Decision Trees Classifier

Dataset	Best Params	Test accuracy	F1 Score
test_c300_d100	ccp_alpha=0.0, class_weight=None, criterion='entropy', max_depth=3, max_features=300, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2,min_weight_fraction_leaf= 0.0, presort='deprecated', random_state=42, splitter='random'	0.64	[0.625, 0.65384]
test_c300_d1000	ccp_alpha=0.0, class_weight=None, criterion='entropy', max_depth=5, max_features=300, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=5, min_samples_split=2,min_weight_fraction_leaf= 0.0, presort='deprecated',random_state=42, splitter='random'	0.6615	[0.60708, 0.70267]
test_c300_d5000	ccp_alpha=0.0, class_weight=None, criterion=’gini’, max_depth=20, max_features=500, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=2, min_samples_split=2,min_weight_fraction_leaf= 0.0, presort='deprecated',random_state=42, splitter=’best’	0.7642	[0.75963, 0.76859]
test_c500_d100	ccp_alpha=0.0, class_weight=None, criterion=’gini’, max_depth=2, max_features=400, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=5, min_samples_split=2,min_weight_fraction_leaf= 0.0, presort='deprecated',random_state=42, splitter=’best’	0.59	[0.61682, 0.55913]
test_c500_d1000	ccp_alpha=0.0, class_weight=None, criterion=’gini’, max_depth=10, max_features=500, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=20, min_samples_split=2,min_weight_fraction_leaf= 0.0, presort='deprecated',random_state=42, splitter=’random’	0.6965	[0.71053, 0.68102]
test_c500_d5000	ccp_alpha=0.0, class_weight=None, criterion=’entropy’, max_depth=10, max_features=400, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=20, min_samples_split=2,min_weight_fraction_leaf=	0.7823	[0.77669, 0.78763]

	0.0, presort='deprecated',random_state=42, splitter=’random’		
test_c1000_d100	ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=3, max_features=300, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=10, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='random'	0.705	[0.7551, 0.62893]
test_c1000_d1000	ccp_alpha=0.0, class_weight=None, criterion='entropy', max_depth=10, max_features=200, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='random'	0.7975	[0.7900, 0.80444]
test_c1000_d5000	ccp_alpha=0.0, class_weight=None, criterion='entropy', max_depth=10, max_features=200, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='random'	0.7975	[0.7900, 0.80444]
test_c1500_d100	ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'	1.0	[1., 1.]
test_c1500_d1000	ccp_alpha=0.0, class_weight=None, criterion='entropy', max_depth=10, max_features=500, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=10, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'	0.9225	[0.9222, 0.92277]
test_c1500_d5000	ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=10, max_features=400, max_leaf_nodes=None,	0.944	[0.94311, 0.94486]

	min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=20, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='random'		
test_c1800_d100	ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=3, max_features=300, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='random'	0.905	[0.9005, 0.90909]
test_c1800_d1000	ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=10, max_features=200, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=20, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'	0.955	[0.95365 0.95626]
test_c1800_d5000	ccp_alpha=0.0,class_weight=None,criterion='en tropy',max_depth=10,max_features=400,max_l eaf_nodes=None,min_impurity_decrease=0.0, min_impurity_split=None,min_samples_leaf=5, min_samples_split=2,min_weight_fraction_leaf= 0.0,presort='deprecated', random_state=42,splitter='best'	0.9846	[0.9845, 0.98467]

Bagging

Dataset	Best Params	Test accuracy	F1 Score
test_c300_d100	base_estimator=DecisionTreeClassifier(ccp_alp ha=0.0, class_weight=None, criterion='gini', max_depth=10, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2,	0.85	[0.85148, 0.84848]

	min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False,bootstrap_features=False,max _features=1.0, max_samples=1.0,n_estimators=280,n_jobs=N one, oob_score=False,random_state=42,verbose=0, warm_start=False		
test_c300_d1000	base_estimator=DecisionTreeClassifier(ccp_alp ha=0.0, class_weight=None, criterion='gini', max_depth=10, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=50, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.9015	[0.90045, 0.90252]
test_c300_d5000	base_estimator=DecisionTreeClassifier(ccp_alp ha=0.0, class_weight=None, criterion='gini', max_depth=10, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=50, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0,	0.928	[0.92676, 0.92918]

	warm_start=False		
test_c500_d100	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=3, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.915	[0.91542, 0.91457]
test_c500_d1000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=20, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=20, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0,	0.9685	[0.9682, 0.96876]

	max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c500_d5000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=20, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=20, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.9742	[0.97394, 0.97444]
test_c1000_d100	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None,	0.995	[0.99497 487 0.995024 88]

	min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1000_d1000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=20, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=20, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=False, bootstrap_features=False, max_features=1.0, max_samples=1.0,	0.998	[0.998 0.998]

	n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1000_d5000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1500_d100	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0,	1.0	[1., 1.]

	min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1500_d1000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42,	0.9995	[0.99949975 0.99950025]

	verbose=0, warm_start=False		
test_c1500_d5000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1800_d100	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,	1.0	[1., 1.]

	min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1800_d1000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=80, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.9995	[0.99950025 0.99949975]

test_c1800_d5000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=3, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]

Random Forest Classifier

Dataset	Best Params	Test accuracy	F1 Score
test_c300_d100	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=300, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0,	0.83	[0.81720, 0.84112]

	n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c300_d1000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.882	[0.88080, 0.88316]
test_c300_d5000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.9132	[0.91184, 0.91451]
test_c500_d100	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=300, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.875	[0.87046 632 0.879227 05]
test_c500_d1000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5,	0.955	[0.95431, 0.95566]

	max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c500_d5000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.9613	[0.96081013 0.96177778]
test_c1000_d100	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	0.995	[0.99502488 0.99497487]
test_c1000_d1000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=2, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2,	0.996	[0.99599, 0.99600]

	min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1000_d5000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1500_d100	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=3, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1500_d1000	base_estimator=DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=2, max_features=2, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None,	0.9995	[0.99949975 0.99950025]

	min_samples_leaf=5, min_samples_split=2, min_weight_fraction_leaf=0.0, presort='deprecated', random_state=42, splitter='best'), bootstrap=True, bootstrap_features=False, max_features=1.0, max_samples=1.0, n_estimators=280, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1500_d5000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=2, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=200, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1800_d100	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=2, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=100, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1800_d1000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=2,	1.0	[1., 1.]

	max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=100, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False		
test_c1800_d5000	bootstrap=True, ccp_alpha=0.0, class_weight=None, criterion='gini', max_depth=5, max_features=2, max_leaf_nodes=None, max_samples=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=100, n_jobs=None, oob_score=False, random_state=42, verbose=0, warm_start=False	1.0	[1., 1.]

Gradient Boosting Classifier

Dataset	Best Params	Test accuracy	F1 Score
test_c300_d100	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.825	[0.82233503 0.82758621]

test_c300_d1000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.994	[0.99396, 0.99403]
test_c300_d5000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.996	[0.99598394 0.99601594]
test_c500_d100	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None,	0.925	[0.92610837 0.92385787]

	subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False		
test_c500_d1000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.996	[0.99598394 0.99601594]
test_c500_d5000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.998	[0.99799599 0.99800399]
test_c1000_d100	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2,	0.975	[0.97512438 0.97487437]

	min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False		
test_c1000_d1000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.998	[0.99799599 0.99800399]
test_c1000_d5000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.998	[0.99799599 0.99800399]
test_c1500_d100	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None,	1.0	[1., 1.]

	max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False		
test_c1500_d1000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	0.9995	[0.99949975 0.99950025]
test_c1500_d5000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	1.0	[1., 1.]

test_c1800_d100	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1800_d1000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=1, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None, subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False	1.0	[1., 1.]
test_c1800_d5000	ccp_alpha=0.0, criterion='friedman_mse', init=None, learning_rate=0.1, loss='deviance', max_depth=3, max_features=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=250, n_iter_no_change=None, presort='deprecated', random_state=None,	1.0	[1., 1.]

	subsample=1.0, tol=0.0001, validation_fraction=0.1, verbose=0, warm_start=False		

(Q5)

All Models give 100% accuracy and [1.0, 1.0] F1 Score on test_c1500_d100 dataset.

1)Overall Gradient Boosting is the best performer on all datasets. A Gradient Boosting Machine or GBM combines the predictions from multiple decision trees to generate the final predictions thus it has better accuracy compared to other algorithms.

2)Increasing the amount of dataset on the following classifiers:

Decision Trees: Increasing the number of Clauses and Data points increases the Accuracy

Bagging Classifier: Increasing the number of Data Points does not increase accuracy on all numbers of clauses in the dataset. For Eg. increasing data points from 100 to 1000 in these c1500_d100, c1500_d1000 datasets decreases the Accuracy from 100% to 99.95%

Random Forest: Increasing the number of Data Points does not increase accuracy on all numbers of clauses in the dataset. For Eg. increasing data points from 100 to 1000 in these c1500_d100, c1500_d1000 datasets decreases the Accuracy from 100% to 99.95%

3)Increasing the amount of clauses on the following classifiers:

Decision Trees: Increasing the number of Clauses and Data points increases the Accuracy

Bagging Classifier: Increasing the number of Clauses does not increase accuracy in all the datasets. For Eg. increasing data points from 100 to 1000 in these c1500_d100, c1500_d1000 datasets decreases the Accuracy from 100% to 99.95%

Random Forest: Increasing the number of Clauses does not increase accuracy on all numbers of data points in the dataset. For Eg. increasing data points from 100 to 1000 in these c1500_d100, c1500_d1000 datasets decreases the Accuracy from 100% to 99.95%

Gradient Boosting Classifier: Increasing the number of Data Points does not increase accuracy on all numbers of clauses in the dataset. For Eg. increasing data points from 100 to 1000 in these c1500_d100, c1500_d1000 datasets decreases the Accuracy from 100% to 99.95%

(Q6) - Extra Marks

Test Accuracy for tree is 0.8732
Test Accuracy for bagging is 0.7325
Test Accuracy for randomForest is 0.9709
Test Accuracy for Gradient Boosting is 0.9899
Gradient Boosting Performs best on Mnist Dataset