



REVIEWER'S REPORT

Manuscript No.: IJAR-57818

Title: A Comparative Study of Indexing Strategies for Boosting PostgreSQL Query Performance

Recommendation:

- Accept as it is
- Accept after minor revision...yes.....**
- Accept after major revision
- Do not accept (*Reasons below*)

| Rating | Excel. | Good | Fair | Poor |
|----------------|--------|------|------|------|
| Originality | | | Y | |
| Techn. Quality | | | Y | |
| Clarity | | | y | |
| Significance | | | Y | |

Reviewer's ID: JPR-Dr.Shaweta sachdeva

Detailed Reviewer's Report

1. The manuscript addresses a highly relevant topic in database optimization by evaluating the impact of different indexing strategies on PostgreSQL query performance. The study has practical significance for large-scale database applications.
2. The abstract clearly summarizes the objectives, methodology, and key findings of the study. Including specific experimental metrics strengthens the clarity and impact of the paper.
3. The introduction effectively explains the importance of query optimization and indexing in modern database systems. The motivation for selecting PostgreSQL as the experimental platform is well justified.
4. The literature review provides a good overview of PostgreSQL indexing techniques and related optimization studies. However, the manuscript could benefit from including additional recent research on learned indexes, adaptive indexing, and cloud-native database optimization.
5. The dataset description is sufficiently detailed and demonstrates careful experimental design through the use of high-cardinality and low-cardinality attributes.
6. The experimental setup is clearly described, and the use of PostgreSQL's `EXPLAIN ANALYZE` command improves reproducibility and reliability of the results.
7. The methodology section would be strengthened by providing additional information regarding query complexity, indexing commands, transaction isolation levels, and PostgreSQL configuration parameters used during experimentation.
8. The performance evaluation is comprehensive because it includes execution time, CPU utilization, memory consumption, and index size. This multidimensional evaluation improves the practical value of the study.
9. The results clearly demonstrate the effectiveness of indexing strategies, particularly for retrieval and update operations. The comparative presentation of simple, composite, and text indexes is informative and well organized.
10. The discussion section appropriately explains why deletion operations achieve lower improvement rates due to index maintenance overhead. This interpretation enhances the technical quality of the analysis.

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11. The manuscript would benefit from statistical validation of the experimental results, such as standard deviation analysis or confidence intervals across repeated runs.
12. Although the synthetic dataset provides controlled experimentation, including experiments on real-world datasets would significantly strengthen the practical applicability of the conclusions.
13. The graphical representations improve readability; however, some figures and captions require formatting refinement and improved alignment for better presentation quality.
14. The discussion on storage overhead associated with text indexes is valuable because it highlights the trade-off between performance and resource utilization.
15. The conclusion effectively summarizes the main findings and provides practical recommendations for index selection in PostgreSQL systems.
16. The future work section is relevant and appropriately suggests extending the study toward advanced PostgreSQL index types such as GiST, GIN, BRIN, and SP-GiST.
17. Several minor grammatical issues, spacing inconsistencies, and formatting errors are present throughout the manuscript. Careful proofreading and formatting revision are recommended before publication. For example, some section headings and figure references appear merged or inconsistently spaced.
- 18.** Overall, the manuscript presents a useful comparative experimental study with strong practical implications for PostgreSQL database optimization. With additional experimental depth, clearer statistical analysis, and improved language polishing, the paper would make a valuable contribution to the field of database performance engineering.