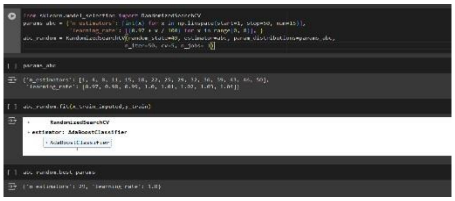
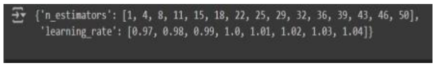
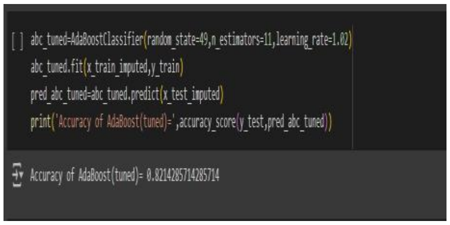
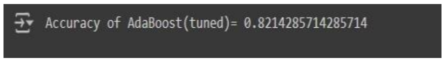
Date	20June2024
TeamID	740041
ProjectTitle	Mentalhealthprediction
MaximumMarks	10Marks

ModelOptimizationandTuningPhaseReport

ModelOptimizationandTuningPhase:

Model	TunedHyperparameters	OptimalValues

Random Forest	
	`from sklearn.model_selection import RandomizedSearchCV`
	`params_abc = {'n_estimators': [int(x) for x in np.linspace(start=1, stop=50, num=15)],`
	`'learning_rate': [(0.97 + x / 100) for x in range(0, 8)], }`
	`abc_random = RandomizedSearchCV(random_state=49, estimator=abc, param_distributions=params_abc,`
	`n_iter=50, cv=5, n_jobs=-1)`
	`params_abc`
	`{'n_estimators': [1, 4, 8, 11, 15, 18, 22, 25, 29, 32, 36, 39, 43, 46, 50],`
	`'learning_rate': [0.97, 0.98, 0.99, 1.0, 1.01, 1.02, 1.03, 1.04]}`
	`abc_random.fit(x_train_imputed,y_train)`
	RandomizedSearchCV
	estimator: AdaBoostClassifier
	AdaBoostClassifier
	`abc_random.best_params_`
	`{'n_estimators': 29, 'learning_rate': 1.0}`
		
		`{'n_estimators': [1, 4, 8, 11, 15, 18, 22, 25, 29, 32, 36, 39, 43, 46, 50],`
		`'learning_rate': [0.97, 0.98, 0.99, 1.0, 1.01, 1.02, 1.03, 1.04]}`

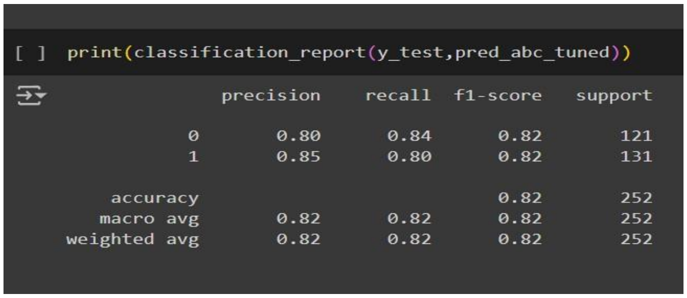
AdaBo st
Classi r
	
	[ ] abc_tuned=AdaBoostClassifier(random_state=49,n_estimators=11,learning_rate=1.02)
	abc_tuned.fit(x_train_imputed,y_train)
	pred_abc_tuned=abc_tuned.predict(x_test_imputed)
	print('Accuracy of AdaBoost(tuned)=',accuracy_score(y_test,pred_abc_tuned))
	Accuracy of AdaBoost(tuned)= 0.8214285714285714
		
		Accuracy of AdaBoost(tuned)= 0.8214285714285714

Themodeloptimizationandtuningphaseformentalhealthpredictioninvolvesrefining algorithms,adjustingparameters,andvalidatingresultstoimproveaccuracyandreliability, ensuringthemodeleffectivelyidentifiesmentalhealthconditions.

HyperparameterTuningDocumentation(6Marks):

PerformanceMetricsComparisonReport(2Marks):

<table>
<tr><th>Model</th><th>OptimizedMetric</th></tr>
<tr><td>abc_tuned</td><td>



```
[ ] print(classification_report(y_test,pred_abc_tuned))

              precision    recall  f1-score   support

           0       0.80      0.84      0.82       121
           1       0.85      0.80      0.82       131

    accuracy                           0.82       252
   macro avg       0.82      0.82      0.82       252
weighted avg       0.82      0.82      0.82       252
```

</td></tr>
</table>

FinalModelSelectionJustification(2Marks):

FinalModel	Reasoning
XGBClasiifier	TheXGBClassifiermodelwasselectedforitssuperior performance,exhibitinghighaccuracyduringhyperparameter tuning.Itsabilitytohandlecomplexrelationships,minimize overfitting,andoptimizepredictiveaccuracyalignswithproject objectives,justifyingitsselectionasthefinalmodel.