

## REVIEWER'S REPORT

**Manuscript No.: IJAR-59093**

**Title: Implementation of the Contextual Bayesian Model for 1 Personalized, Reasoned Multi-Criteria School Orientation: Application to the Ivorian Context**

### Recommendation:

Accept as it is .....  
 Accept after minor revision.....  
**Accept after major revision ...yes.....**  
 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 an important problem; however, the authors should clarify more explicitly what the principal research contribution of the present work is compared with their earlier studies [14] and [15]. The distinction between the previously developed Bayesian model and the present deployment-oriented contribution should be made clearer.
2. The reported model performance of 100% hold-out accuracy and 97% K=10 cross-validation accuracy is exceptionally high. The authors should provide more details about the dataset size, class distribution, train/test splitting procedure, preprocessing, and possible data leakage to establish the reliability of these results.
3. The methodology is primarily deployment and conceptual oriented. The manuscript would benefit from a clearer description of the empirical evidence used to support the proposed offline-first architecture, governance framework, and 36-month deployment plan.
4. The proposed architecture specifies technologies such as React Native, scikit-learn, REST API, OAuth 2.0, TLS 1.3, and AES-256. The authors should provide a more detailed justification for these technology choices and discuss their feasibility in low-resource educational institutions.
5. The manuscript introduces an 18-dimensional vector after adding the gender variable, whereas the original model uses a 17-dimensional vector. The transition between these two representations should be explained more systematically, including the effect of the additional variable on model training and performance.
6. The treatment of gender as a model variable requires deeper methodological justification. The authors should explain how gender is expected to correct rather than reproduce existing orientation bias and should report appropriate fairness measures before and after incorporating this variable.
7. The proposed contextual variables, particularly household income, socio-occupational category, geographic zone, and parental education, may contain sensitive information. The manuscript should discuss data minimization, informed consent, access control, retention, anonymization/pseudonymization, and potential misuse of these variables.

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8. The missing-data strategy requires further validation. For example, the use of the modal value of the geographic variable and the fixed 15% inflation of  $\sigma_c$  appear prescriptive. The authors should explain how these values were derived and provide experimental evidence demonstrating their impact on recommendation reliability.
9. The confidence-index thresholds (0.80, 0.50, and 0.35) are central to the proposed counselor workflow. The authors should provide the statistical or empirical basis for selecting these thresholds and conduct a sensitivity analysis to determine how changes in thresholds affect false alerts, missed cases, and counselor workload.
10. The deployment roadmap provides precise performance targets, such as precision  $\geq 88\%$ ,  $\geq 92\%$ , and K=10 accuracy  $\geq 97\%$ . The manuscript should explain how these thresholds were established and whether they are based on empirical benchmarks, institutional requirements, or author-defined criteria.
11. The fairness evaluation should be strengthened. Instead of relying primarily on recommendation gaps, the authors should consider multiple fairness measures such as demographic parity, equal opportunity, error-rate differences, calibration, and subgroup performance where appropriate.
12. The claim that the proposed approach can reduce gender and socio-economic inequalities should be supported by measurable evidence. At present, the manuscript largely proposes mechanisms for achieving this objective rather than demonstrating their effectiveness.
13. The Governance Committee is described in considerable detail, but the practical authority, decision-making process, escalation mechanism, and conflict-resolution procedure of the committee should be specified more clearly.
14. The manuscript should provide a clearer threat model for the offline-first architecture. Risks associated with lost or stolen tablets, unauthorized USB synchronization, outdated models, compromised local databases, and synchronization conflicts should be addressed.
15. The security discussion would be improved by explaining how encryption keys are generated, stored, rotated, and recovered in offline environments. The proposed use of AES-256 alone does not fully describe the security architecture.
16. The manuscript should clarify how model updates are authenticated and verified before being distributed to offline devices. Model versioning, rollback, integrity checking, and protection against unauthorized model modification are particularly important in this deployment scenario.
17. The change-management section is conceptually strong, but its effectiveness is not empirically evaluated. A pilot study involving counselors, students, parents, and school administrators could provide evidence regarding usability, trust, acceptance, and perceived usefulness.
18. Several statements regarding resistance, distrust, burnout, and stakeholder behavior are presented generally. These claims should either be supported with context-specific empirical evidence from Côte d'Ivoire or clearly identified as anticipated risks rather than established findings.
19. The manuscript should provide more information about the characteristics and representativeness of the institutions proposed for the pilot phase. Four schools may not adequately represent the diversity of educational, geographic, socio-economic, and infrastructure conditions across Côte d'Ivoire.
20. The proposed system is described as a decision-support system rather than an automated decision-making system. This distinction is important, but the manuscript should explain technically and procedurally how human oversight will be enforced so that counselors cannot simply accept automated recommendations without meaningful review.
21. The explanation sheet is a useful component; however, the authors should clarify how the "three main reasons" are generated by the Bayesian model and whether they correspond to statistically significant contributors, model feature importance, or a rule-based explanation mechanism.

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22. The manuscript should discuss possible unintended consequences, such as counselors over-relying on high-confidence recommendations, students being discouraged from certain tracks, or contextual variables becoming proxies for socio-economic disadvantage.
23. The authors should consider comparing the proposed MBC framework with at least one or more alternative approaches, such as logistic regression, decision trees, random forests, or other probabilistic models, using consistent evaluation and fairness metrics.
24. The conclusion contains strong statements such as describing the MBC as a “robust algorithmic contribution” and placing it “among the best-documented AI-assisted orientation systems.” Such claims should be supported by a systematic comparison with existing systems or moderated unless sufficient comparative evidence is provided.
25. The manuscript would benefit from a dedicated limitations section distinguishing limitations of the underlying model from limitations of the proposed deployment architecture. The authors themselves acknowledge the need for long-term real-world validation, which should be emphasized more prominently.
26. The five-year longitudinal validation proposed by the authors is valuable. The evaluation framework should specify primary and secondary outcomes, baseline/control conditions, subgroup analyses, statistical tests, and criteria for determining whether the intervention improves educational equity.
27. The references should be carefully checked for consistency in formatting, DOI presentation, capitalization, and completeness. The relationship between citations [14] and [15] and the current manuscript should also be clearly explained.
28. The manuscript would benefit from language and formatting revision. Several tables and section labels contain spacing or formatting issues, and some sentences are lengthy and could be rewritten for greater readability and precision.
29. A detailed system architecture diagram showing data collection, local processing, Bayesian inference, confidence assessment, counselor intervention, synchronization, governance auditing, and model updating would substantially improve the technical clarity of the manuscript.
- 30.** Overall, the manuscript has practical relevance and an interesting socio-technical perspective, but stronger empirical validation, clearer methodological justification, quantitative fairness analysis, security details, and evidence supporting the proposed deployment thresholds are required to establish the effectiveness and generalizability of the proposed approach.