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REVIEWER'S REPORT

Manuscript No.: IJAR-53600 Date:29/08/25

Title: Predicting Student Academic Performance: A Machine Learning Analysis of Study Habits and Lifestyle Factors

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		yes		
Techn. Quality		yes		
Clarity		yes		
Significance		yes		

Reviewer Name: Dr.Shaweta Sachdeva **Date:** 29/08/25

Reviewer's Comment for Publication. Accepted with Minor Revisions

(*To be published with the manuscript in the journal*)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

Significance

- Addresses a **critical challenge in education**: understanding and predicting academic performance for better student support and interventions.
- Goes beyond traditional demographic and grade-based predictors by incorporating **lifestyle, study habits, mental health, and digital usage**, making the analysis more holistic.
- Provides **evidence-based thresholds** (e.g., study time, mental health levels, screen time) that can directly inform policies and academic advising.

Strengths

- **Comprehensive dataset**: Analysis of 1,000 students with 16 behavioral and academic factors ensures breadth and depth.

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- Methodological rigor: Employs multiple ML algorithms, feature engineering, statistical tests, and clustering for robust analysis.
- High predictive accuracy: Ridge Regression achieved $R^2 = 0.9015$, showing excellent reliability.
- Practical application: Actionable insights for early warning systems, personalized interventions, and institutional policy development.
- Clustering analysis: Identification of three performance groups adds value by enabling tailored recommendations.

Key Insights

- Study hours are the dominant predictor of academic success (r = 0.825); 4+ hours daily is a critical threshold linked to significantly higher scores.
- Mental health strongly influences performance: students with high well-being achieve ~15 points higher on average.
- Excessive screen time harms performance: strong negative correlation with social media and streaming hours.
- Nonlinear relationships matter: Polynomial and interaction features improved model accuracy, highlighting the complexity of study-behavior dynamics.
- Holistic interventions are needed: Supporting both academic habits and lifestyle/mental health factors can maximize student success.

Detailed Reviewer's Report

1. **Relevance & Impact**: The study addresses an important issue in education—predicting academic performance—providing actionable insights for student support and policy-making.
2. **Comprehensive Dataset**: Uses a well-structured dataset of 1,000 students with both lifestyle and academic factors, allowing a holistic analysis.
3. **Methodological Rigor**: Employs multiple ML models (Ridge, Lasso, Random Forest, Gradient Boosting, SVR), feature engineering, statistical tests, and clustering, ensuring robust results.
4. **High Predictive Accuracy**: Achieves excellent results ($R^2 = 0.9015$), demonstrating the strength of the proposed approach.
5. **Actionable Insights**: Clear thresholds are identified (e.g., 4+ hours of study → +35 points; mental health >7 → +15 points; excessive screen time → negative impact).
6. **Clustering Analysis**: Adds depth by segmenting students into performance groups, which enhances practical application for interventions.

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7. **Overemphasis on Study Hours**: While study time is clearly dominant, the paper could explore **interaction with other factors** more deeply (e.g., sleep, exercise, part-time jobs).
8. **Data Limitations**: Since study habits and screen time are **self-reported**, results may be biased. This limitation is acknowledged but could be further discussed.
9. **External Validity**: The dataset is limited to one student population; results may not generalize across different institutions or cultural contexts.
10. **Model Choice**: While Ridge Regression performed best, a comparison with **neural networks or deep learning models** could strengthen contributions.
11. **Visualization**: Results would benefit from clearer **graphs/plots** (e.g., feature importance bar charts, performance comparisons across models).
12. **Discussion Depth**: The discussion could better connect findings to **existing educational theories or frameworks** (e.g., self-regulated learning, digital distraction literature).