structural equation modeling. Welcome to visit my website to find more information on my research:

https://fst.uic.edu.cn/stat_en/faculty/faculty.htm#/jiajuanliang/en

Google Scholar:

https://scholar.google.com/citations?hl=en&user=3qwbWyQAAAAJ

Dr. Hongbin Fang has extensive collaborative research experience in the statistical design and analysis of laboratory, translational, clinical and epidemiological studies in cancer research. His statistical expertise includes the design and analysis of preclinical models and clinical trials, the evaluation of diagnostic tests, biomarkers and drug combinations, survival analysis, the analysis of high dimensional genomic data and statistical bioinformatics, predictive and prognostic models of cancer, longitudinal and Bayesian hierarchical/multi-level modeling and applied Bayesian methods. Welcome to visit my website to find more information on my research:

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