STREAMLINE Training Summary Report: 2022-06-21 20:57:04.879407

General Pipeline Settings:

Data Path: /home/ryanurb/idata/datasets/multiplexer_set
Output Path: /home/ryanurb/idata/output
Experiment Name: MultiplexerSet_noSelect_Sub
Class Label: Class
Instance Label: None
Ignored Features: None
Specified Categorical Features: None
CV Partitions: 10
Partition Method: S
Match Label: None
Categorical Cutoff: 10
Statistical Significance Cutoff: 0.05
Export Feature Correlations: True
Export Univariate Plots: False
Random Seed: 42
Run From Jupyter Notebook: False
Use Data Scaling: True
Use Data Imputation: True
Use Multivariate Imputation: True
Use Mutual Information: True
Use MultiSURF: True
Use TURF: False
TURF Cutoff: 0.5
MultiSURF Instance Subset: 2000
Max Features to Keep: 2000
Filter Poor Features: False
Top Features to Display: 40
Export Feature Importance Plot: True
Overwrite CV Datasets: True
Primary Metric: balanced_accuracy
Training Subsample for KNN,ANN,SVM,and XGB: 5000
Uniform Feature Importance Estimation (Models): True
Hyperparameter Sweep Number of Trials: 200
Hyperparameter Timeout: 900
Export Hyperparameter Sweep Plots: True
Export ROC Plot: True
Export PRC Plot: True
Export Metric Boxplots: True
Export Feature Importance Boxplots: True
Metric Weighting Composite FI Plots: balanced_accuracy
Top Model Features To Display: 40

ML Modeling Algorithms:

Naive Bayes: True
Logistic Regression: True
Decision Tree: True
Random Forest: True
Gradient Boosting: True
Extreme Gradient Boosting: True
Light Gradient Boosting: True
Category Gradient Boosting: True
Support Vector Machine: True
Artificial Neural Network: True
K-Nearest Neightbors: True
Genetic Programming: True
eLCS: False
XCS: False
ExSTraCS: True

LCS Settings (eLCS,XCS,ExSTraCS):

Do LCS Hyperparameter Sweep: False
nu: 10
Training Iterations: 500000
N (Rule Population Size): 5000
LCS Hyperparameter Sweep Timeout: 1200

Datasets:

D1 = A_6_bit_mutliplexer_500_01
D2 = B_11_bit_mutliplexer_1000_01
D3 = C_20_bit_mutliplexer_2000_01
D4 = D_37_bit_mutliplexer_5000_01
D5 = E_70_bit_mutliplexer_10000_01
D6 = F_135_bit_mutliplexer_20000_01

Univariate Analysis of Each Dataset (Top 10 Features for Each): Page 1

D1 = A_6_bit_mutliplexer_500_01

Feature:	P-Value
R_0:	1.26939024268301e-10
R_3:	3.509298244030297e-07
R_1:	9.059261024221464e-07
R_2:	1.7448416343049778e-05
A_0:	0.5694973919380477
A_1:	0.7971447941453101

D2 = B_11_bit_mutliplexer_1000_01

Feature:	P-Value
R_4:	2.2248801885218974e-05
R_2:	0.0001766997611545
R_6:	0.000193302557659
R_0:	0.0003044847642591
R_1:	0.0012360481186965
R_7:	0.0052238913440066
R_3:	0.0224712913608342
R_5:	0.0225536002419627
A_2:	0.2035317994195949
A_0:	0.4098568324810853

D3 = C_20_bit_mutliplexer_2000_01

Feature:	P-Value
R_2:	8.852163558112362e-05
R_3:	0.0001193452640023
R_6:	0.000384686668138
R_5:	0.0008311970831204
R_1:	0.0008925709376199
R_4:	0.0016002295505668
R_14:	0.0023725177489401
R_13:	0.0033974532166476
R_15:	0.0048580643893158
R_7:	0.0050257374945953

D4 = D_37_bit_mutliplexer_5000_01

Feature:	P-Value
R_31:	0.0007736754593663
R_30:	0.0008832966181209
R_13:	0.0009918366525363
R_2:	0.0016474655174039
R_19:	0.0023476917358282
R_1:	0.0024614843515886
R_3:	0.0027526782036786
R_15:	0.0095181037929174
R_29:	0.0106617018265068
R_5:	0.0110527366236116

D5 = E_70_bit_mutliplexer_10000_01

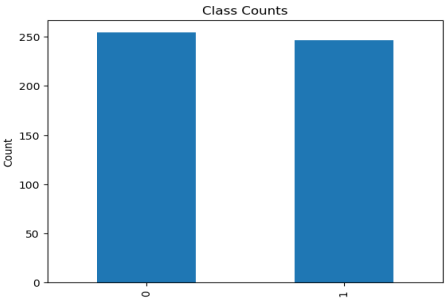
Feature:	P-Value
R_22:	2.225314574216959e-07
R_34:	3.5048304422665855e-05
R_25:	0.0004675117666111
A_5:	0.0026933624905259
R_38:	0.0030718690386894
R_13:	0.0035117346967141
R_29:	0.0039853662019388
R_12:	0.0045245747368835
R_52:	0.0057657049009223
R_59:	0.0060974802599191

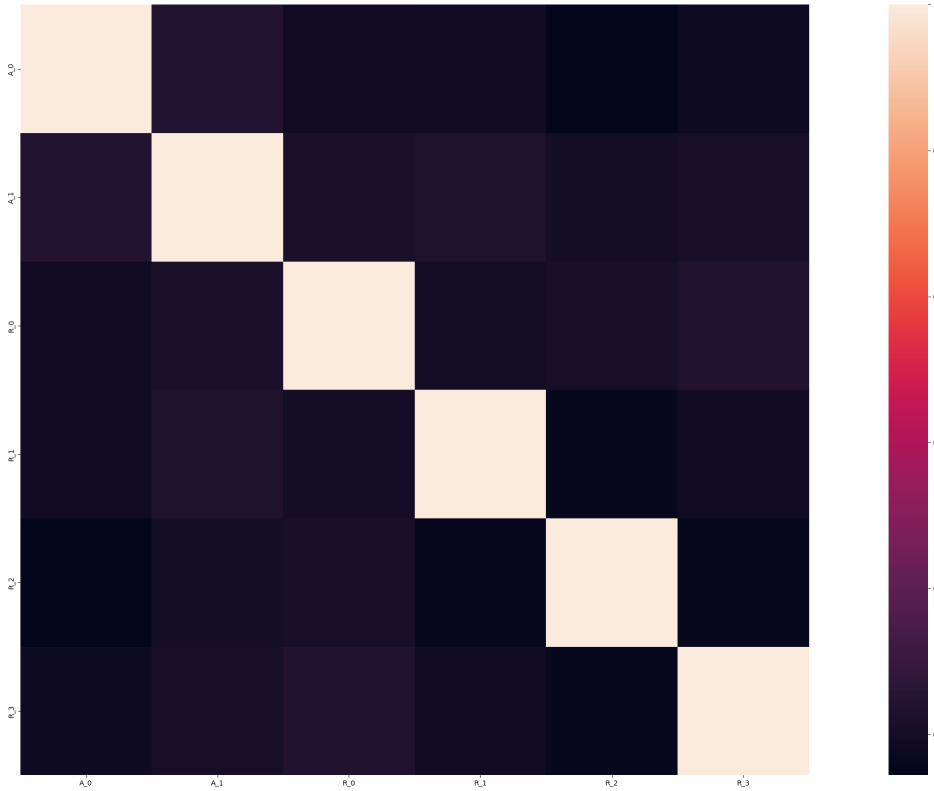
Univariate Analysis of Each Dataset (Top 10 Features for Each): Page 2

D6 = F_135_bit_mutliplexer_20000_01

Feature:	P-Value
R_23:	0.0008774724917323
R_65:	0.0028169569692886
R_49:	0.0033365077024448
R_74:	0.0055759947488155
R_105:	0.0058873767124799
R_116:	0.0075815765786996
R_94:	0.0090281431801193
R_26:	0.0124580448268327
R_59:	0.0168492271574137
R_35:	0.0240939875657274

Dataset and Model Prediction Summary: D1 = A_6_bit_mutliplexer_500_01

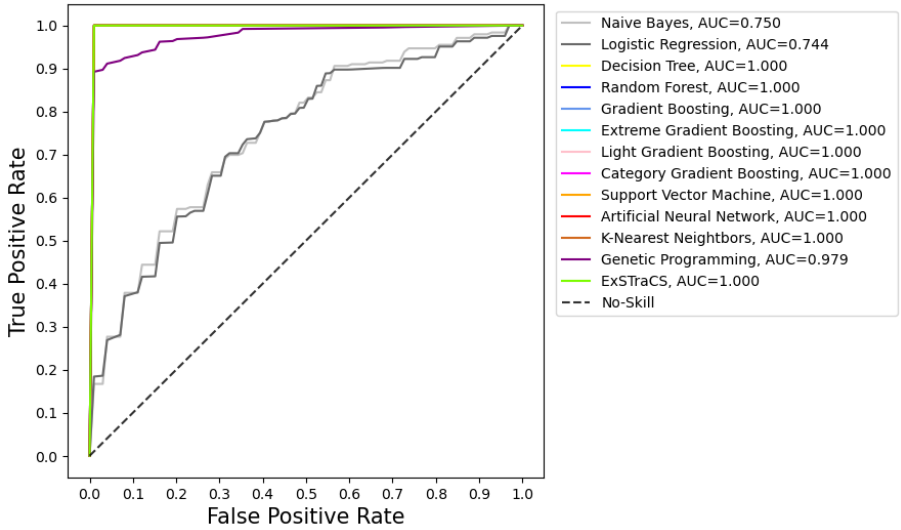


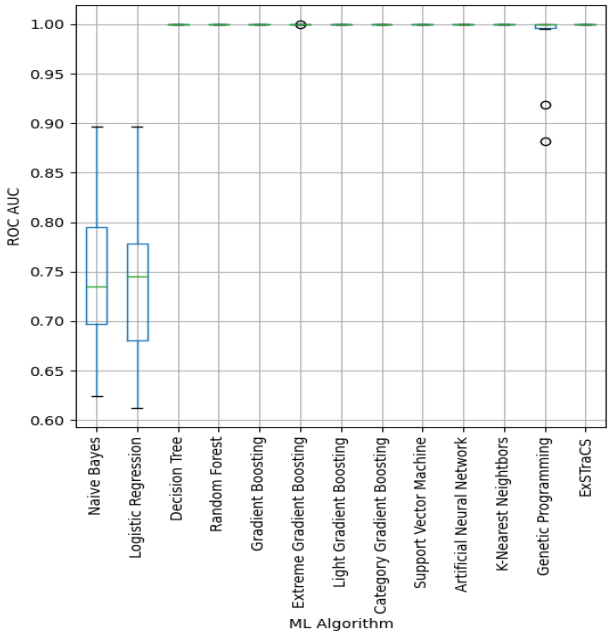


Dataset Counts Summary:
instances: 500.0
features: 6.0
categorical_features: 6.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

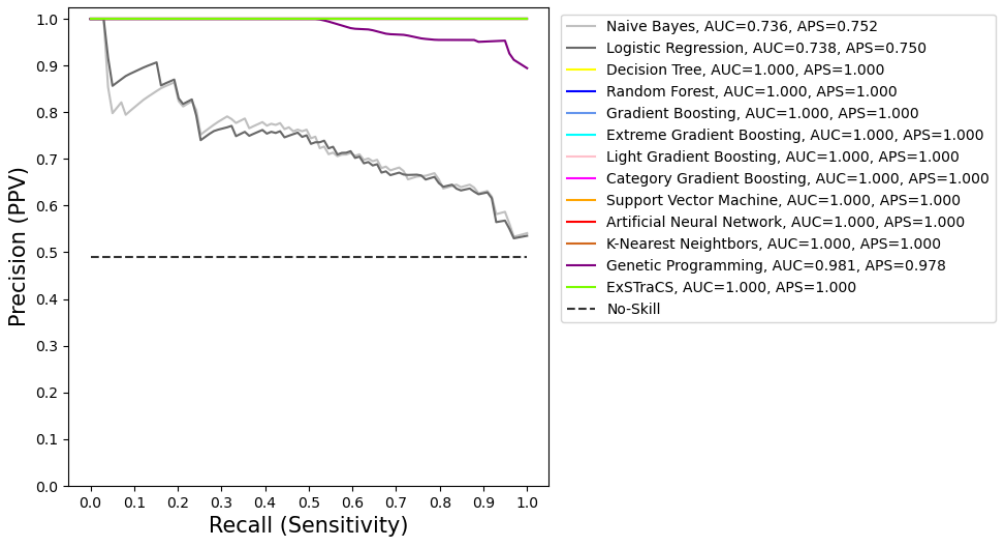
Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): Decision Tree (TIE) = 1.000
Best (Balanced Acc.): Decision Tree (TIE) = 1.000
Best (F1 Score): Decision Tree (TIE) = 1.000
Best (PRC AUC): Decision Tree (TIE) = 1.000
Best (PRC APS): Decision Tree (TIE) = 1.000

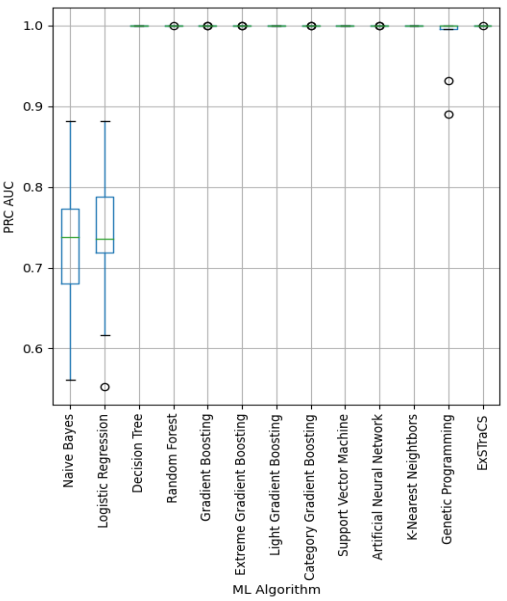
ROC



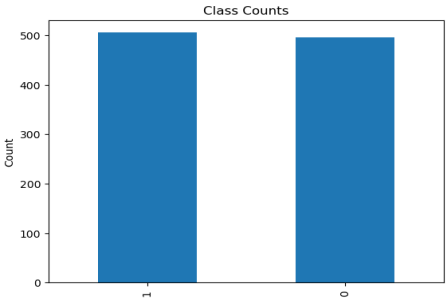


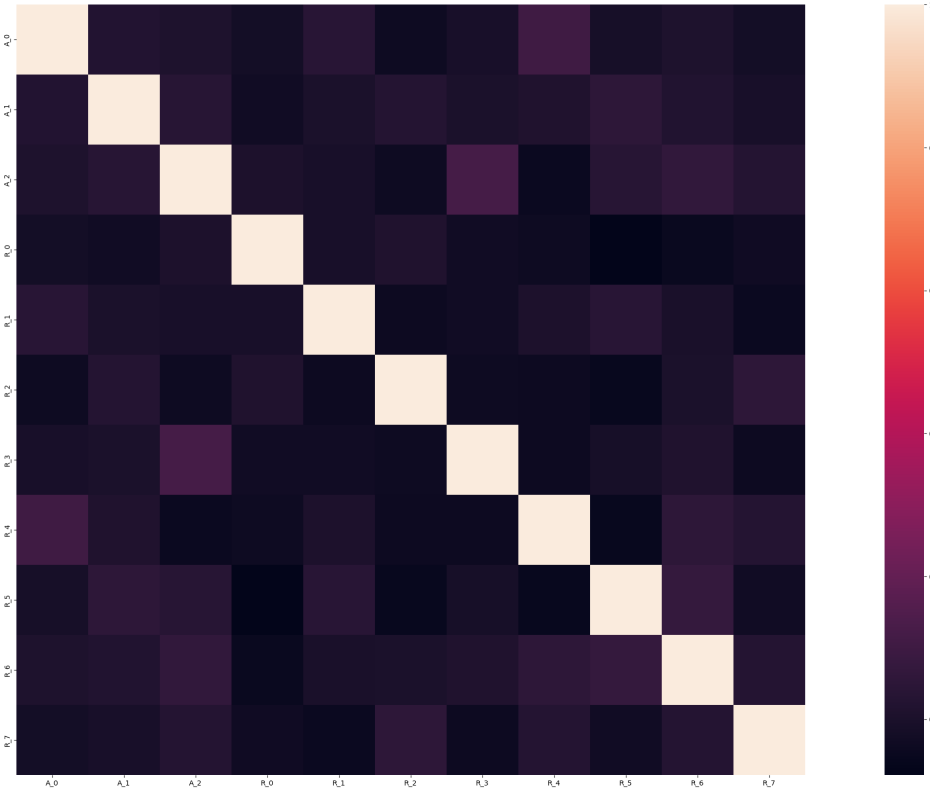
PRC





Dataset and Model Prediction Summary: D2 = B_11_bit_mutliplexer_1000_01

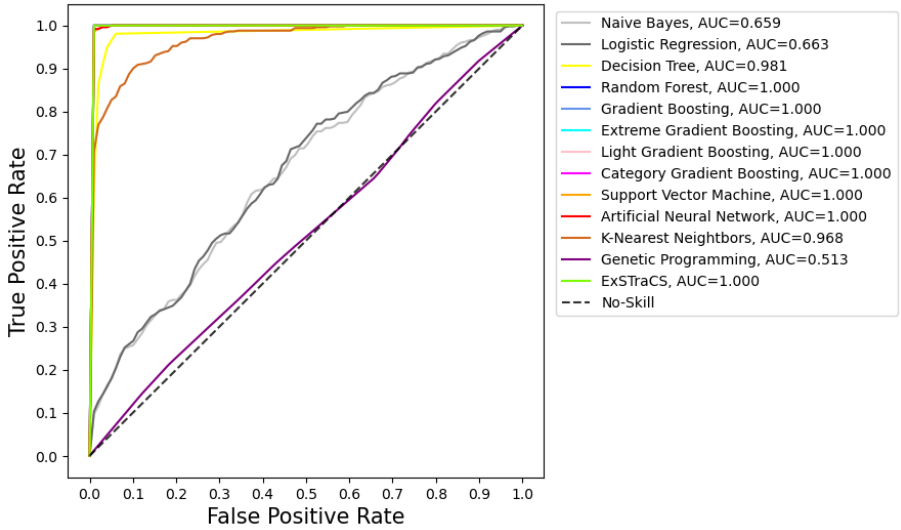


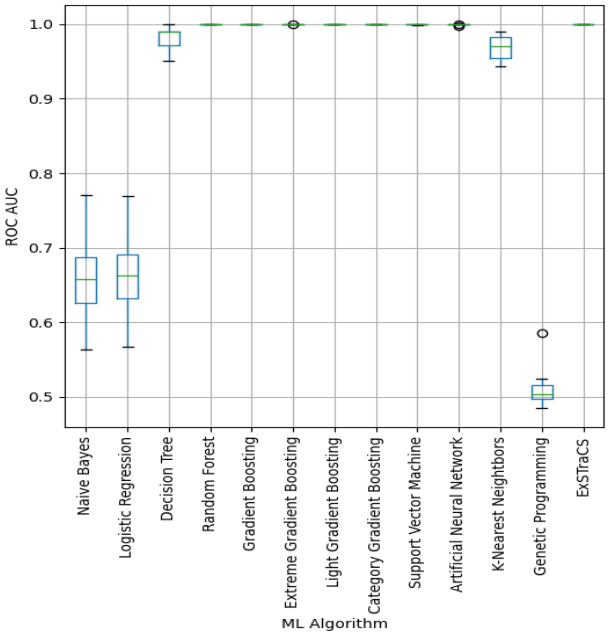


Dataset Counts Summary:
instances: 1000.0
features: 11.0
categorical_features: 11.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

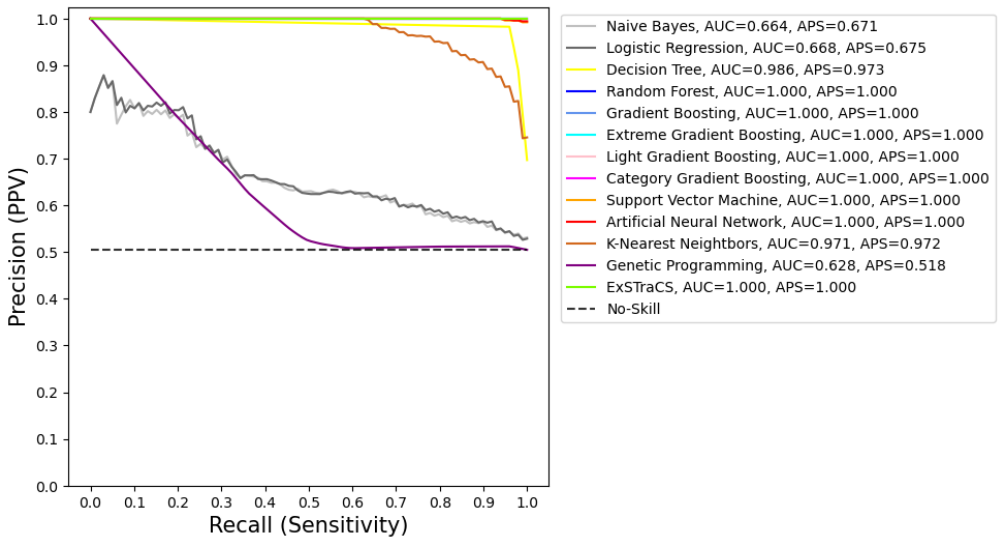
Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): Random Forest (TIE) = 1.000
Best (Balanced Acc.): Random Forest (TIE) = 1.000
Best (F1 Score): Random Forest (TIE) = 1.000
Best (PRC AUC): Random Forest (TIE) = 1.000
Best (PRC APS): Random Forest (TIE) = 1.000

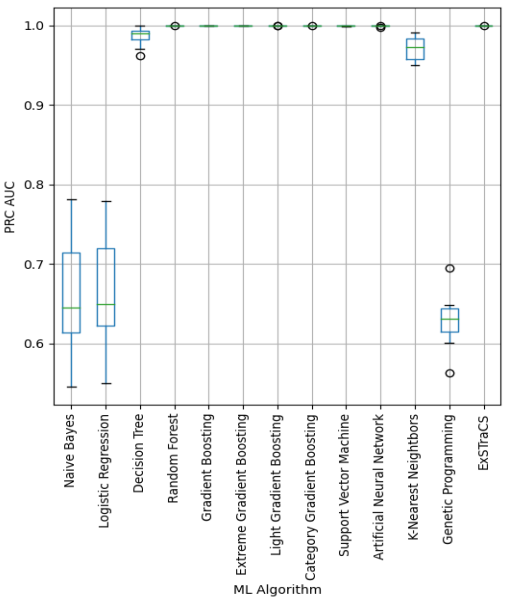
ROC





PRC





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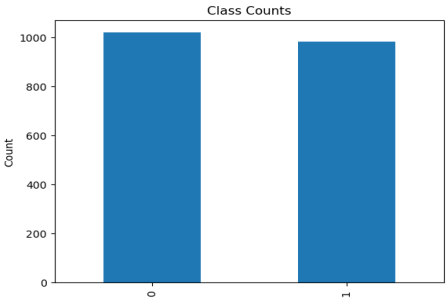
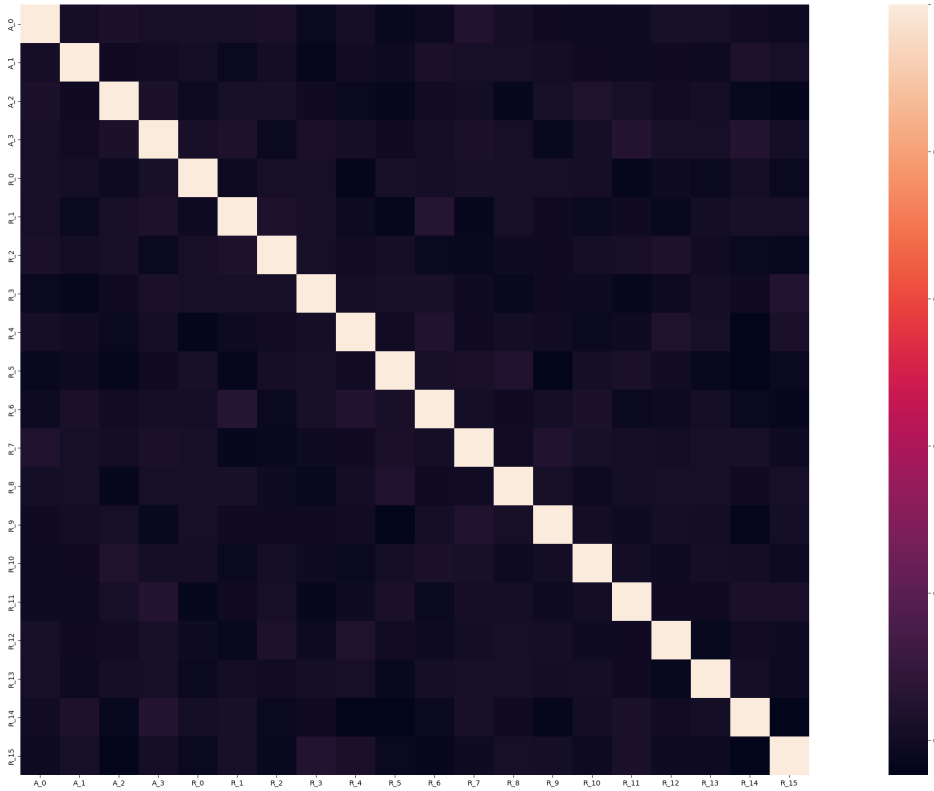
Dataset and Model Prediction Summary: D3 = C_20_bit_mutliplexer_2000_01

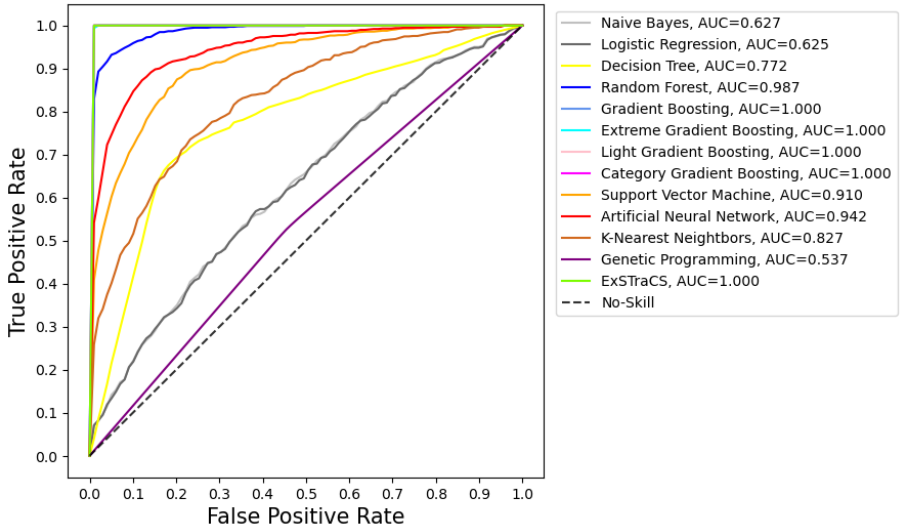


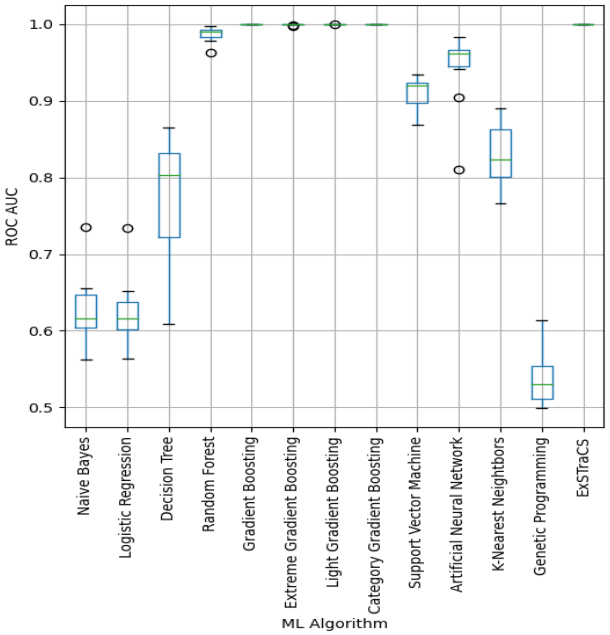


Dataset Counts Summary:
instances: 2000.0
features: 20.0
categorical_features: 20.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

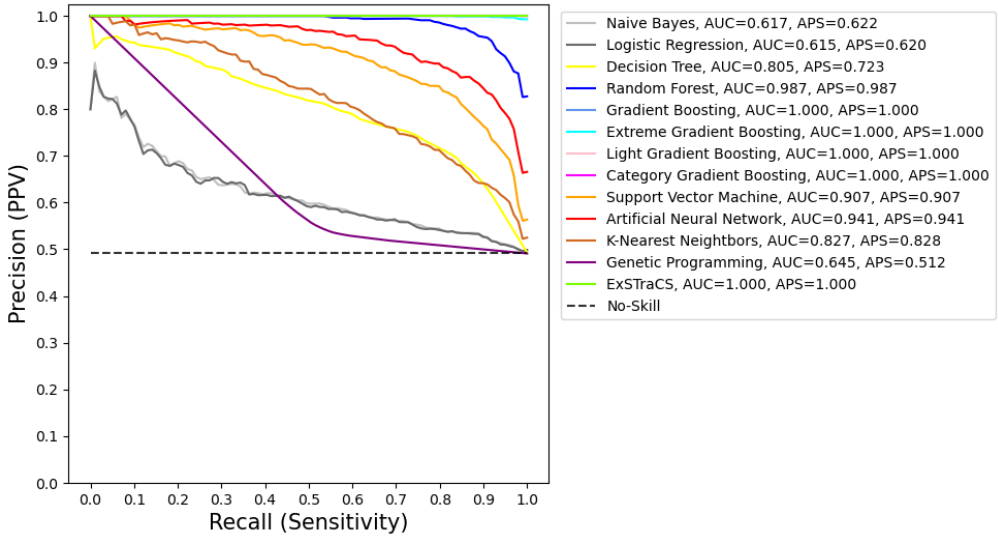
Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): Gradient Boosting (TIE) = 1.000
Best (Balanced Acc.): Category Gradient Boosting (TIE) = 1.000
Best (F1 Score): Category Gradient Boosting (TIE) = 1.000
Best (PRC AUC): Gradient Boosting (TIE) = 1.000
Best (PRC APS): Gradient Boosting (TIE) = 1.000

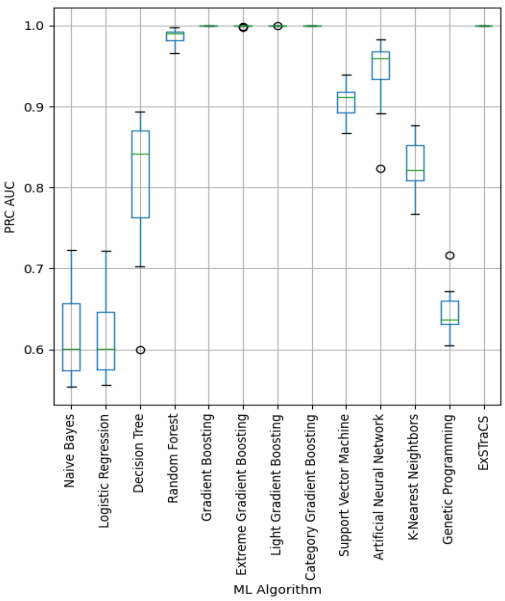
ROC





PRC





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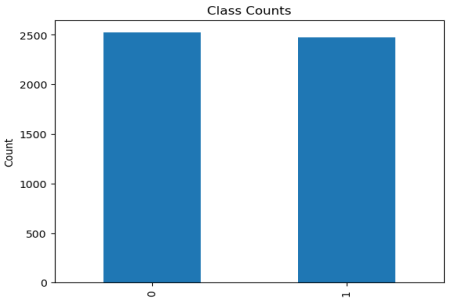
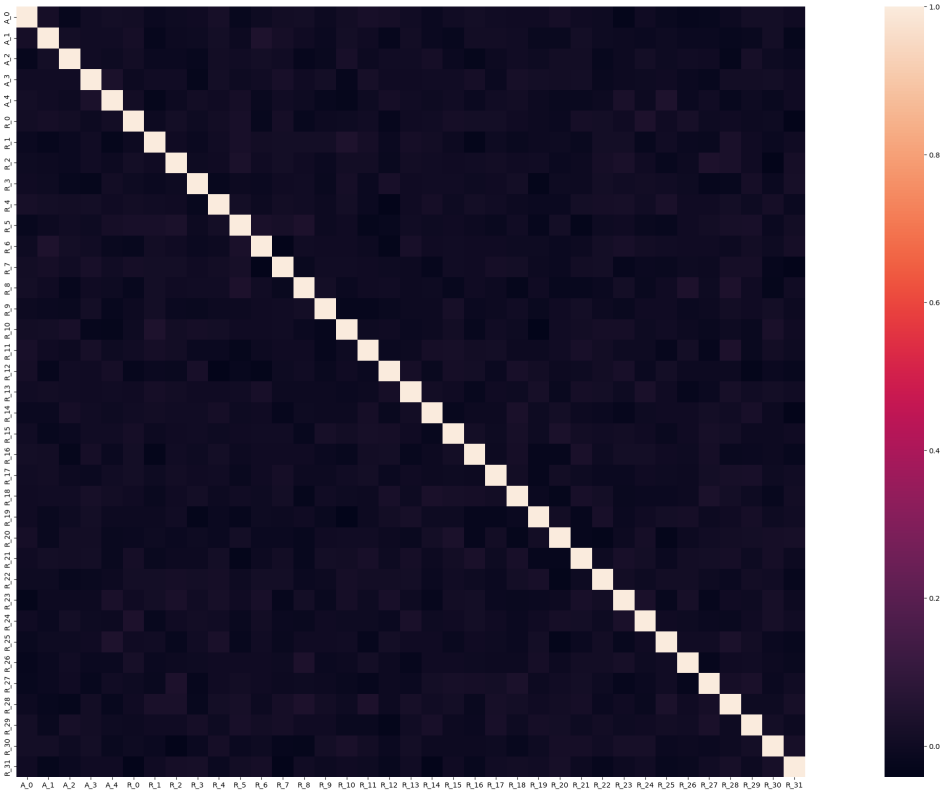
Dataset and Model Prediction Summary: D4 = D_37_bit_mutliplexer_5000_01

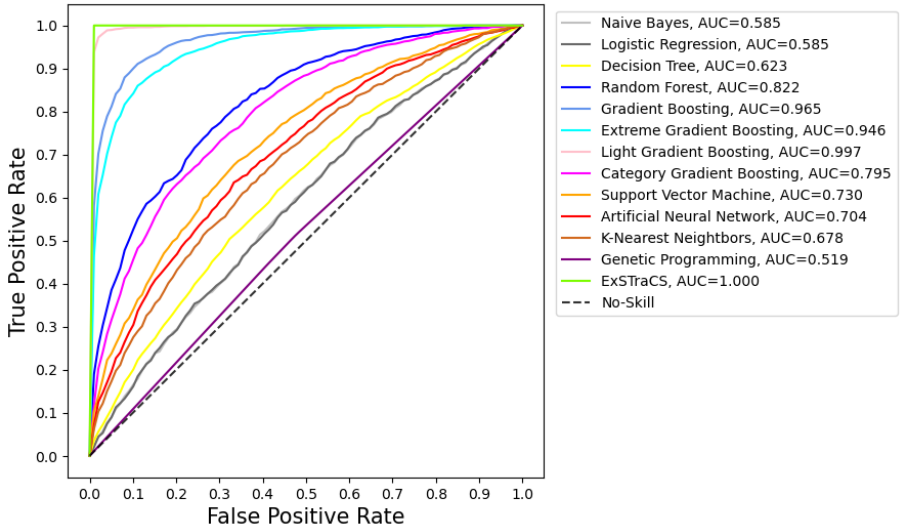


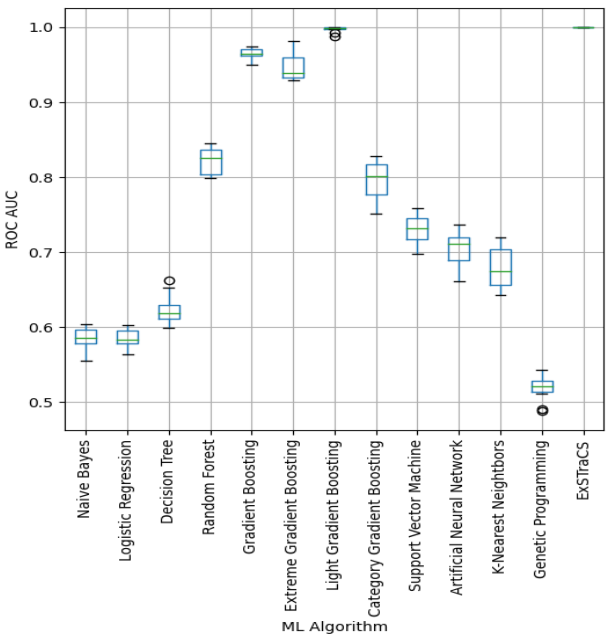


Dataset Counts Summary:
instances: 5000.0
features: 37.0
categorical_features: 37.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

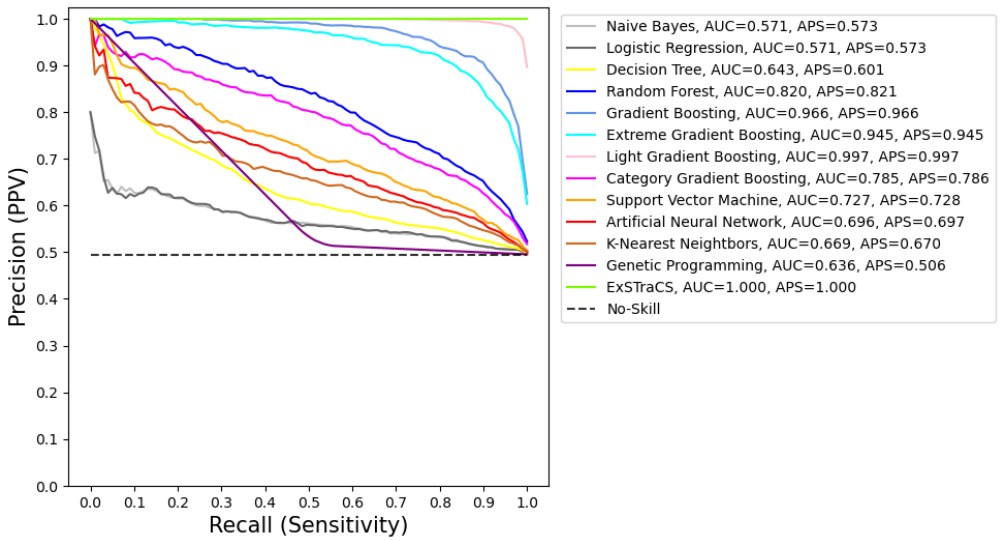
Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): ExSTraCS = 1.000
Best (Balanced Acc.): ExSTraCS = 1.000
Best (F1 Score): ExSTraCS = 1.000
Best (PRC AUC): ExSTraCS = 1.000
Best (PRC APS): ExSTraCS = 1.000

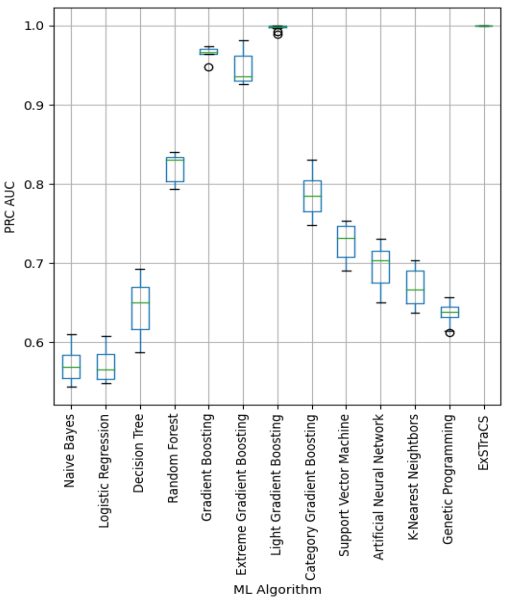
ROC





PRC





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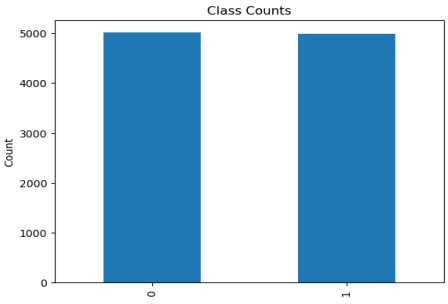
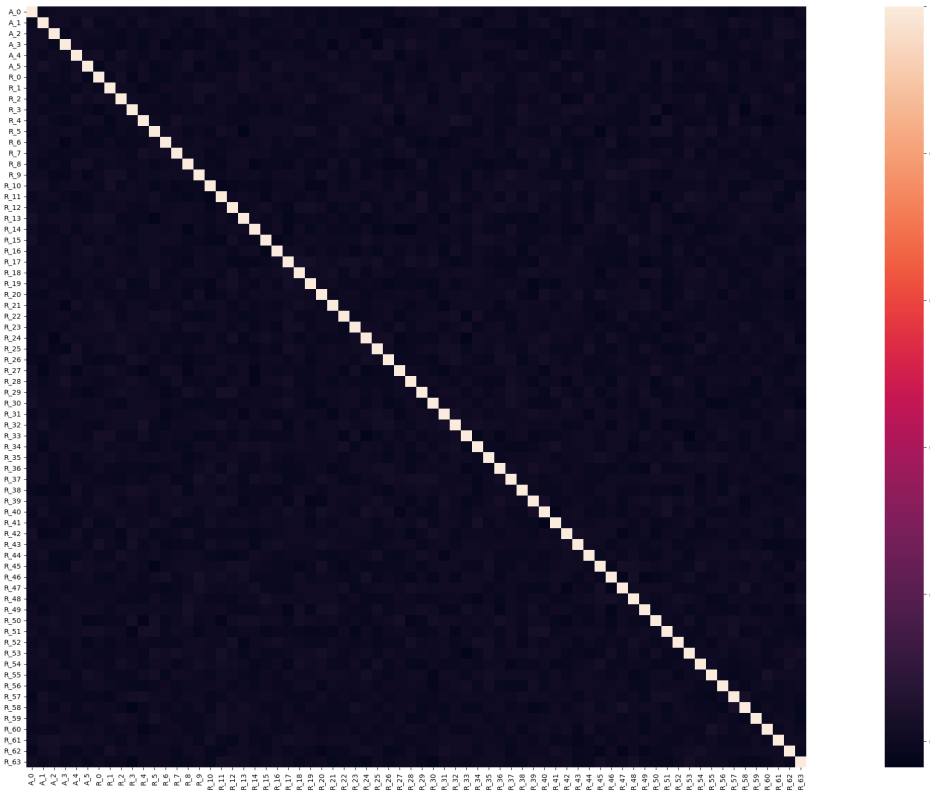
Dataset and Model Prediction Summary: D5 = E_70_bit_mutliplexer_10000_01

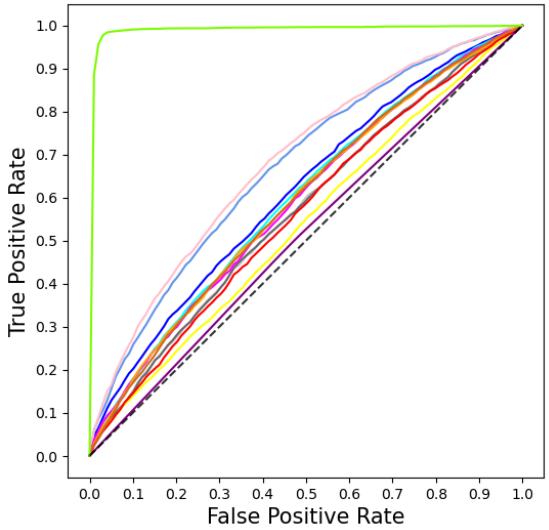


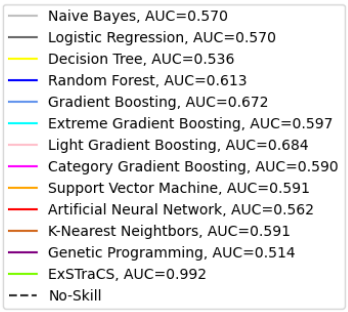


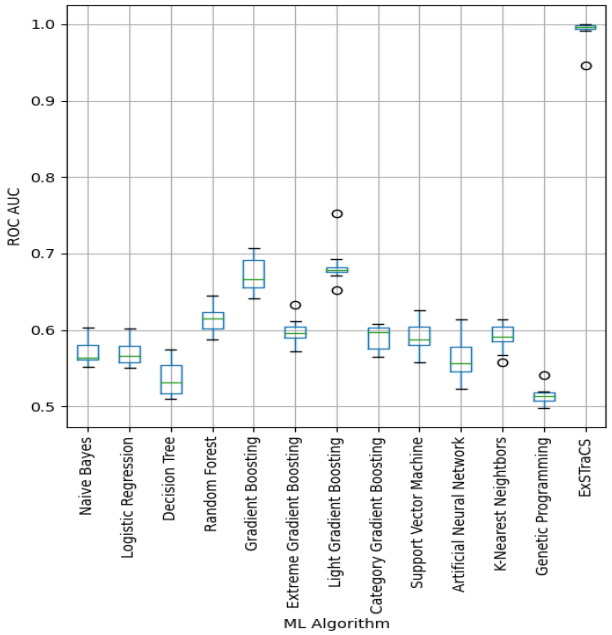
Dataset Counts Summary:
instances: 10000.0
features: 70.0
categorical_features: 70.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): ExSTraCS = 0.992
Best (Balanced Acc.): ExSTraCS = 0.983
Best (F1 Score): ExSTraCS = 0.983
Best (PRC AUC): ExSTraCS = 0.989
Best (PRC APS): ExSTraCS = 0.988

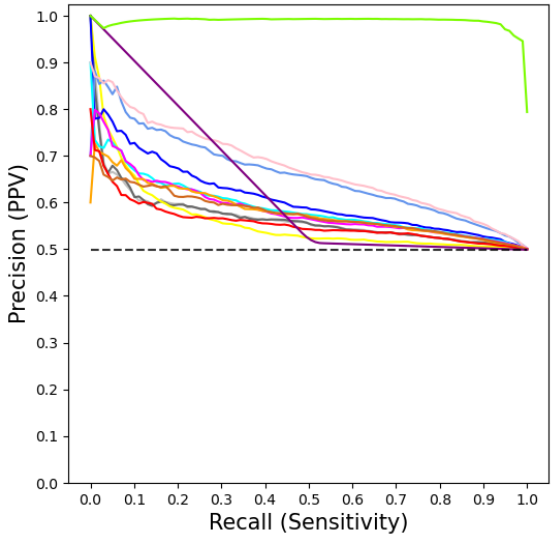
ROC

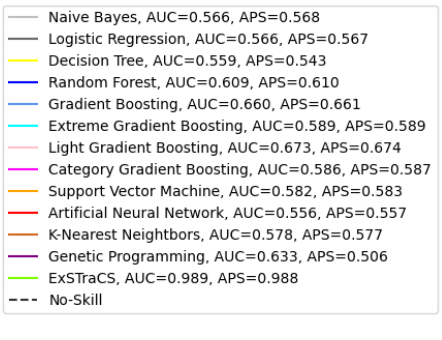


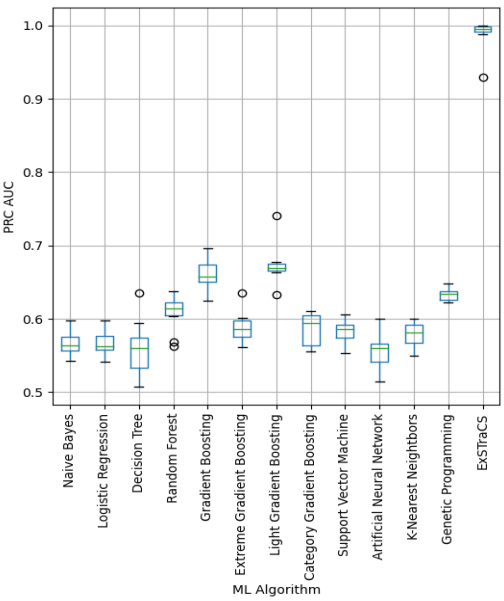




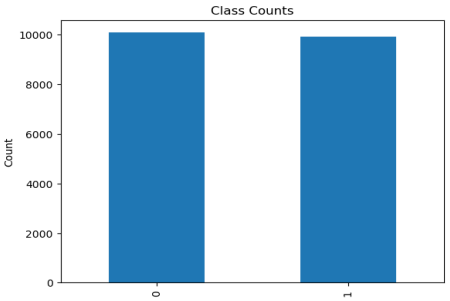
PRC

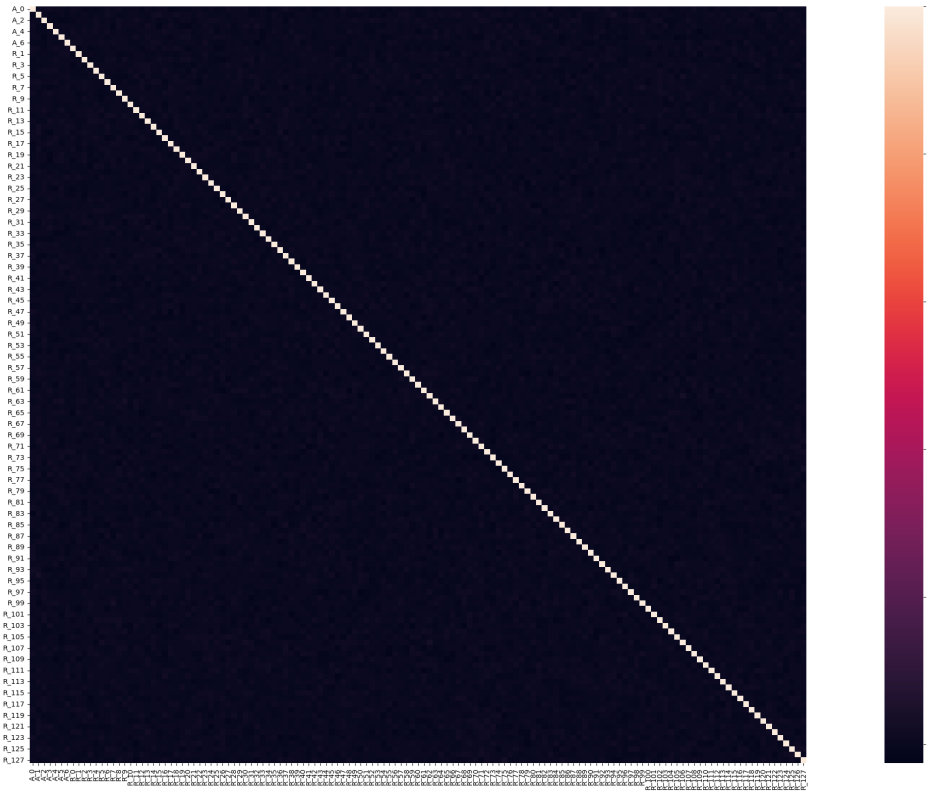






Dataset and Model Prediction Summary: D6 = F_135_bit_mutliplexer_20000_01

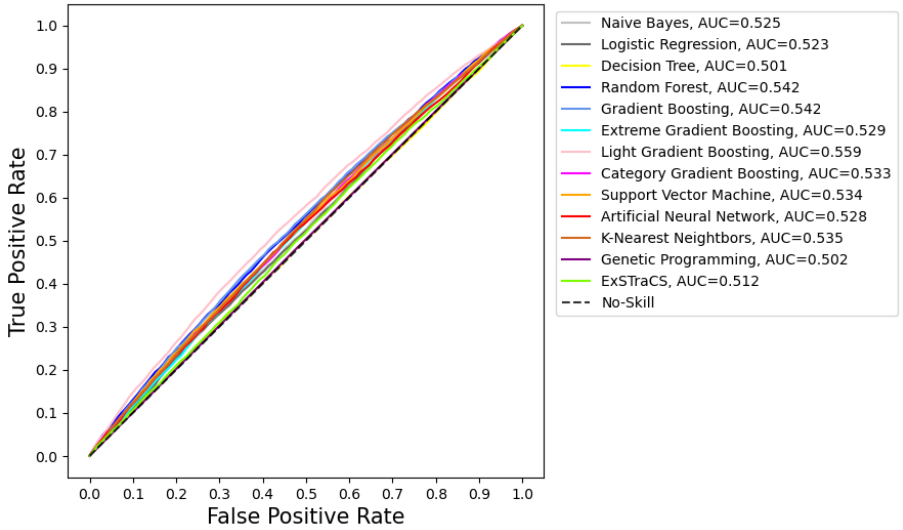


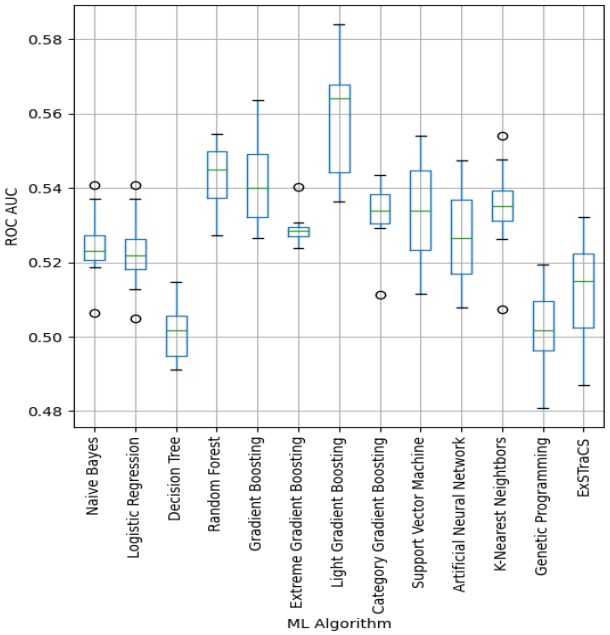


Dataset Counts Summary:
instances: 20000.0
features: 135.0
categorical_features: 135.0
quantitative_features: 0.0
missing_values: 0.0
missing_percent: 0.0

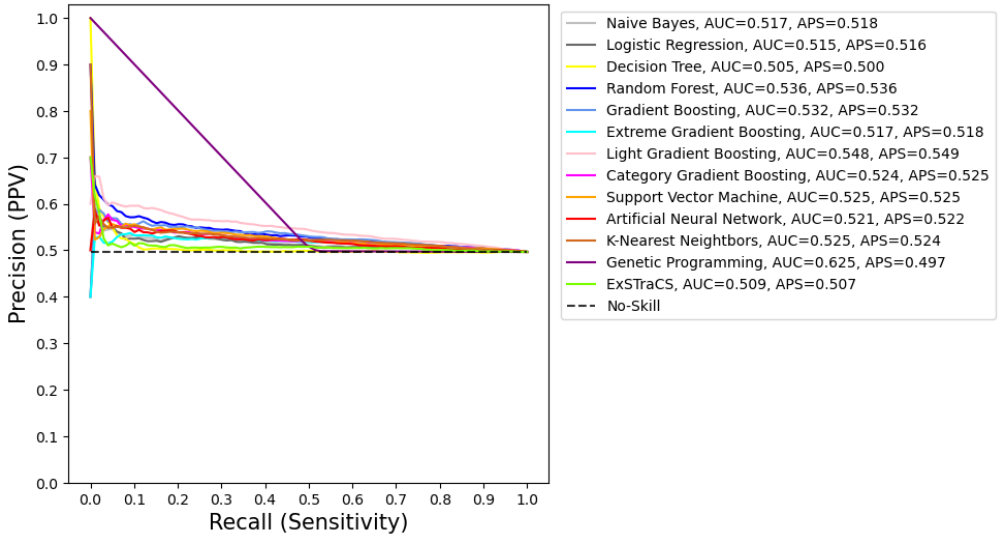
Top ML Algorithm Results (Averaged Over CV Runs):
Best (ROC_AUC): Light Gradient Boosting = 0.559
Best (Balanced Acc.): Light Gradient Boosting = 0.543
Best (F1 Score): ExSTraCS = 0.612
Best (PRC AUC): Genetic Programming = 0.625
Best (PRC APS): Light Gradient Boosting = 0.549

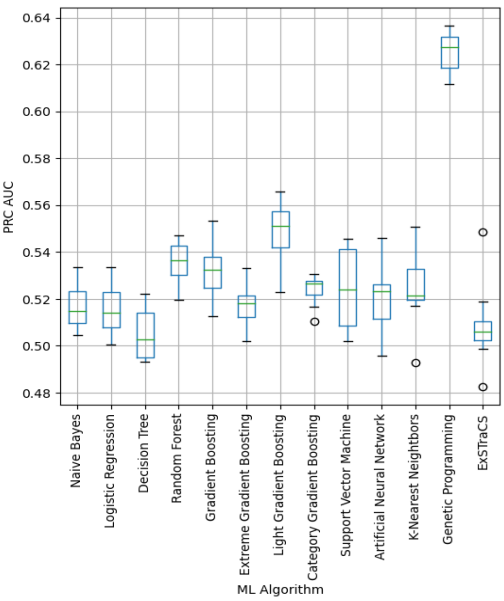
ROC





PRC





Average Model Prediction Statistics (Rounded to 3 Decimal Points): Page 1

D1 = A_6_bit_mutliplexer_500_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.664	0.664	0.653	0.654	0.673	0.665	16.1	17.1	8.3	8.5	0.674	2.194	0.512	0.75	0.736	0.752
Logistic Regression	0.652	0.652	0.637	0.63	0.673	0.666	15.5	17.1	8.3	9.1	0.661	3.242	0.549	0.744	0.738	0.75
Decision Tree	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Random Forest	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Light Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Artificial Neural Network	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
K-Nearest Neightbors	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Genetic Programming	0.949	0.948	0.952	0.976	0.922	0.934	24.0	23.4	2.0	0.6	0.974	6.708	0.029	0.979	0.981	0.978
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	24.6	25.4	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D2 = B_11_bit_mutliplexer_1000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.613	0.613	0.624	0.638	0.587	0.613	32.2	29.1	20.4	18.3	0.614	1.596	0.63	0.659	0.664	0.671
Logistic Regression	0.605	0.606	0.618	0.636	0.575	0.607	32.1	28.5	21.0	18.4	0.607	1.557	0.648	0.663	0.668	0.675
Decision Tree	0.979	0.979	0.979	0.976	0.982	0.982	49.3	48.6	0.9	1.2	0.976	23.409	0.024	0.981	0.986	0.973
Random Forest	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Light Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	0.991	0.991	0.991	0.994	0.988	0.988	50.2	48.9	0.6	0.3	0.994	22.102	0.006	1.0	1.0	1.0
Artificial Neural Network	0.991	0.991	0.991	0.996	0.986	0.986	50.3	48.8	0.7	0.2	0.996	19.602	0.004	1.0	1.0	1.0
K-Nearest Neightbors	0.905	0.905	0.906	0.911	0.899	0.904	46.0	44.5	5.0	4.5	0.909	11.462	0.1	0.968	0.971	0.972
Genetic Programming	0.503	0.503	0.508	0.511	0.495	0.509	25.8	24.5	25.0	24.7	0.496	1.025	1.011	0.513	0.628	0.518
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D3 = C_20_bit_mutliplexer_2000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.589	0.589	0.574	0.563	0.615	0.587	55.3	62.6	39.2	42.9	0.592	1.517	0.722	0.627	0.617	0.622
Logistic Regression	0.582	0.582	0.555	0.534	0.63	0.583	52.4	64.1	37.7	45.8	0.584	1.495	0.747	0.625	0.615	0.62
Decision Tree	0.751	0.751	0.743	0.751	0.751	0.741	73.7	76.4	25.4	24.5	0.766	3.449	0.345	0.772	0.805	0.723
Random Forest	0.938	0.938	0.936	0.928	0.948	0.945	91.1	96.5	5.3	7.1	0.932	26.245	0.076	0.987	0.987	0.987
Gradient Boosting	1.0	0.999	0.999	1.0	0.999	0.999	98.2	101.7	0.1	0.0	1.0	10.1	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	0.993	0.993	0.993	0.993	0.993	0.993	97.5	101.1	0.7	0.7	0.993	40.592	0.007	1.0	1.0	1.0
Light Gradient Boosting	0.999	0.999	0.999	1.0	0.998	0.998	98.2	101.6	0.2	0.0	1.0	20.3	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	98.2	101.8	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	0.829	0.829	0.825	0.824	0.834	0.829	80.9	84.9	16.9	17.3	0.832	5.206	0.211	0.91	0.907	0.907
Artificial Neural Network	0.878	0.878	0.876	0.881	0.876	0.872	86.5	89.2	12.6	11.7	0.886	8.043	0.139	0.942	0.941	0.941
K-Nearest Neightbors	0.751	0.751	0.744	0.738	0.763	0.75	72.5	77.7	24.1	25.7	0.753	3.19	0.344	0.827	0.827	0.828
Genetic Programming	0.537	0.537	0.531	0.538	0.535	0.526	52.8	54.5	47.3	45.4	0.548	1.16	0.865	0.537	0.645	0.512
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	98.2	101.8	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D4 = D_37_bit_mutliplexer_5000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.559	0.559	0.545	0.534	0.584	0.558	132.2	147.3	104.9	115.6	0.56	1.285	0.799	0.585	0.571	0.573
Logistic Regression	0.556	0.556	0.544	0.535	0.577	0.554	132.6	145.4	106.8	115.2	0.558	1.268	0.807	0.585	0.571	0.573
Decision Tree	0.59	0.59	0.594	0.606	0.575	0.584	150.1	145.0	107.2	97.7	0.598	1.434	0.686	0.623	0.643	0.601
Random Forest	0.735	0.735	0.728	0.718	0.753	0.741	177.8	189.8	62.4	70.0	0.731	2.941	0.375	0.822	0.82	0.821
Gradient Boosting	0.899	0.899	0.898	0.897	0.901	0.9	222.2	227.3	24.9	25.6	0.899	9.404	0.115	0.965	0.966	0.966
Extreme Gradient Boosting	0.874	0.874	0.872	0.869	0.879	0.877	215.3	221.7	30.5	32.5	0.873	8.41	0.15	0.946	0.945	0.945
Light Gradient Boosting	0.98	0.98	0.98	0.981	0.978	0.978	243.1	246.7	5.5	4.7	0.981	67.068	0.02	0.997	0.997	0.997
Category Gradient Boosting	0.717	0.717	0.706	0.685	0.748	0.729	169.7	188.7	63.5	78.1	0.708	2.788	0.422	0.795	0.785	0.786
Support Vector Machine	0.669	0.669	0.665	0.665	0.673	0.667	164.7	169.8	82.4	83.1	0.672	2.044	0.498	0.73	0.727	0.728
Artificial Neural Network	0.646	0.646	0.642	0.641	0.651	0.644	158.8	164.3	87.9	89.0	0.649	1.849	0.552	0.704	0.696	0.697
K-Nearest Neightbors	0.624	0.624	0.611	0.595	0.653	0.628	147.5	164.6	87.6	100.3	0.622	1.738	0.622	0.678	0.669	0.67
Genetic Programming	0.519	0.519	0.516	0.518	0.52	0.515	128.3	131.1	121.1	119.5	0.523	1.082	0.93	0.519	0.636	0.506
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	247.8	252.2	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D5 = E_70_bit_mutliplexer_10000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.549	0.549	0.546	0.544	0.555	0.549	271.3	277.9	223.2	227.6	0.55	1.225	0.824	0.57	0.566	0.568
Logistic Regression	0.549	0.55	0.547	0.545	0.554	0.549	271.8	277.7	223.4	227.1	0.55	1.226	0.823	0.57	0.566	0.567
Decision Tree	0.522	0.522	0.515	0.51	0.534	0.521	254.4	267.5	233.6	244.5	0.522	1.096	0.919	0.536	0.559	0.543
Random Forest	0.577	0.577	0.572	0.568	0.586	0.577	283.3	293.6	207.5	215.6	0.577	1.374	0.738	0.613	0.609	0.61
Gradient Boosting	0.622	0.622	0.621	0.622	0.623	0.621	310.1	312.0	189.1	188.8	0.623	1.651	0.608	0.672	0.66	0.661
Extreme Gradient Boosting	0.568	0.568	0.559	0.551	0.584	0.569	274.9	292.7	208.4	224.0	0.567	1.326	0.768	0.597	0.589	0.589
Light Gradient Boosting	0.633	0.633	0.632	0.633	0.632	0.632	315.9	316.9	184.2	183.0	0.634	1.733	0.581	0.684	0.673	0.674
Category Gradient Boosting	0.557	0.557	0.549	0.54	0.574	0.558	269.3	287.7	213.4	229.6	0.556	1.269	0.802	0.59	0.586	0.587
Support Vector Machine	0.563	0.564	0.56	0.557	0.57	0.563	277.7	285.8	215.3	221.2	0.564	1.296	0.777	0.591	0.582	0.583
Artificial Neural Network	0.542	0.542	0.547	0.556	0.527	0.54	277.6	264.0	237.1	221.3	0.544	1.183	0.845	0.562	0.556	0.557
K-Nearest Neightbors	0.562	0.562	0.555	0.549	0.576	0.563	273.7	288.4	212.7	225.2	0.562	1.295	0.784	0.591	0.578	0.577
Genetic Programming	0.514	0.514	0.51	0.507	0.521	0.513	253.1	261.1	240.0	245.8	0.515	1.061	0.947	0.514	0.633	0.506
ExSTraCS	0.983	0.983	0.983	0.982	0.984	0.984	489.8	493.2	7.9	9.1	0.983	129.236	0.019	0.992	0.989	0.988

Average Model Prediction Statistics (Rounded to 3 Decimal Points): Page 2

D6 = F_135_bit_mutliplexer_20000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.515	0.515	0.503	0.494	0.536	0.512	490.5	540.2	467.1	502.2	0.518	1.066	0.944	0.525	0.517	0.518
Logistic Regression	0.512	0.512	0.485	0.469	0.555	0.51	466.0	558.7	448.6	526.7	0.515	1.058	0.957	0.523	0.515	0.516
Decision Tree	0.502	0.502	0.493	0.489	0.515	0.498	485.3	518.7	488.6	507.4	0.506	1.008	0.993	0.501	0.505	0.5
Random Forest	0.529	0.529	0.519	0.512	0.545	0.526	508.4	549.3	458.0	484.3	0.532	1.127	0.895	0.542	0.536	0.536
Gradient Boosting	0.531	0.531	0.524	0.52	0.541	0.528	516.7	545.4	461.9	476.0	0.534	1.136	0.886	0.542	0.532	0.532
Extreme Gradient Boosting	0.519	0.519	0.497	0.479	0.56	0.517	475.2	563.6	443.7	517.5	0.521	1.088	0.932	0.529	0.517	0.518
Light Gradient Boosting	0.543	0.543	0.536	0.531	0.554	0.54	527.6	558.1	449.2	465.1	0.546	1.193	0.846	0.559	0.548	0.549
Category Gradient Boosting	0.52	0.521	0.453	0.4	0.639	0.523	397.5	643.9	363.4	595.2	0.52	1.111	0.938	0.533	0.524	0.525
Support Vector Machine	0.524	0.524	0.518	0.517	0.53	0.52	512.8	534.3	473.0	479.9	0.527	1.101	0.912	0.534	0.525	0.525
Artificial Neural Network	0.522	0.522	0.515	0.511	0.533	0.519	507.3	537.1	470.2	485.4	0.525	1.096	0.917	0.528	0.521	0.522
K-Nearest Neightbors	0.525	0.525	0.509	0.497	0.553	0.523	493.5	556.8	450.5	499.2	0.527	1.114	0.911	0.535	0.525	0.524
Genetic Programming	0.502	0.502	0.502	0.507	0.496	0.498	503.4	499.9	507.4	489.3	0.505	1.008	0.994	0.502	0.625	0.497
ExSTraCS	0.505	0.503	0.612	0.799	0.212	0.5	792.9	213.0	794.3	199.8	0.508	1.015	0.991	0.512	0.509	0.507

Median Model Prediction Statistics (Rounded to 3 Decimal Points): Page 1

D1 = A_6_bit_mutliplexer_500_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.66	0.66	0.667	0.673	0.628	0.655	16.5	16.0	9.5	8.0	0.674	1.938	0.495	0.735	0.738	0.748
Logistic Regression	0.646	0.647	0.638	0.612	0.6	0.648	15.0	15.0	10.0	9.5	0.648	1.885	0.556	0.745	0.736	0.746
Decision Tree	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Random Forest	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Light Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Artificial Neural Network	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
K-Nearest Neighbors	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Genetic Programming	0.99	0.99	0.99	1.0	0.981	0.981	24.0	25.0	0.5	0.0	1.0	1.387	0.0	1.0	1.0	1.0
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	25.0	25.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D2 = B_11_bit_mutliplexer_1000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.633	0.634	0.647	0.654	0.6	0.625	33.0	30.0	20.0	17.5	0.639	1.634	0.555	0.658	0.645	0.654
Logistic Regression	0.609	0.61	0.63	0.644	0.586	0.614	32.5	29.0	20.5	18.0	0.618	1.56	0.607	0.663	0.65	0.659
Decision Tree	0.985	0.985	0.985	0.97	0.98	0.981	49.0	48.5	1.0	1.5	0.971	20.016	0.03	0.99	0.99	0.98
Random Forest	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Light Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	0.99	0.99	0.99	1.0	0.99	0.99	50.0	49.0	0.5	0.0	1.0	12.5	0.0	1.0	1.0	1.0
Artificial Neural Network	0.995	0.995	0.995	1.0	0.99	0.99	50.5	49.0	0.5	0.0	1.0	11.76	0.0	1.0	1.0	1.0
K-Nearest Neighbors	0.905	0.905	0.908	0.912	0.909	0.909	46.5	45.0	4.5	4.5	0.912	9.875	0.095	0.97	0.973	0.974
Genetic Programming	0.5	0.5	0.508	0.5	0.525	0.505	25.0	26.0	23.5	25.0	0.495	1.001	0.998	0.504	0.631	0.513
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	50.5	49.5	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D3 = C_20_bit_mutliplexer_2000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.589	0.59	0.572	0.556	0.613	0.586	54.5	62.5	39.5	43.5	0.591	1.468	0.714	0.616	0.6	0.603
Logistic Regression	0.573	0.575	0.555	0.546	0.627	0.585	53.5	64.0	38.0	44.5	0.574	1.451	0.769	0.616	0.6	0.604
Decision Tree	0.781	0.78	0.784	0.772	0.739	0.752	76.0	75.0	26.5	22.5	0.784	3.253	0.287	0.804	0.841	0.747
Random Forest	0.94	0.94	0.939	0.939	0.946	0.944	92.0	96.5	5.5	6.0	0.942	17.867	0.064	0.99	0.99	0.99
Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	98.0	102.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Extreme Gradient Boosting	0.993	0.993	0.992	0.99	0.995	0.995	97.5	101.0	0.5	1.0	0.99	25.5	0.01	1.0	1.0	1.0
Light Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	98.0	102.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Category Gradient Boosting	1.0	1.0	1.0	1.0	1.0	1.0	98.0	102.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0
Support Vector Machine	0.836	0.835	0.835	0.842	0.863	0.841	82.5	88.0	14.0	15.5	0.842	5.473	0.196	0.92	0.912	0.912
Artificial Neural Network	0.893	0.893	0.893	0.898	0.877	0.878	88.5	89.5	12.5	10.0	0.902	7.489	0.112	0.961	0.96	0.96
K-Nearest Neighbors	0.755	0.755	0.751	0.755	0.775	0.751	74.0	79.0	23.0	24.0	0.759	3.131	0.328	0.823	0.822	0.823
Genetic Programming	0.531	0.531	0.519	0.531	0.539	0.522	52.0	55.0	47.0	46.0	0.538	1.132	0.889	0.531	0.637	0.508
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	98.0	102.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D4 = D_37_bit_mutliplexer_5000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.56	0.56	0.545	0.533	0.586	0.557	132.0	148.0	104.5	115.5	0.563	1.282	0.791	0.586	0.568	0.571
Logistic Regression	0.557	0.557	0.548	0.53	0.577	0.554	131.5	145.5	106.5	116.5	0.559	1.263	0.803	0.584	0.565	0.567
Decision Tree	0.588	0.588	0.592	0.599	0.563	0.579	148.5	142.0	110.0	99.5	0.595	1.406	0.692	0.618	0.65	0.592
Random Forest	0.734	0.734	0.727	0.723	0.75	0.742	179.0	189.0	63.0	68.5	0.729	2.924	0.377	0.826	0.83	0.83
Gradient Boosting	0.904	0.904	0.904	0.903	0.909	0.907	224.0	229.0	23.0	24.0	0.906	9.892	0.106	0.965	0.966	0.966
Extreme Gradient Boosting	0.868	0.868	0.867	0.871	0.865	0.864	216.0	218.0	34.0	32.0	0.876	6.455	0.145	0.939	0.935	0.935
Light Gradient Boosting	0.984	0.984	0.984	0.982	0.984	0.984	243.5	248.5	4.0	4.5	0.982	61.857	0.018	0.999	0.999	0.999
Category Gradient Boosting	0.713	0.713	0.707	0.675	0.75	0.728	167.5	189.0	63.0	80.5	0.707	2.717	0.421	0.801	0.784	0.786
Support Vector Machine	0.667	0.667	0.667	0.671	0.677	0.662	166.5	170.5	81.5	81.5	0.673	1.998	0.494	0.732	0.731	0.732
Artificial Neural Network	0.647	0.647	0.645	0.642	0.652	0.644	158.5	165.0	88.0	88.5	0.651	1.842	0.545	0.712	0.703	0.705
K-Nearest Neighbors	0.619	0.619	0.608	0.601	0.649	0.623	149.0	163.5	88.5	99.0	0.614	1.683	0.639	0.675	0.666	0.668
Genetic Programming	0.521	0.521	0.513	0.514	0.518	0.516	127.5	130.5	121.5	120.5	0.526	1.085	0.919	0.521	0.638	0.506
ExSTraCS	1.0	1.0	1.0	1.0	1.0	1.0	248.0	252.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0

D5 = E_70_bit_mutliplexer_10000_01

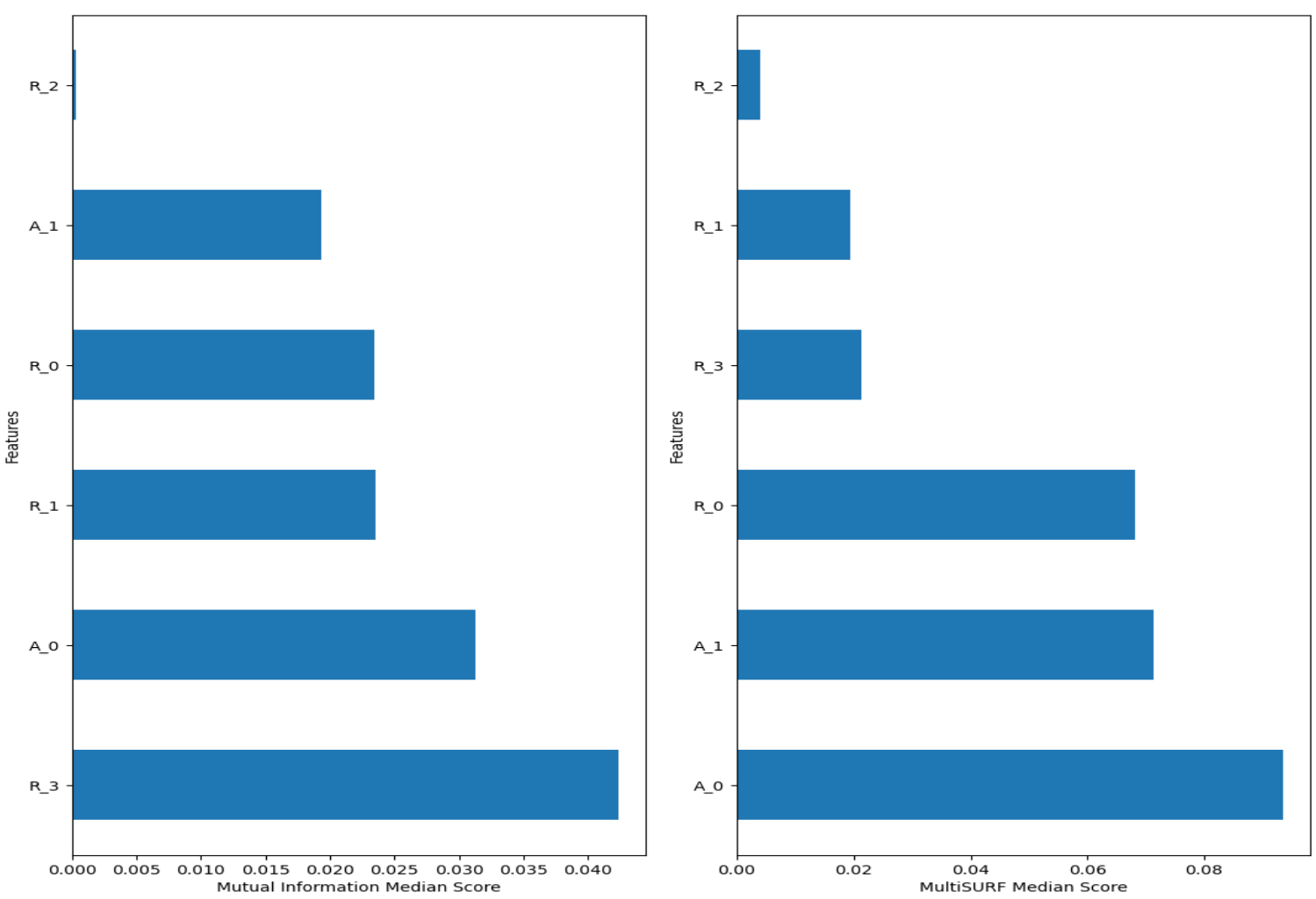
ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.544	0.544	0.541	0.547	0.555	0.544	273.0	278.0	223.0	226.0	0.544	1.198	0.843	0.564	0.564	0.565
Logistic Regression	0.545	0.545	0.541	0.546	0.562	0.546	272.5	281.5	219.5	226.5	0.544	1.207	0.843	0.566	0.563	0.564
Decision Tree	0.516	0.516	0.519	0.513	0.53	0.514	256.0	265.5	235.5	243.0	0.517	1.064	0.94	0.531	0.56	0.535
Random Forest	0.572	0.572	0.57	0.573	0.579	0.574	286.0	290.0	211.0	213.0	0.573	1.355	0.75	0.614	0.614	0.615
Gradient Boosting	0.624	0.624	0.622	0.62	0.625	0.624	309.5	313.0	188.0	189.5	0.624	1.666	0.605	0.666	0.657	0.658
Extreme Gradient Boosting	0.566	0.566	0.56	0.552	0.585	0.568	275.5	293.0	208.0	223.5	0.566	1.32	0.771	0.595	0.586	0.587
Light Gradient Boosting	0.627	0.627	0.633	0.637	0.632	0.624	318.0	316.5	184.5	181.0	0.634	1.669	0.581	0.679	0.67	0.671
Category Gradient Boosting	0.56	0.56	0.546	0.536	0.578	0.563	267.5	289.5	211.5	231.5	0.557	1.292	0.799	0.597	0.594	0.595
Support Vector Machine	0.56	0.56	0.554	0.551	0.57	0.561	275.0	285.5	215.5	224.0	0.56	1.286	0.79	0.588	0.585	0.586
Artificial Neural Network	0.536	0.536	0.554	0.559	0.532	0.534	279.0	266.5	234.5	220.0	0.537	1.15	0.865	0.556	0.561	0.562
K-Nearest Neighbors	0.564	0.564	0.555	0.551	0.58	0.567	275.0	290.5	210.5	224.0	0.565	1.316	0.774	0.591	0.581	0.58
Genetic Programming	0.513	0.513	0.513	0.509	0.519	0.512	254.0	260.0	241.0	245.0	0.514	1.053	0.949	0.513	0.634	0.506
ExSTraCS	0.99	0.99	0.99	0.995	0.988	0.988	496.0	495.0	6.0	2.5	0.995	40.594	0.005	0.996	0.995	0.994

Median Model Prediction Statistics (Rounded to 3 Decimal Points): Page 2

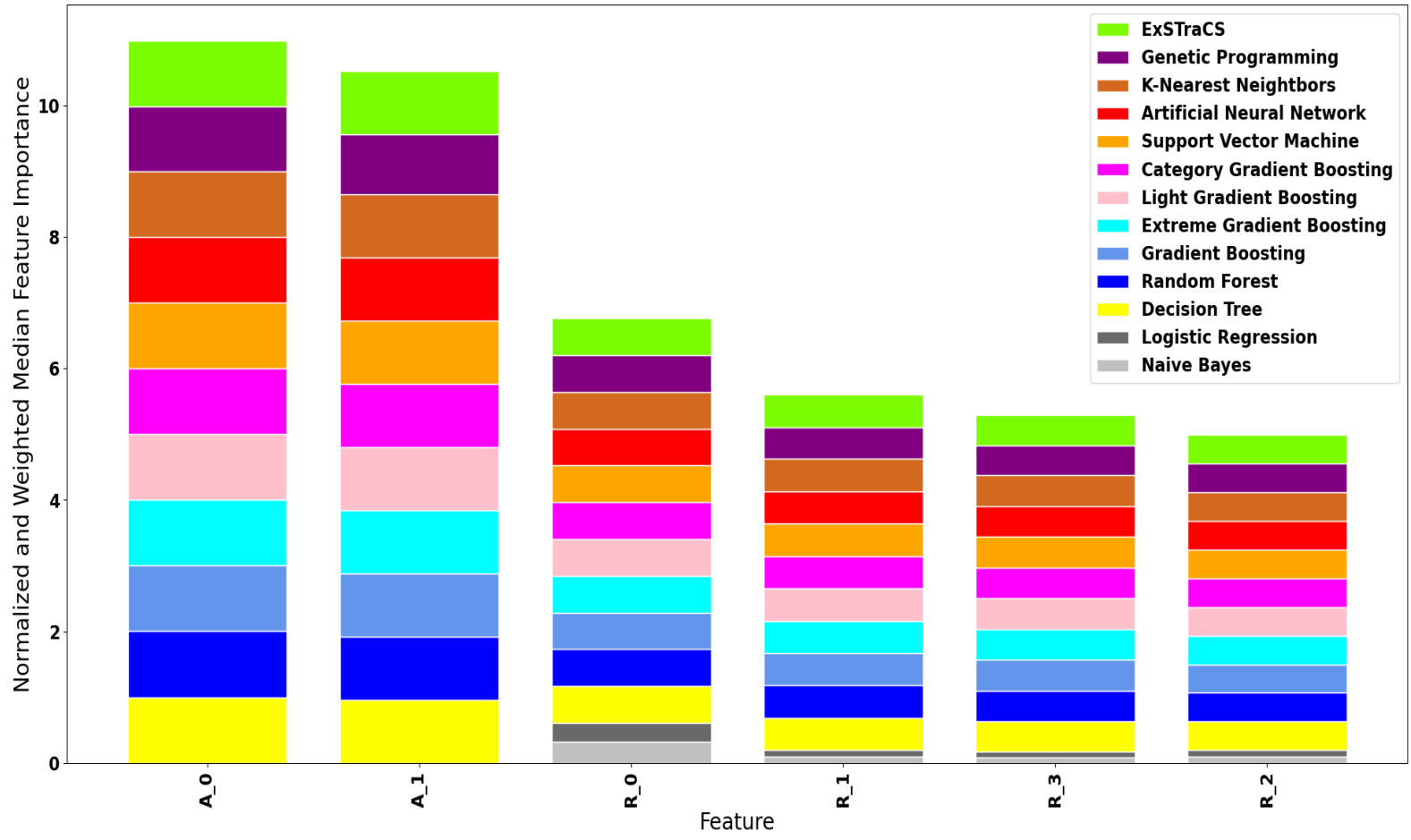
D6 = F_135_bit_mutliplexer_20000_01

ML Algorithm	Balanced Accuracy	Accuracy	F1 Score	Sensitivity (Recall)	Specificity	Precision (PPV)	TP	TN	FP	FN	NPV	LR+	LR-	ROC AUC	PRC AUC	PRC APS
Naive Bayes	0.517	0.517	0.504	0.495	0.535	0.514	492.0	538.5	468.5	501.0	0.521	1.074	0.934	0.523	0.515	0.516
Logistic Regression	0.513	0.513	0.504	0.503	0.523	0.509	499.0	526.5	480.5	494.0	0.515	1.053	0.956	0.522	0.514	0.515
Decision Tree	0.502	0.502	0.492	0.489	0.517	0.498	485.5	521.0	486.5	507.0	0.505	1.007	0.993	0.502	0.503	0.499
Random Forest	0.529	0.529	0.52	0.516	0.54	0.528	512.0	544.0	463.0	481.0	0.532	1.137	0.891	0.545	0.537	0.537
Gradient Boosting	0.528	0.528	0.523	0.522	0.547	0.525	518.5	550.5	456.5	474.0	0.531	1.122	0.896	0.54	0.532	0.533
Extreme Gradient Boosting	0.519	0.519	0.499	0.479	0.553	0.518	475.5	557.0	450.0	517.5	0.522	1.089	0.931	0.529	0.518	0.519
Light Gradient Boosting	0.545	0.545	0.537	0.532	0.558	0.542	528.0	562.0	446.0	465.0	0.548	1.2	0.838	0.564	0.551	0.552
Category Gradient Boosting	0.52	0.521	0.451	0.398	0.644	0.524	395.5	649.0	358.0	597.5	0.52	1.116	0.938	0.534	0.526	0.527
Support Vector Machine	0.522	0.522	0.518	0.519	0.53	0.519	515.0	534.0	473.0	478.0	0.526	1.094	0.915	0.534	0.524	0.525
Artificial Neural Network	0.527	0.527	0.518	0.514	0.533	0.524	510.0	536.5	470.5	482.5	0.529	1.119	0.904	0.527	0.523	0.524
K-Nearest Neightbors	0.528	0.529	0.508	0.499	0.545	0.526	495.5	549.0	458.5	497.0	0.53	1.128	0.902	0.535	0.521	0.522
Genetic Programming	0.502	0.502	0.507	0.511	0.498	0.498	507.0	501.5	505.5	486.0	0.505	1.007	0.993	0.502	0.627	0.497
ExSTraCS	0.501	0.498	0.607	0.772	0.249	0.497	766.5	251.0	756.0	226.0	0.511	1.002	0.973	0.515	0.506	0.506

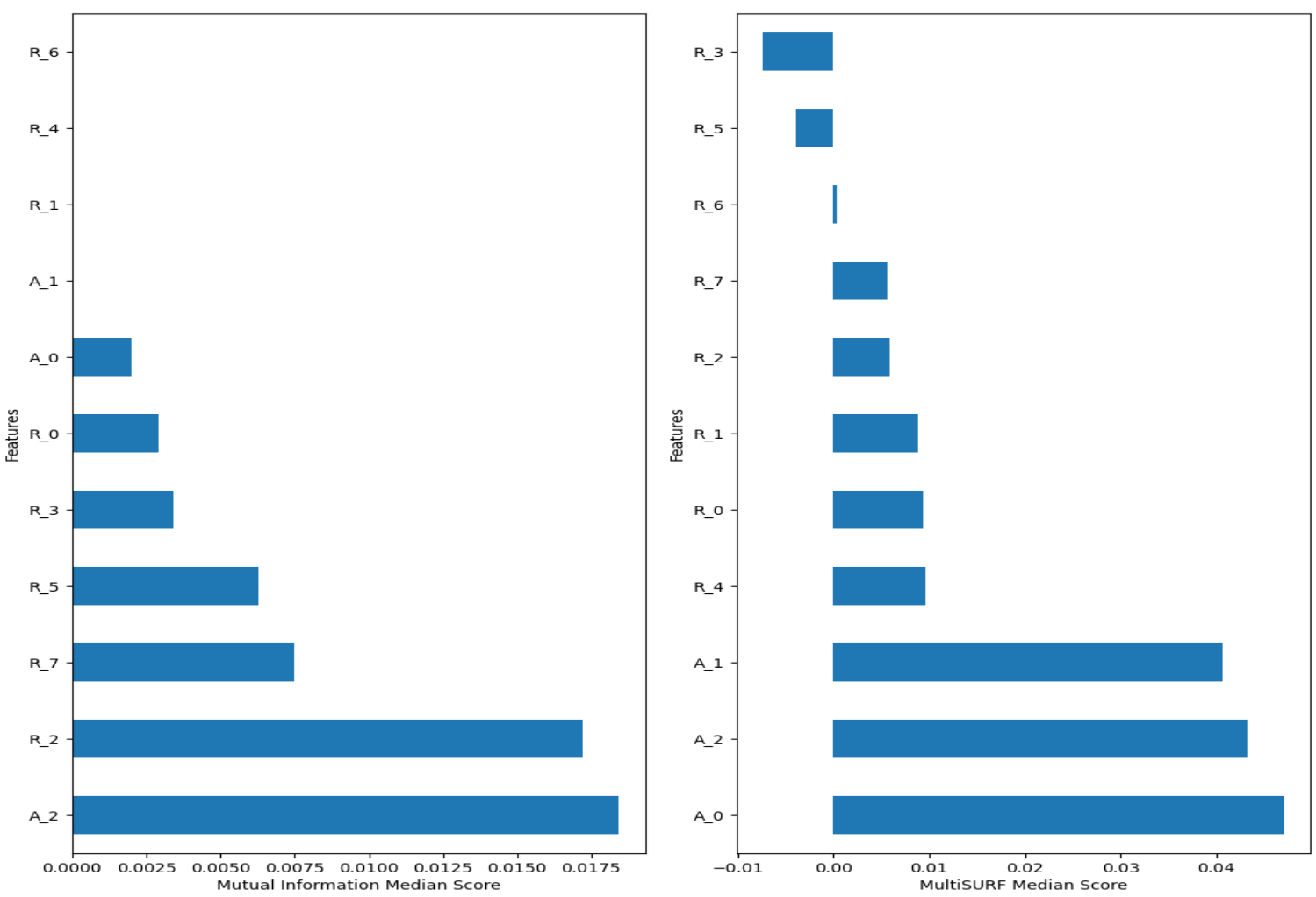
Feature Importance Summary: D1 = A_6_bit_mutliplexer_500_01



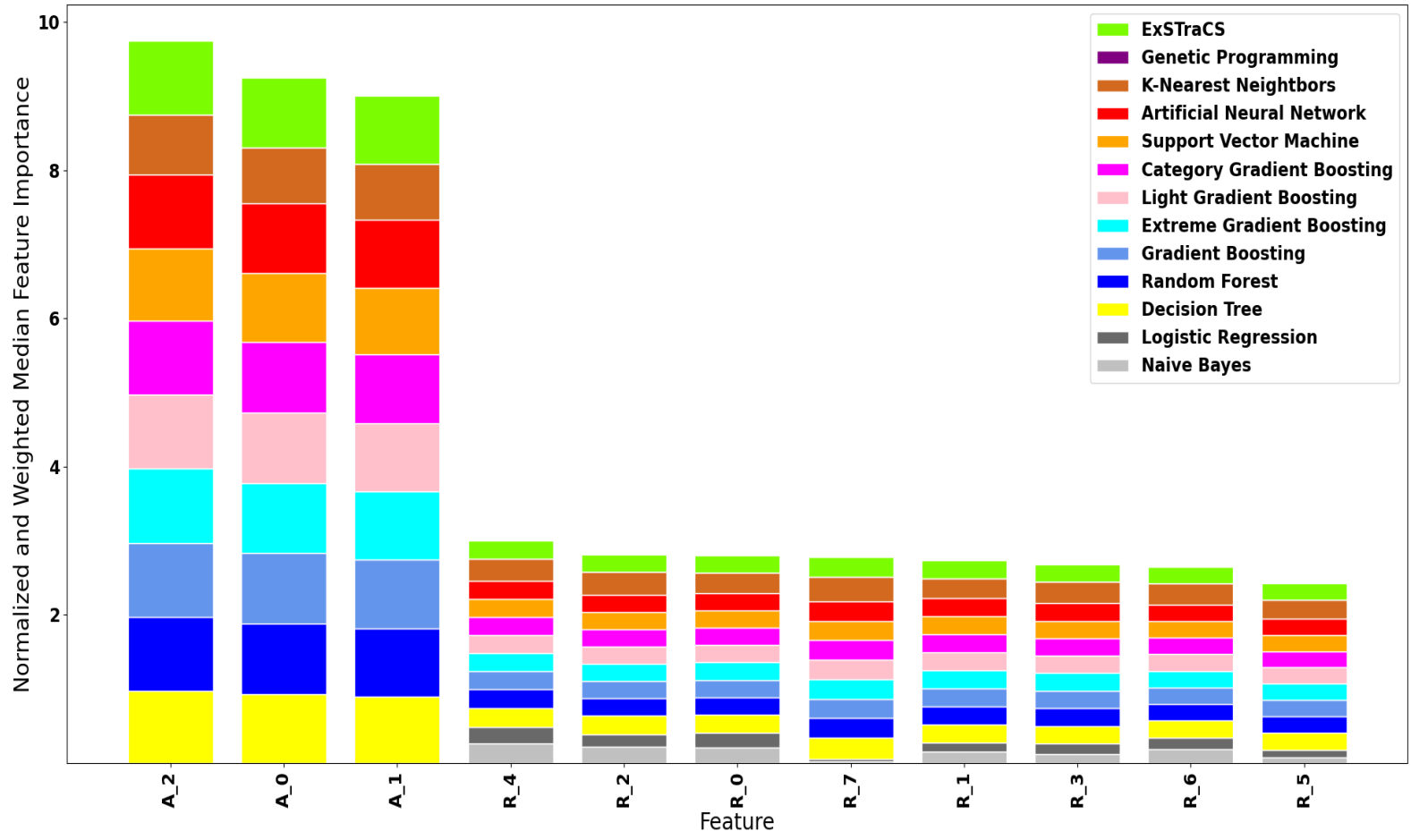
Composite Feature Importance Plot (Normalized and Performance Weighted)



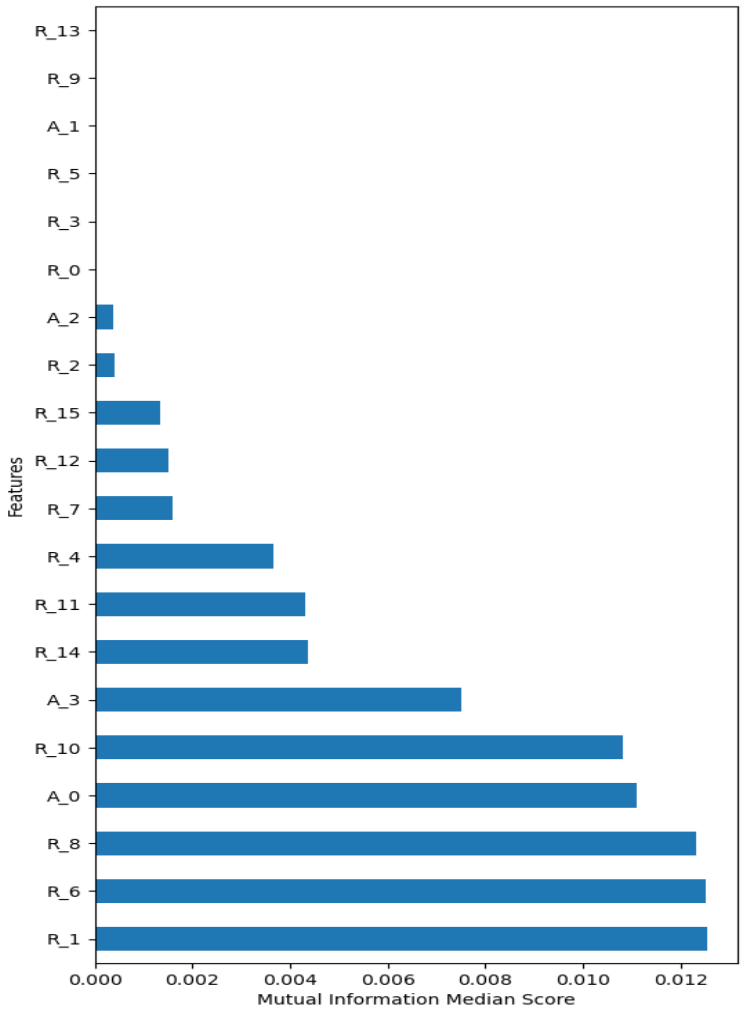
Feature Importance Summary: D2 = B_11_bit_mutliplexer_1000_01

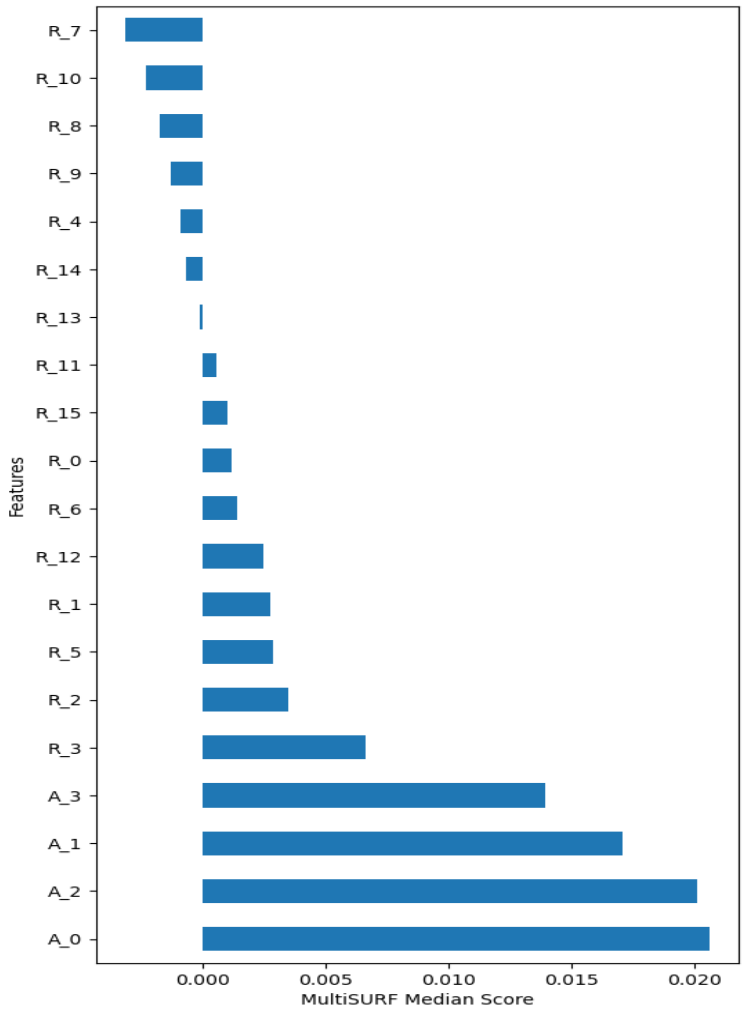


Composite Feature Importance Plot (Normalized and Performance Weighted)

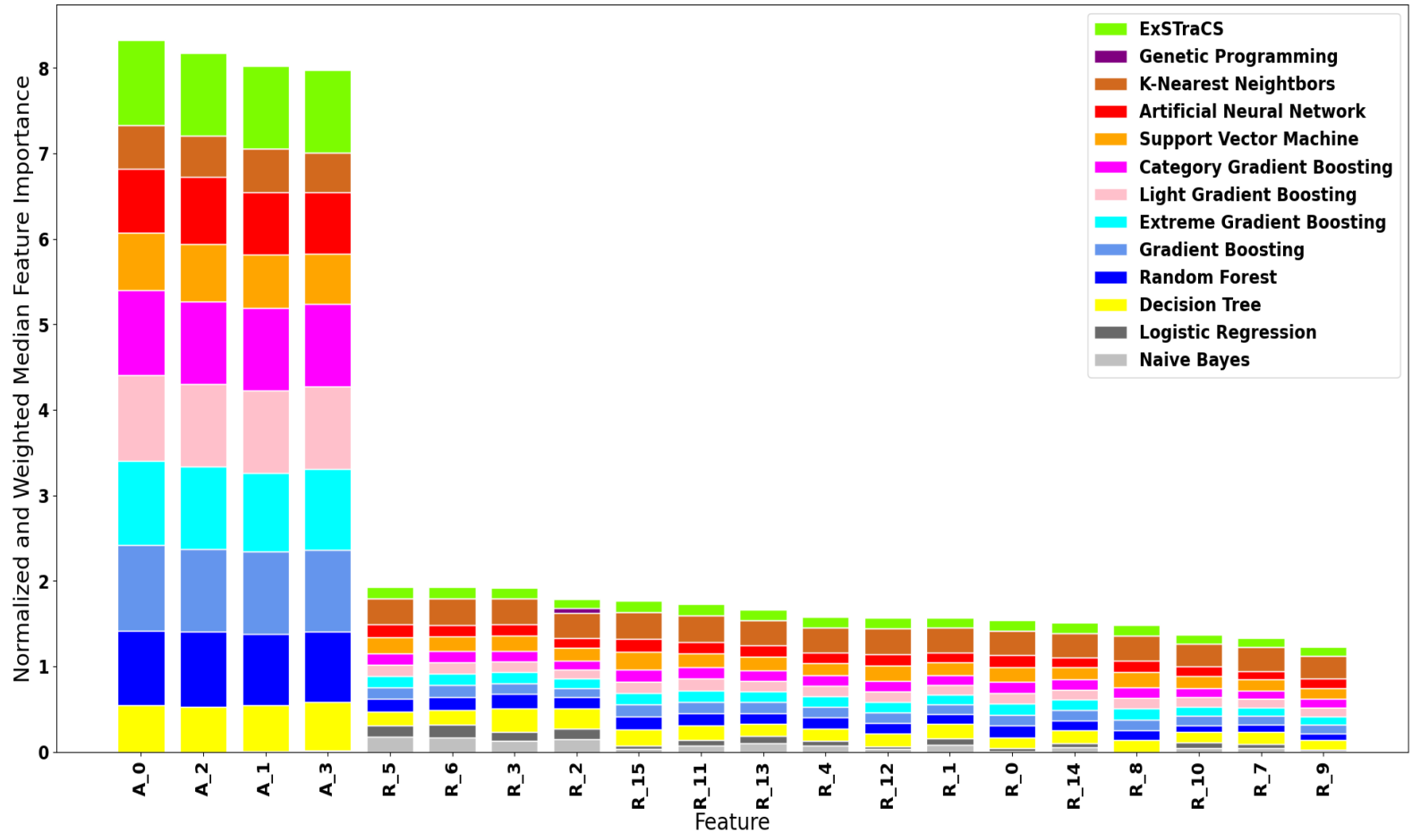


Feature Importance Summary: D3 = C_20_bit_mutliplexer_2000_01



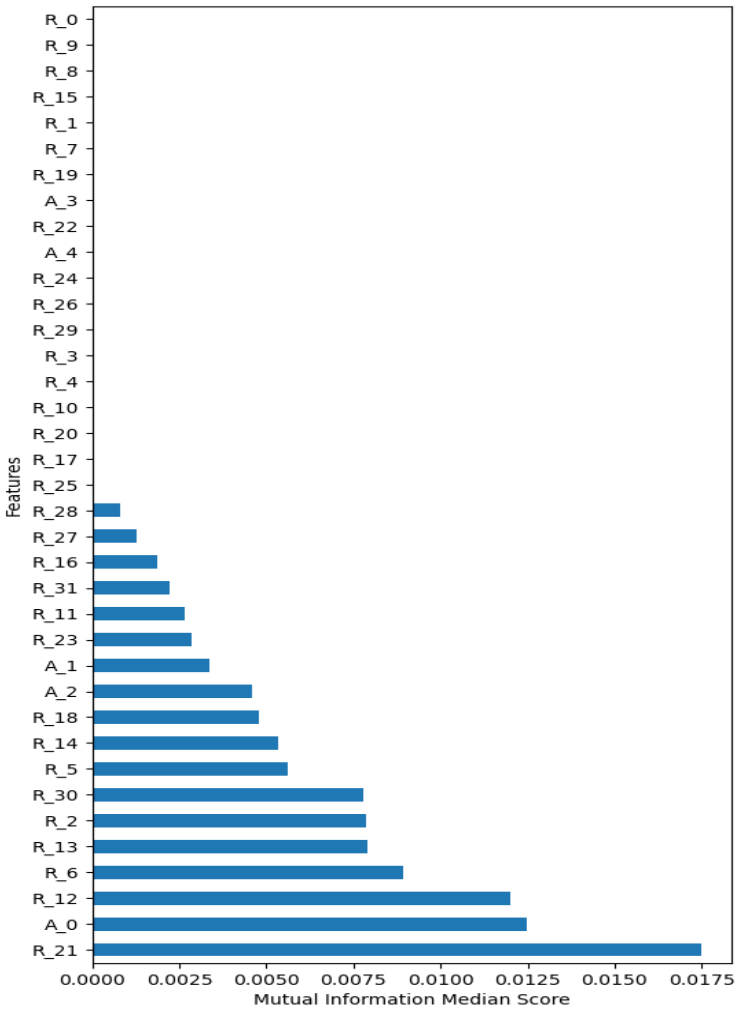


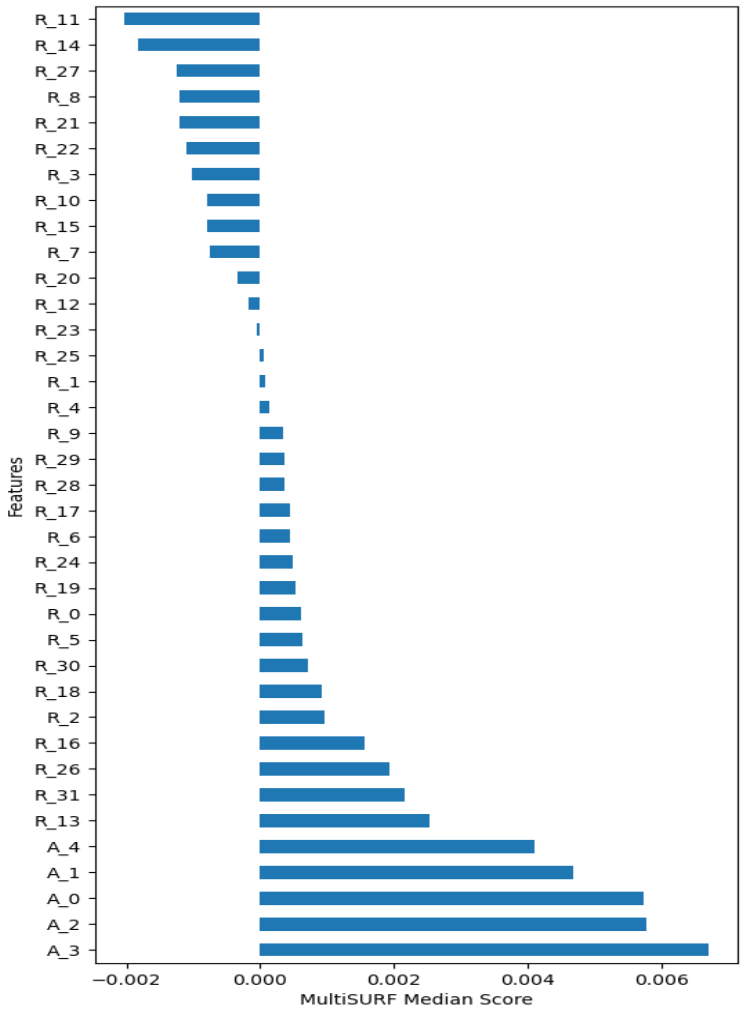
Composite Feature Importance Plot (Normalized and Performance Weighted)



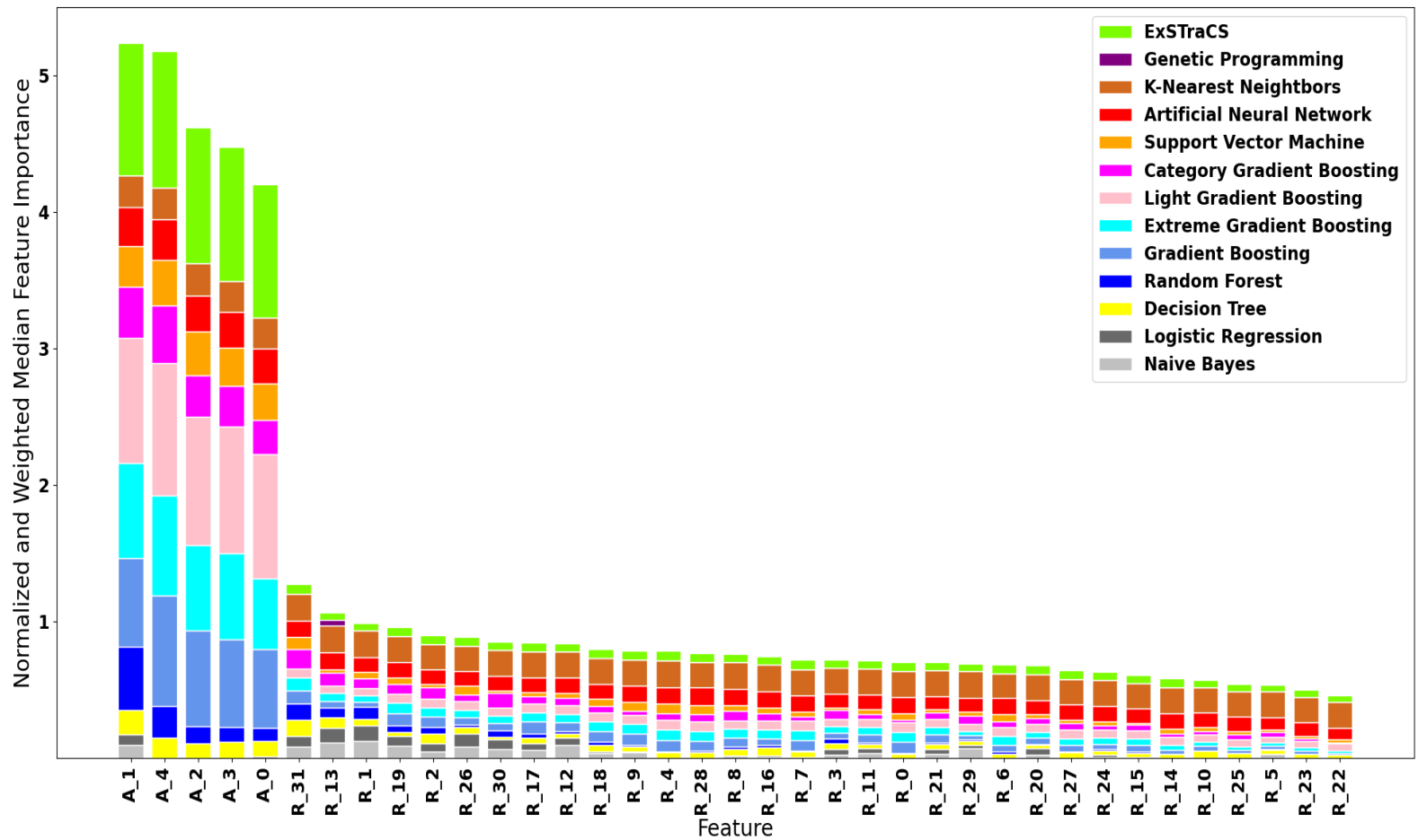
Generated with the URBS-Lab STREAMLINE: (https://github.com/UrbsLab/STREAMLINE)

Feature Importance Summary: D4 = D_37_bit_mutliplexer_5000_01

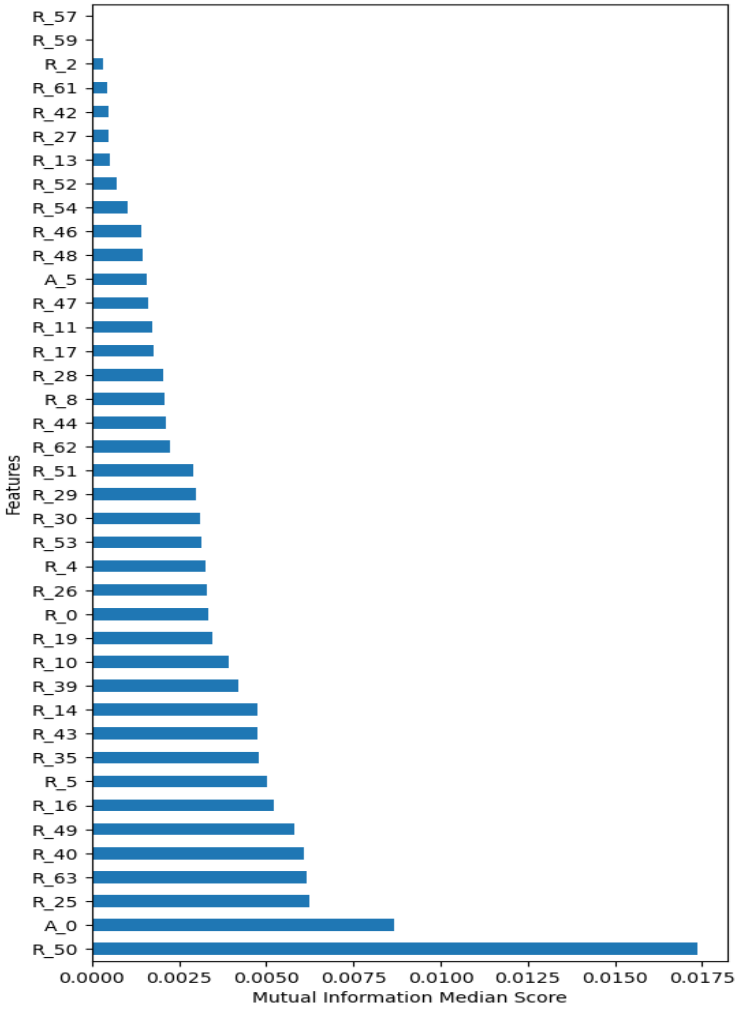


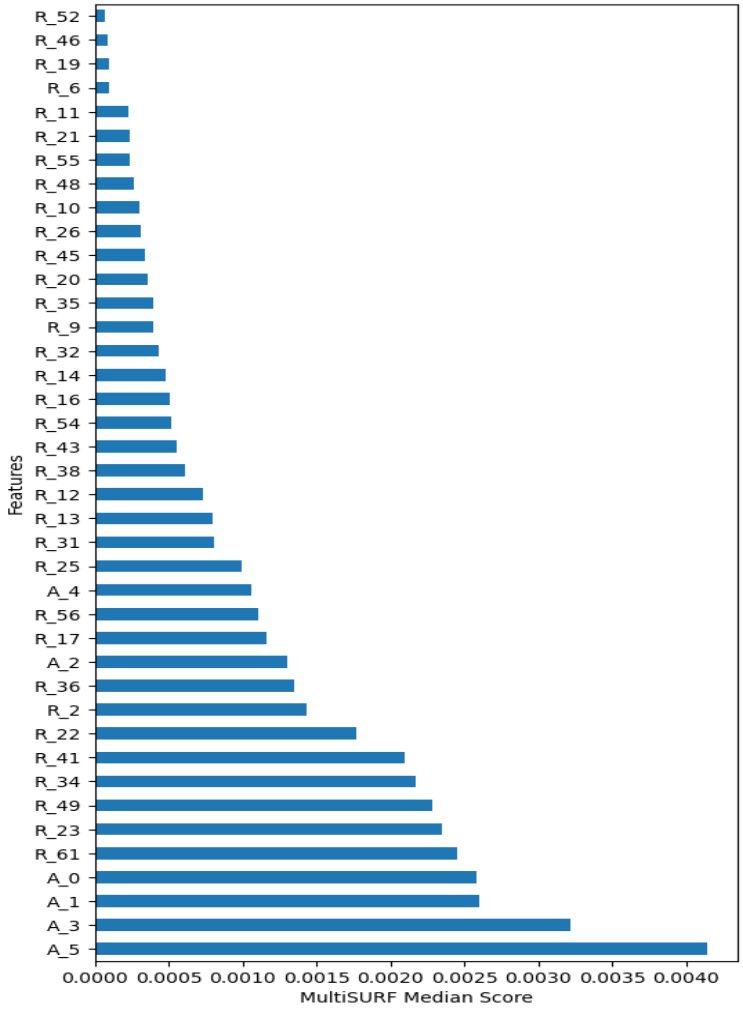


Composite Feature Importance Plot (Normalized and Performance Weighted)

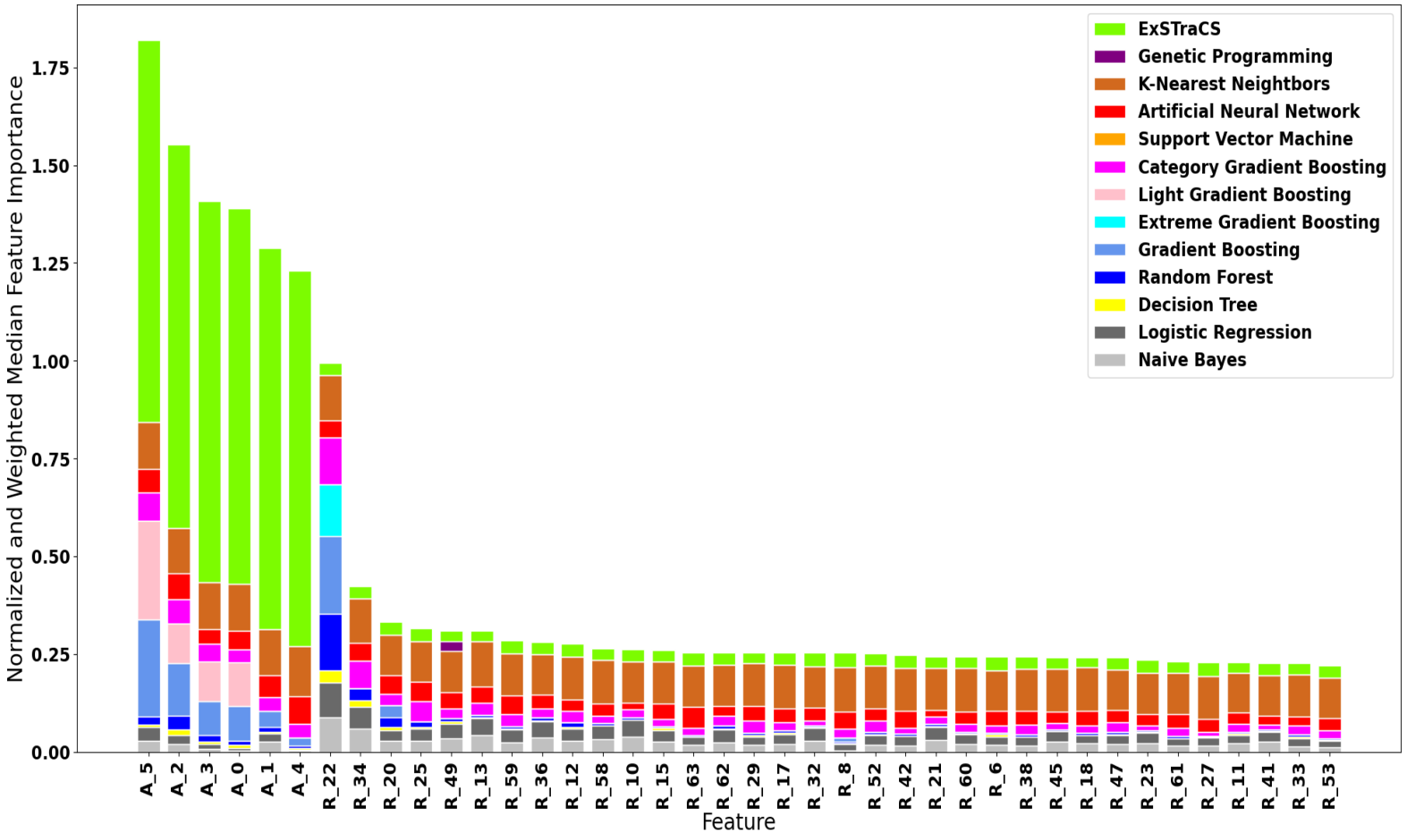


Feature Importance Summary: D5 = E_70_bit_mutliplexer_10000_01

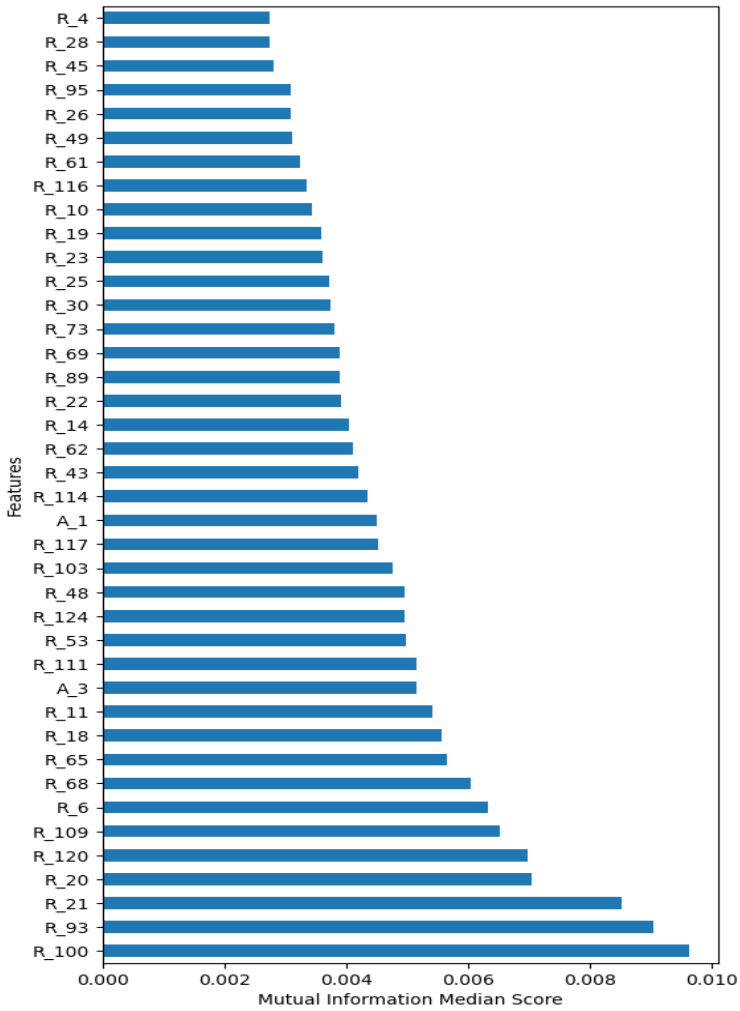


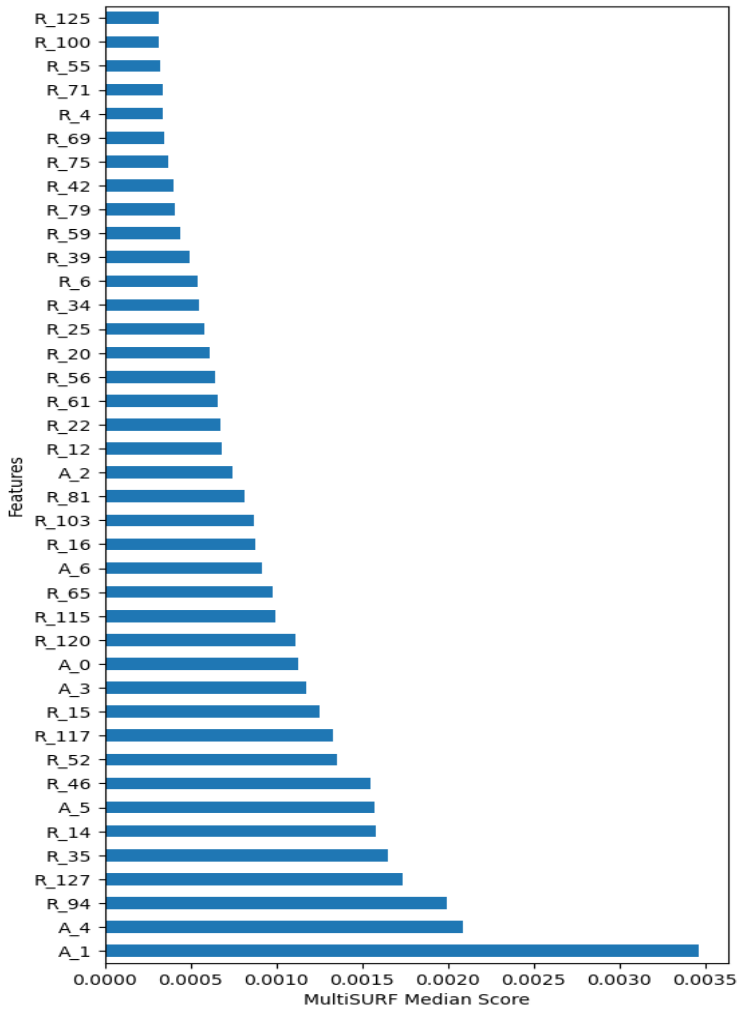


Composite Feature Importance Plot (Normalized and Performance Weighted)

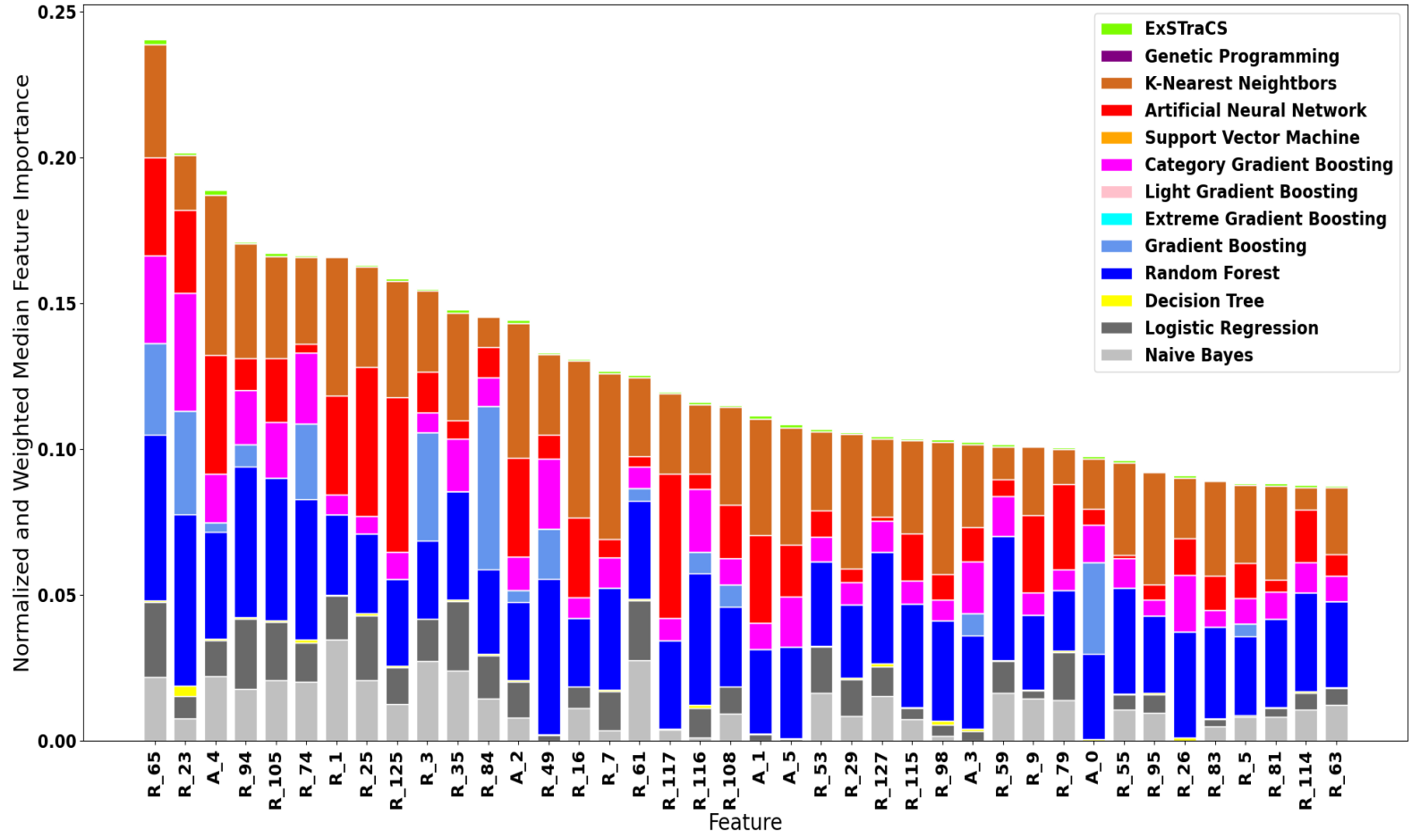


Feature Importance Summary: D6 = F_135_bit_mutliplexer_20000_01



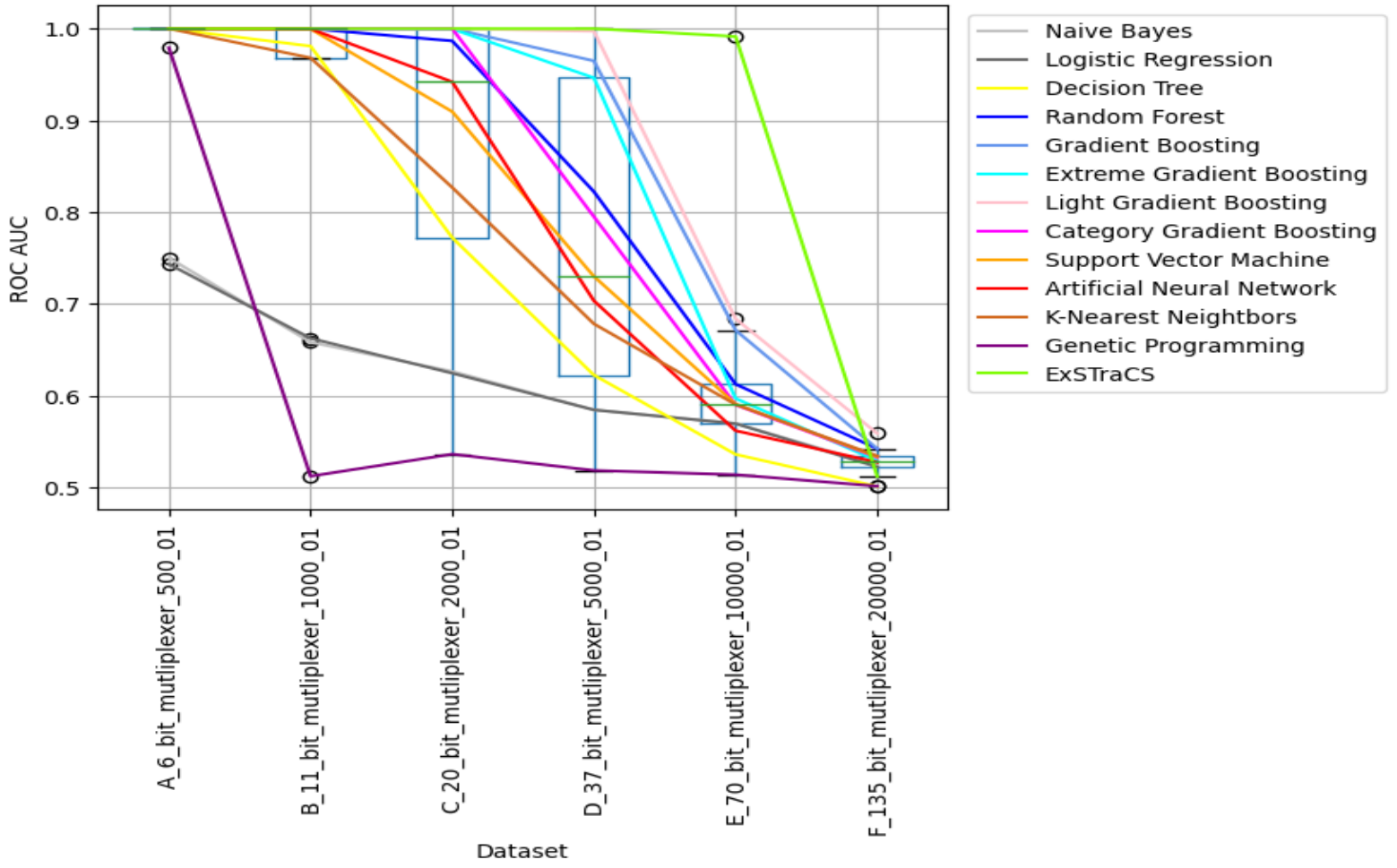


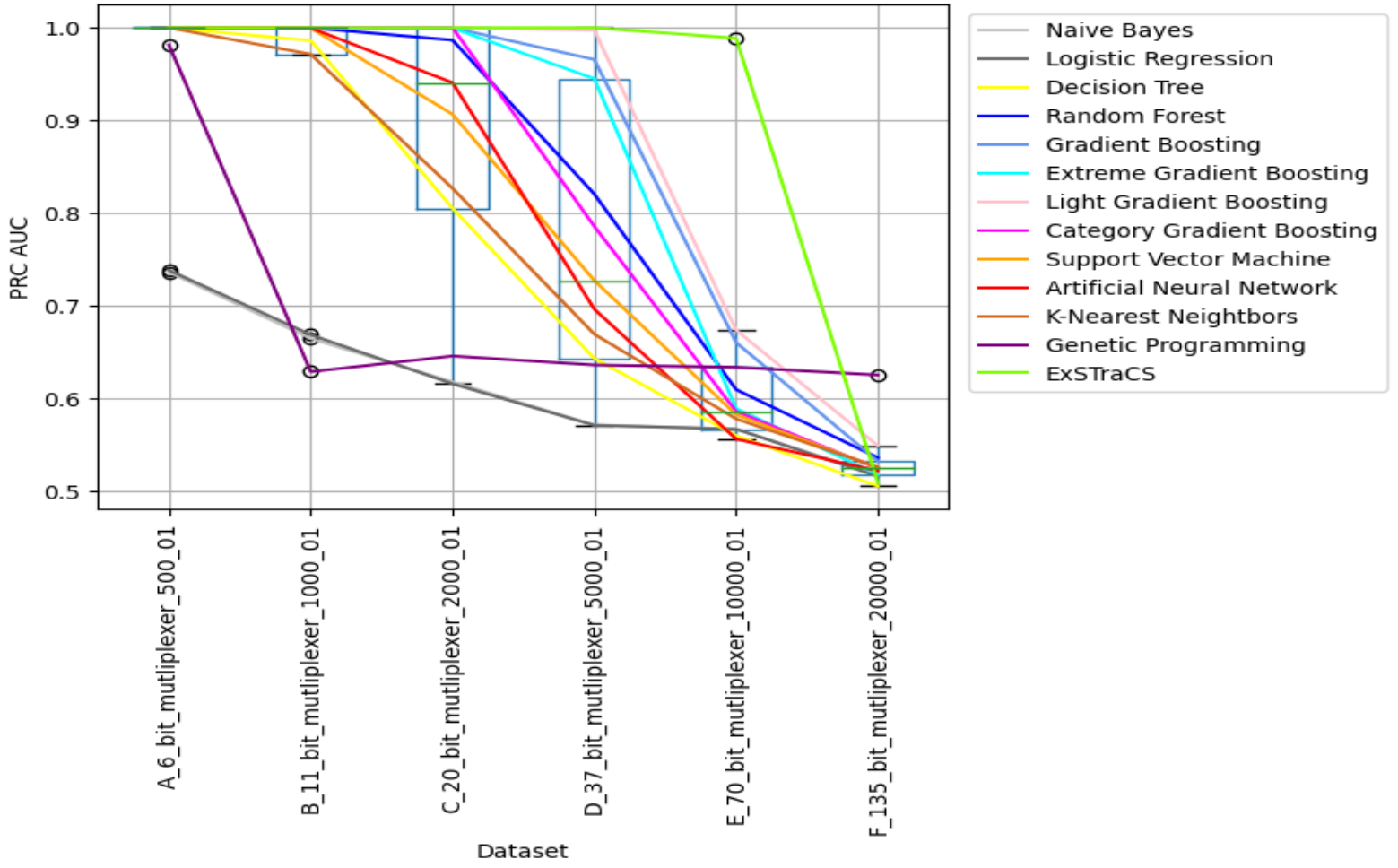
Composite Feature Importance Plot (Normalized and Performance Weighted)



Generated with the URBS-Lab STREAMLINE: (https://github.com/UrbsLab/STREAMLINE)

Compare ML Performance Across Datasets





Using Best Performing Algorithms (Kruskall Wallis Compare Datasets)

Datasets:

D1 = A_6_bit_mutliplexer_500_01

D2 = B_11_bit_mutliplexer_1000_01

D3 = C_20_bit_mutliplexer_2000_01

D4 = D_37_bit_mutliplexer_5000_01

D5 = E_70_bit_mutliplexer_10000_01

D6 = F_135_bit_mutliplexer_20000_01

index	P-Value	Best_Alg_D1	Median_D1	Best_Alg_D2	Median_D2	Best_Alg_D3	Median_D3
Balanced Accuracy	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
Accuracy	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
F1 Score	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
Sensitivity (Recall)	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
Specificity	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
Precision (PPV)	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
TP	0.0	Decision Tree	25.0	Random Forest	50.5	Gradient Boosting	98.0
TN	0.0	Decision Tree	25.0	Random Forest	49.5	Gradient Boosting	102.0
FP	0.0	Logistic Regression	10.0	Genetic Programming	23.5	Genetic Programming	47.0
FN	0.0	Logistic Regression	9.5	Genetic Programming	25.0	Genetic Programming	46.0
NPV	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
LR+	0.0196	Naive Bayes	1.9383	Decision Tree	20.0163	Extreme Gradient Boosting	25.5
LR-	0.0	Logistic Regression	0.556	Genetic Programming	0.9984	Genetic Programming	0.8894
ROC AUC	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
PRC AUC	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0
PRC APS	0.0	Decision Tree	1.0	Random Forest	1.0	Gradient Boosting	1.0

index	P-Value	Best_Alg_D4	Median_D4	Best_Alg_D5	Median_D5	Best_Alg_D6	Median_D6
Balanced Accuracy	0.0	ExSTraCS	1.0	ExSTraCS	0.9905	Light Gradient Boosting	0.5451
Accuracy	0.0	ExSTraCS	1.0	ExSTraCS	0.9905	Light Gradient Boosting	0.5452
F1 Score	0.0	ExSTraCS	1.0	ExSTraCS	0.9904	ExSTraCS	0.6066
Sensitivity (Recall)	0.0	ExSTraCS	1.0	ExSTraCS	0.995	ExSTraCS	0.7723
Specificity	0.0	ExSTraCS	1.0	ExSTraCS	0.988	Category Gradient Boosting	0.6445
Precision (PPV)	0.0	ExSTraCS	1.0	ExSTraCS	0.9881	Light Gradient Boosting	0.5418
TP	0.0	ExSTraCS	248.0	ExSTraCS	496.0	ExSTraCS	766.5
TN	0.0	ExSTraCS	252.0	ExSTraCS	495.0	Category Gradient Boosting	649.0
FP	0.0	Genetic Programming	121.5	Genetic Programming	241.0	ExSTraCS	756.0
FN	0.0	Genetic Programming	120.5	Genetic Programming	245.0	Category Gradient Boosting	597.5
NPV	0.0	ExSTraCS	1.0	ExSTraCS	0.9949	Light Gradient Boosting	0.5477
LR+	0.0196	Light Gradient Boosting	61.8569	ExSTraCS	40.5937	Light Gradient Boosting	1.2003
LR-	0.0	Genetic Programming	0.9189	Genetic Programming	0.9492	Genetic Programming	0.9931
ROC AUC	0.0	ExSTraCS	1.0	ExSTraCS	0.9958	Light Gradient Boosting	0.5642
PRC AUC	0.0	ExSTraCS	1.0	ExSTraCS	0.9949	Genetic Programming	0.6272
PRC APS	0.0	ExSTraCS	1.0	ExSTraCS	0.9944	Light Gradient Boosting	0.5519

Pipeline Runtime Summary

A_6_bit_mutliplexer_500_01

Pipeline Component	Time (sec)
Exploratory Analysis	0.67
Preprocessing	0.02
Mutual Information	0.22
MultiSURF	7.04
Feature Selection	0.24
Naive Bayes	0.65
Logistic Regression	44.39
Decision Tree	48.91
Random Forest	3980.24
Gradient Boosting	1488.16
Extreme Gradient Boosting	6447.96
Light Gradient Boosting	416.71
Category Gradient Boosting	9420.65
Support Vector Machine	1874.1
Artificial Neural Network	2364.51
K-Nearest Neightbors	92.67
Genetic Programming	14222.49
ExSTraCS	5436.65
Stats Summary	16.61

B_11_bit_mutliplexer_1000_01

Pipeline Component	Time (sec)
Exploratory Analysis	0.81
Preprocessing	0.03
Mutual Information	0.47
MultiSURF	36.71
Feature Selection	0.27
Naive Bayes	1.47
Logistic Regression	58.18
Decision Tree	52.11
Random Forest	3012.63
Gradient Boosting	3614.84
Extreme Gradient Boosting	8154.53
Light Gradient Boosting	1127.0
Category Gradient Boosting	9320.95
Support Vector Machine	1010.71
Artificial Neural Network	5922.24
K-Nearest Neightbors	123.02
Genetic Programming	12499.19
ExSTraCS	34330.41
Stats Summary	16.06

C_20_bit_mutliplexer_2000_01

Pipeline Component	Time (sec)
Exploratory Analysis	1.17
Preprocessing	0.05
Mutual Information	1.35
MultiSURF	220.78
Feature Selection	0.33
Naive Bayes	4.18
Logistic Regression	85.61
Decision Tree	68.9
Random Forest	8546.24
Gradient Boosting	8547.08
Extreme Gradient Boosting	9170.34
Light Gradient Boosting	2363.66
Category Gradient Boosting	10655.57
Support Vector Machine	7783.43
Artificial Neural Network	8910.17
K-Nearest Neightbors	917.35
Genetic Programming	10558.32
ExSTraCS	56322.18
Stats Summary	17.7

D_37_bit_mutliplexer_5000_01

Pipeline Component	Time (sec)
Exploratory Analysis	2.55
Preprocessing	0.17
Mutual Information	5.44
MultiSURF	552.11
Feature Selection	0.48
Naive Bayes	15.91
Logistic Regression	194.49
Decision Tree	124.38
Random Forest	11109.55
Gradient Boosting	9739.42
Extreme Gradient Boosting	9643.67
Light Gradient Boosting	6106.74
Category Gradient Boosting	11145.88
Support Vector Machine	16191.87
Artificial Neural Network	9194.73
K-Nearest Neightbors	39670.32
Genetic Programming	11294.3
ExSTraCS	96453.65
Stats Summary	22.13

E_70_bit_mutliplexer_10000_01

Pipeline Component	Time (sec)
Exploratory Analysis	7.1
Preprocessing	0.45
Mutual Information	21.09
MultiSURF	967.6
Feature Selection	0.56
Naive Bayes	88.41
Logistic Regression	479.16
Decision Tree	299.64
Random Forest	14742.59
Gradient Boosting	11423.64
Extreme Gradient Boosting	11716.09
Light Gradient Boosting	13558.08
Category Gradient Boosting	14275.26
Support Vector Machine	53373.8
Artificial Neural Network	8158.81
K-Nearest Neightbors	184243.87
Genetic Programming	9675.91
ExSTraCS	242323.1
Stats Summary	25.06

F_135_bit_mutliplexer_20000_01

Pipeline Component	Time (sec)
Exploratory Analysis	22.12
Preprocessing	1.62
Mutual Information	87.74
MultiSURF	1920.68
Feature Selection	0.53
Naive Bayes	491.1
Logistic Regression	2953.84
Decision Tree	834.76
Random Forest	31430.96
Gradient Boosting	18523.58
Extreme Gradient Boosting	15423.16
Light Gradient Boosting	28213.6
Category Gradient Boosting	20532.51
Support Vector Machine	54617.27
Artificial Neural Network	8524.78
K-Nearest Neightbors	332107.3
Genetic Programming	10696.83
ExSTraCS	876241.06
Stats Summary	25.7