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Ensemble Learning Approaches to Predicting Youth Suicidal Ideation Using Emotional Numbing, Cyberbullying Exposure, AI Chatbot Attachment, Hopelessness, and Social Withdrawal

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1. Round 1

1.1. Reviewer 1

Reviewer:

The paragraph beginning with “Another emerging dimension of adolescent psychological functioning involves the increasing emotional attachment to artificial intelligence systems and conversational agents” overstates the maturity of current empirical literature on AI-human emotional attachment. The authors cite emerging studies, but the manuscript presents AI chatbot attachment almost as an established clinical construct. The literature review should more clearly distinguish speculative concerns, theoretical hypotheses, and empirically validated findings to avoid conceptual inflation and technological determinism.

The adapted “Parasocial Interaction and Emotional Attachment to AI Scale” represents one of the central variables of the study, yet the psychometric reporting is inadequate. The manuscript mentions expert review and pilot testing with 50 students, but no exploratory factor analysis, confirmatory factor analysis, convergent validity assessment, or measurement invariance testing is reported. Given that this instrument appears partially novel or substantially adapted, the psychometric validation procedures should be presented in far greater detail.

The paragraph beginning with "Data analysis was performed using Python programming language version 3.12" lacks sufficient computational reproducibility. The authors should report hyperparameter tuning procedures, random seed settings, optimization strategies, handling of class imbalance, feature selection methods, and exact model architectures used in the stacked ensemble classifier. Without these details, the machine learning framework cannot be independently replicated.

The sentence "Missing values below 5% were managed using multiple imputation procedures" requires methodological expansion. The authors should specify which multiple imputation algorithm was used, how many imputations were generated, whether imputations were performed before or after train-test splitting, and whether leakage prevention procedures were implemented. In machine learning studies, improper imputation can produce substantial information leakage and inflated performance estimates.

The reported predictive performance metrics appear exceptionally high for psychosocial suicide prediction using self-report cross-sectional data. Specifically, the stacked ensemble classifier achieved an AUC-ROC of 0.97, accuracy of 94%, and specificity of 95%. These results raise concerns regarding potential overfitting, target leakage, or insufficient separation between training and testing procedures. The manuscript should provide calibration plots, confusion matrices, external validation results, or nested cross-validation procedures to demonstrate model robustness.

The paragraph discussing "stratified 10-fold cross-validation procedures" does not clarify whether cross-validation was nested within the training set only or performed across the full dataset. This distinction is critical because improper preprocessing before cross-validation can substantially inflate predictive accuracy. The authors should explicitly explain the sequence of preprocessing, normalization, imputation, feature engineering, and cross-validation operations.

Table 1 presents high intercorrelations among several predictors, particularly hopelessness, emotional numbing, and social withdrawal. However, the manuscript does not evaluate multicollinearity or discuss feature redundancy within the ensemble models. Although machine learning methods can tolerate multicollinearity better than linear regression, highly overlapping constructs may distort feature importance estimation and SHAP interpretation. The authors should address this issue analytically.

Authors uploaded the revised manuscript.

1.2. Reviewer 2

Reviewer:

The statement "Approximately 64% of participants reported daily use of AI conversational systems or chatbot applications" requires substantially greater methodological clarification. The manuscript does not define what qualifies as an "AI chatbot system." It remains unclear whether participants included ChatGPT, Replika, Siri, customer service bots, educational tutors, or mental health applications. Because the meaning of "attachment" depends heavily on the type of AI interaction, the lack of platform categorization threatens construct validity and interpretability.

The Methods section states that participants were recruited through "online announcements, counseling center referrals, student mailing lists, and digital recruitment advertisements distributed through social media platforms." This recruitment strategy likely introduced substantial self-selection bias toward digitally engaged youth and psychologically distressed individuals. The authors should explicitly discuss how recruitment through online mental health support networks may have inflated rates of suicidal ideation, cyberbullying exposure, and AI chatbot attachment, thereby affecting external validity.

The sentence "Participants under the age of 18 provided assent alongside parental or guardian consent" requires additional ethical clarification given the highly sensitive topic of suicidality. The manuscript does not explain what suicide risk protocols were implemented for participants endorsing severe suicidal ideation. The authors should specify whether emergency referral procedures, crisis resources, or clinician monitoring mechanisms were used during data collection. This omission is particularly concerning given the adolescent population and suicide-related content.

The paragraph describing the Beck Scale for Suicide Ideation is methodologically insufficient because the manuscript does not explain how the continuous suicidal ideation scores were transformed into the dichotomous classification outcome used in the machine learning analyses. The sentence "The target variable consisted of dichotomized suicidal ideation severity levels

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derived from clinically validated cutoff scores" requires precise reporting of cutoff values, clinical rationale, class distribution, and supporting validation references.

Authors uploaded the revised manuscript.

2. Revised

Editor's decision after revisions: Accepted.
Editor in Chief's decision: Accepted.

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