

Supplemental materials to the paper 'Classification methods based on fitting logistic regression to positive and unlabeled data'

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Accuracy

Table 1. Accuracy for 'Banknote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.86	0.84	0.94	0.99	0.99
AdaS_svm	0.90	0.89	0.97	0.98	1.00
Joint BFGS	1.00	1.00	0.99	1.00	0.99
Joint MM	0.98	0.98	0.98	0.99	0.99
LassoJoint_BFGS	1.00	1.00	0.99	1.00	0.99
LassoJoint_BFGS_lambda.1se	0.65	1.00	0.99	1.00	0.99
LassoJoint_BFGS_lambda.min	1.00	1.00	0.99	1.00	0.99
LassoJoint_MM	0.98	0.98	0.98	0.99	0.99
LassoJoint_MM_lambda.1se	0.72	0.98	0.98	0.99	0.99
LassoJoint_MM_lambda.min	0.98	0.98	0.98	0.99	0.99
Naive	0.45	0.47	0.68	0.94	0.99
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.97	0.96	0.97	0.99	0.99

Table 2. Accuracy for 'Breastc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.77	0.85	0.97	0.96	0.90
AdaS_svm	0.83	0.88	0.91	0.95	0.91
Joint BFGS	0.78	0.91	0.98	0.94	0.79
Joint MM	0.86	0.85	0.98	0.95	0.90
LassoJoint_BFGS	0.79	0.93	0.98	0.94	0.90
LassoJoint_BFGS_lambda.1se	0.70	0.93	0.97	0.95	0.77
LassoJoint_BFGS_lambda.min	0.90	0.93	0.98	0.94	0.90
LassoJoint_MM	0.86	0.85	0.97	0.95	0.90
LassoJoint_MM_lambda.1se	0.75	0.90	0.96	0.95	0.90
LassoJoint_MM_lambda.min	0.89	0.88	0.97	0.95	0.90
Naive	0.54	0.50	0.75	0.95	0.91
Oracle	0.96	0.96	0.96	0.96	0.96
Weighted BFGS	0.72	0.90	0.97	0.95	0.79

Table 3. Accuracy for 'Credit_a' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.62	0.74	0.78	0.76	0.84
AdaS_svm	0.51	0.76	0.84	0.86	0.88
Joint BFGS	0.46	0.45	0.61	0.82	0.61
Joint MM	0.56	0.52	0.82	0.83	0.90
LassoJoint_BFGS	0.74	0.83	0.61	0.83	0.76
LassoJoint_BFGS_lambda.1se	0.46	0.83	0.48	0.85	0.83
LassoJoint_BFGS_lambda.min	0.82	0.76	0.68	0.84	0.78
LassoJoint_MM	0.55	0.57	0.82	0.84	0.90
LassoJoint_MM_lambda.1se	0.46	0.74	0.87	0.84	0.90
LassoJoint_MM_lambda.min	0.62	0.76	0.86	0.85	0.90
Naive	0.46	0.51	0.64	0.73	0.90
Oracle	0.92	0.92	0.92	0.92	0.92
Weighted BFGS	0.46	0.45	0.59	0.83	0.70

Table 4. Accuracy for 'Credit_g' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.59	0.52	0.58	0.58	0.64
AdaS_svm	0.53	0.52	0.60	0.65	0.65
Joint BFGS	0.62	0.66	0.71	0.70	0.71
Joint MM	0.60	0.65	0.72	0.66	0.73
LassoJoint_BFGS	0.63	0.65	0.63	0.69	0.70
LassoJoint_BFGS_lambda.1se	0.68	0.45	0.45	0.34	0.73
LassoJoint_BFGS_lambda.min	0.44	0.48	0.58	0.60	0.71
LassoJoint_MM	0.58	0.65	0.69	0.67	0.74
LassoJoint_MM_lambda.1se	0.32	0.32	0.64	0.60	0.74
LassoJoint_MM_lambda.min	0.43	0.61	0.69	0.61	0.73
Naive	0.32	0.32	0.43	0.66	0.73
Oracle	0.79	0.79	0.79	0.79	0.79
Weighted BFGS	0.67	0.71	0.73	0.69	0.73

Table 5. Accuracy for 'dhfr' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.59	0.56	0.69	0.74	0.77
AdaS_svm	0.36	0.38	0.69	0.83	0.77
Joint BFGS	0.52	0.47	0.63	0.76	0.78
Joint MM	0.47	0.51	0.60	0.65	0.69
LassoJoint_BFGS	0.52	0.41	0.71	0.74	0.77
LassoJoint_BFGS_lambda.1se	0.52	0.72	0.78	0.92	0.91
LassoJoint_BFGS_lambda.min	0.56	0.56	0.73	0.78	0.80
LassoJoint_MM	0.46	0.43	0.61	0.75	0.80
LassoJoint_MM_lambda.1se	0.40	0.64	0.82	0.91	0.86
LassoJoint_MM_lambda.min	0.49	0.53	0.77	0.84	0.78
Naive	0.49	0.50	0.64	0.73	0.77
Oracle	0.92	0.92	0.92	0.92	0.92
Weighted BFGS	0.52	0.54	0.67	0.70	0.77

Table 6. Accuracy for 'Diabetes' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.52	0.67	0.68	0.71	0.72
AdaS_svm	0.47	0.64	0.64	0.71	0.71
Joint BFGS	0.76	0.71	0.78	0.75	0.57
Joint MM	0.74	0.70	0.78	0.75	0.76
LassoJoint_BFGS	0.75	0.71	0.78	0.75	0.54
LassoJoint_BFGS_lambda.1se	0.37	0.32	0.75	0.72	0.74
LassoJoint_BFGS_lambda.min	0.74	0.69	0.79	0.75	0.54
LassoJoint_MM	0.73	0.70	0.78	0.75	0.76
LassoJoint_MM_lambda.1se	0.37	0.70	0.76	0.72	0.74
LassoJoint_MM_lambda.min	0.73	0.68	0.79	0.75	0.76
Naive	0.37	0.32	0.34	0.68	0.77
Oracle	0.80	0.80	0.80	0.80	0.80
Weighted BFGS	0.73	0.71	0.79	0.77	0.61

Table 7. Accuracy for 'Spambase' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.62	0.77	0.81	0.86	0.87
AdaS_svm	0.61	0.79	0.83	0.90	0.93
Joint BFGS	0.83	0.90	0.82	0.41	0.39
Joint MM	0.64	0.85	0.89	0.93	0.92
LassoJoint_BFGS	0.83	0.89	0.81	0.41	0.66
LassoJoint_BFGS_lambda.1se	0.40	0.90	0.82	0.41	0.89
LassoJoint_BFGS_lambda.min	0.79	0.90	0.90	0.41	0.66
LassoJoint_MM	0.63	0.86	0.89	0.93	0.92
LassoJoint_MM_lambda.1se	0.51	0.85	0.89	0.93	0.92
LassoJoint_MM_lambda.min	0.59	0.85	0.88	0.93	0.92
Naive	0.40	0.40	0.55	0.90	0.91
Oracle	0.94	0.94	0.94	0.94	0.94
Weighted BFGS	0.80	0.88	0.80	0.45	0.45

Table 8. Accuracy for 'Vote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS.knn	0.81	0.87	0.84	0.93	0.88
AdaS.svm	0.72	0.78	0.81	0.94	0.91
Joint BFGS	0.69	0.57	0.77	0.86	0.90
Joint MM	0.51	0.56	0.80	0.90	0.89
LassoJoint_BFGS	0.67	0.66	0.76	0.86	0.90
LassoJoint_BFGS_lambda.1se	0.66	0.67	0.86	0.94	0.91
LassoJoint_BFGS_lambda.min	0.75	0.61	0.82	0.96	0.92
LassoJoint_MM	0.52	0.53	0.79	0.88	0.91
LassoJoint_MM_lambda.1se	0.62	0.81	0.87	0.96	0.91
LassoJoint_MM_lambda.min	0.64	0.53	0.84	0.91	0.93
Naive	0.39	0.46	0.61	0.78	0.87
Oracle	0.96	0.96	0.96	0.96	0.96
Weighted BFGS	0.66	0.57	0.74	0.88	0.87

Table 9. Accuracy for 'Wdbc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS.knn	0.72	0.85	0.85	0.95	0.97
AdaS.svm	0.82	0.87	0.82	0.93	0.99
Joint BFGS	0.39	0.87	0.71	0.42	0.53
Joint MM	0.38	0.77	0.83	0.94	0.95
LassoJoint_BFGS	0.41	0.89	0.85	0.50	0.54
LassoJoint_BFGS_lambda.1se	0.38	0.92	0.91	0.82	0.47
LassoJoint_BFGS_lambda.min	0.74	0.95	0.86	0.82	0.45
LassoJoint_MM	0.39	0.81	0.84	0.96	0.96
LassoJoint_MM_lambda.1se	0.38	0.93	0.87	0.97	0.97
LassoJoint_MM_lambda.min	0.40	0.92	0.85	0.96	0.97
Naive	0.39	0.42	0.57	0.90	0.96
Oracle	0.97	0.97	0.97	0.97	0.97
Weighted BFGS	0.38	0.81	0.69	0.49	0.77

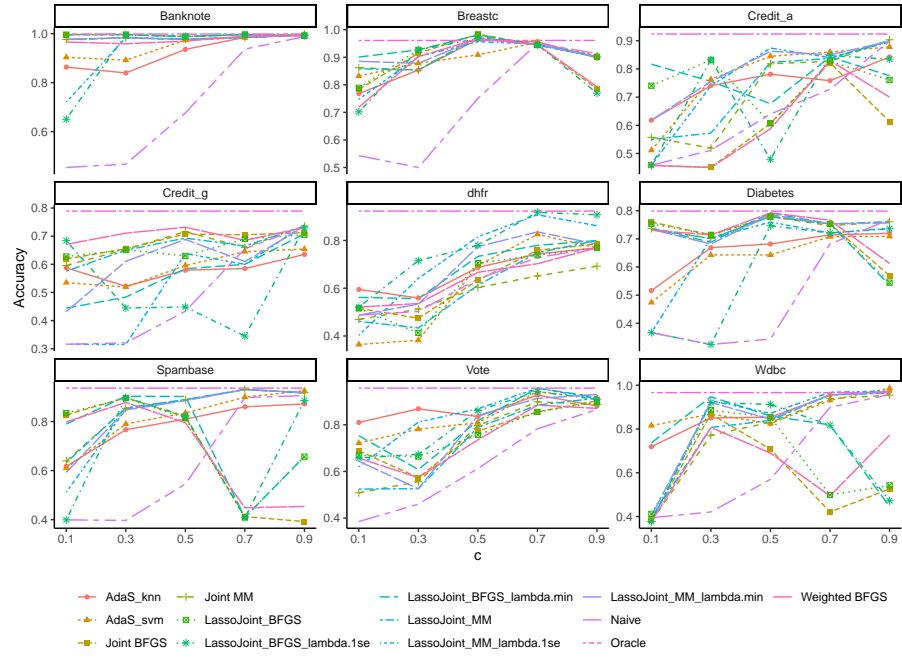


Fig. 1. The accuracy for the test datasets

Recall

Table 10. Recall for 'Banknote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.75	0.70	0.88	0.97	0.99
AdaS_svm	0.82	0.80	0.95	0.97	1.00
Joint BFGS	1.00	1.00	0.98	1.00	1.00
Joint MM	0.96	0.97	0.96	0.97	0.99
LassoJoint_BFGS	1.00	1.00	0.98	1.00	1.00
LassoJoint_BFGS_lambda.1se	0.95	1.00	0.98	1.00	1.00
LassoJoint_BFGS_lambda.min	1.00	1.00	0.98	1.00	1.00
LassoJoint_MM	0.96	0.97	0.96	0.97	0.99
LassoJoint_MM_lambda.1se	0.49	0.97	0.96	0.97	0.99
LassoJoint_MM_lambda.min	0.96	0.97	0.96	0.97	0.99
Naive	0.00	0.00	0.40	0.88	0.98
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.98	0.98	0.97	0.99	1.00

Table 11. Recall for 'Breastc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.56	0.76	0.92	0.94	0.88
AdaS_svm	0.64	0.76	0.79	0.91	0.87
Joint BFGS	0.56	0.83	0.96	0.96	0.56
Joint MM	0.73	0.71	0.94	0.95	0.87
LassoJoint_BFGS	0.55	0.85	0.96	0.96	0.87
LassoJoint_BFGS_lambda.1se	0.41	0.85	0.93	0.95	0.58
LassoJoint_BFGS_lambda.min	0.84	0.85	0.96	0.96	0.87
LassoJoint_MM	0.73	0.71	0.93	0.95	0.87
LassoJoint_MM_lambda.1se	0.49	0.80	0.90	0.95	0.87
LassoJoint_MM_lambda.min	0.77	0.76	0.92	0.95	0.87
Naive	0.00	0.00	0.43	0.89	0.84
Oracle	0.97	0.97	0.97	0.97	0.97
Weighted BFGS	0.48	0.85	0.93	0.94	0.58

Table 12. Recall for 'Credit_a' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.34	0.66	0.75	0.71	0.87
AdaS_svm	0.15	0.65	0.76	0.77	0.83
Joint BFGS	0.00	0.00	0.32	0.86	0.28
Joint MM	0.23	0.14	0.80	0.81	0.91
LassoJoint_BFGS	0.62	0.87	0.31	0.86	0.57
LassoJoint_BFGS_lambda.1se	0.00	0.76	0.00	0.85	0.79
LassoJoint_BFGS_lambda.min	0.93	0.61	0.42	0.86	0.60
LassoJoint_MM	0.23	0.24	0.81	0.80	0.91
LassoJoint_MM_lambda.1se	0.00	0.59	0.82	0.80	0.84
LassoJoint_MM_lambda.min	0.32	0.61	0.83	0.82	0.89
Naive	0.00	0.11	0.35	0.52	0.89
Oracle	0.92	0.92	0.92	0.92	0.92
Weighted BFGS	0.00	0.00	0.29	0.86	0.45

Table 13. Recall for 'Credit_g' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.56	0.44	0.54	0.58	0.64
AdaS_svm	0.39	0.36	0.46	0.61	0.64
Joint BFGS	0.65	0.75	0.89	0.77	0.75
Joint MM	0.46	0.64	0.78	0.65	0.80
LassoJoint_BFGS	0.68	0.72	0.73	0.74	0.73
LassoJoint_BFGS_lambda.1se	1.00	0.33	0.29	0.08	0.78
LassoJoint_BFGS_lambda.min	0.21	0.34	0.55	0.53	0.75
LassoJoint_MM	0.43	0.64	0.74	0.65	0.80
LassoJoint_MM_lambda.1se	0.00	0.00	0.56	0.56	0.81
LassoJoint_MM_lambda.min	0.19	0.57	0.71	0.58	0.80
Naive	0.00	0.01	0.19	0.61	0.79
Oracle	0.91	0.91	0.91	0.91	0.91
Weighted BFGS	0.68	0.78	0.87	0.75	0.78

Table 14. Recall for 'dhfr' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.73	0.51	0.79	0.83	0.88
AdaS_svm	0.04	0.12	0.63	0.79	0.74
Joint BFGS	0.24	0.21	0.48	0.67	0.74
Joint MM	0.30	0.39	0.53	0.65	0.62
LassoJoint_BFGS	0.20	0.11	0.63	0.67	0.76
LassoJoint_BFGS_lambda.1se	0.67	0.77	0.75	0.94	0.88
LassoJoint_BFGS_lambda.min	0.33	0.36	0.68	0.71	0.76
LassoJoint_MM	0.10	0.15	0.44	0.67	0.74
LassoJoint_MM_lambda.1se	0.00	0.56	0.80	0.93	0.83
LassoJoint_MM_lambda.min	0.14	0.32	0.72	0.82	0.71
Naive	0.18	0.26	0.49	0.65	0.71
Oracle	0.93	0.93	0.93	0.93	0.93
Weighted BFGS	0.23	0.31	0.55	0.61	0.74

Table 15. Recall for 'Diabetes' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.48	0.60	0.61	0.69	0.75
AdaS_svm	0.20	0.52	0.55	0.67	0.70
Joint BFGS	0.89	0.71	0.92	0.83	0.36
Joint MM	0.78	0.68	0.89	0.82	0.89
LassoJoint_BFGS	0.92	0.71	0.92	0.83	0.32
LassoJoint_BFGS_lambda.1se	0.00	0.00	0.92	0.91	0.89
LassoJoint_BFGS_lambda.min	0.94	0.68	0.91	0.83	0.30
LassoJoint_MM	0.79	0.68	0.89	0.82	0.89
LassoJoint_MM_lambda.1se	0.00	0.73	0.92	0.91	0.89
LassoJoint_MM_lambda.min	0.78	0.65	0.87	0.82	0.89
Naive	0.00	0.00	0.08	0.58	0.83
Oracle	0.91	0.91	0.91	0.91	0.91
Weighted BFGS	0.92	0.72	0.92	0.86	0.44

Table 16. Recall for 'Spambase' dataset

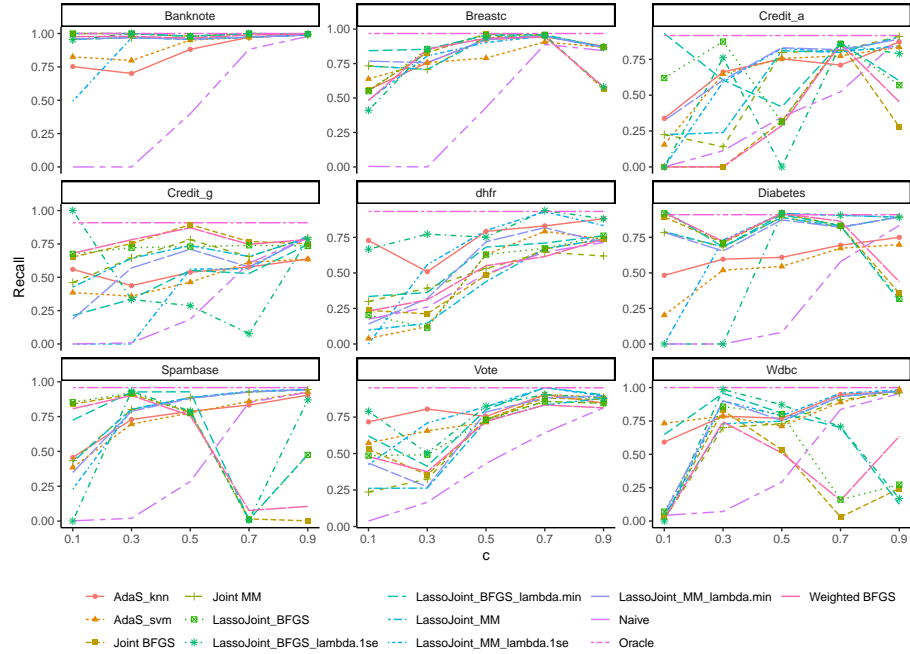
method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.46	0.73	0.79	0.83	0.90
AdaS_svm	0.38	0.70	0.78	0.86	0.93
Joint BFGS	0.84	0.91	0.78	0.02	0.00
Joint MM	0.43	0.80	0.89	0.93	0.94
LassoJoint_BFGS	0.85	0.92	0.77	0.01	0.47
LassoJoint_BFGS_lambda.1se	0.00	0.93	0.79	0.01	0.87
LassoJoint_BFGS_lambda.min	0.72	0.93	0.93	0.01	0.48
LassoJoint_MM	0.42	0.80	0.89	0.93	0.94
LassoJoint_MM_lambda.1se	0.23	0.80	0.89	0.93	0.95
LassoJoint_MM_lambda.min	0.35	0.79	0.88	0.93	0.94
Naive	0.00	0.02	0.28	0.85	0.92
Oracle	0.96	0.96	0.96	0.96	0.96
Weighted BFGS	0.81	0.90	0.76	0.08	0.11

Table 17. Recall for 'Vote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.72	0.81	0.75	0.90	0.85
AdaS_svm	0.57	0.66	0.71	0.90	0.89
Joint BFGS	0.53	0.35	0.73	0.88	0.87
Joint MM	0.24	0.33	0.74	0.86	0.85
LassoJoint_BFGS	0.49	0.49	0.73	0.86	0.85
LassoJoint_BFGS_lambda.1se	0.79	0.50	0.83	0.90	0.88
LassoJoint_BFGS_lambda.min	0.62	0.41	0.80	0.95	0.90
LassoJoint_MM	0.26	0.26	0.72	0.83	0.88
LassoJoint_MM_lambda.1se	0.42	0.71	0.82	0.95	0.89
LassoJoint_MM_lambda.min	0.43	0.27	0.79	0.88	0.89
Naive	0.04	0.17	0.43	0.64	0.81
Oracle	0.95	0.95	0.95	0.95	0.95
Weighted BFGS	0.48	0.38	0.72	0.83	0.81

Table 18. Recall for 'Wdbc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.59	0.79	0.77	0.95	0.97
AdaS_svm	0.73	0.79	0.71	0.89	0.99
Joint BFGS	0.03	0.83	0.53	0.03	0.24
Joint MM	0.01	0.70	0.73	0.91	0.96
LassoJoint_BFGS	0.07	0.86	0.80	0.16	0.27
LassoJoint_BFGS_lambda.1se	0.00	0.99	0.87	0.71	0.17
LassoJoint_BFGS_lambda.min	0.65	0.96	0.81	0.70	0.13
LassoJoint_MM	0.04	0.73	0.75	0.93	0.97
LassoJoint_MM_lambda.1se	0.00	0.90	0.79	0.96	0.98
LassoJoint_MM_lambda.min	0.06	0.90	0.75	0.93	0.97
Naive	0.04	0.07	0.29	0.84	0.96
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.01	0.74	0.51	0.16	0.64


Fig. 2. The recall for the test datasets

Precision

Table 19. Precision for 'Banknote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	1.00	1.00	1.00	1.00	1.00
AdaS_svm	1.00	1.00	1.00	1.00	1.00
Joint BFGS	0.99	0.99	1.00	0.99	0.99
Joint MM	1.00	1.00	1.00	1.00	1.00
LassoJoint_BFGS	0.99	0.99	1.00	0.99	0.99
LassoJoint_BFGS_lambda.1se	0.66	0.99	1.00	0.99	0.99
LassoJoint_BFGS_lambda.min	0.99	0.99	1.00	0.99	0.99
LassoJoint_MM	1.00	1.00	1.00	1.00	1.00
LassoJoint_MM_lambda.1se	0.97	1.00	1.00	1.00	1.00
LassoJoint_MM_lambda.min	1.00	1.00	1.00	1.00	1.00
Naive			1.00	1.00	1.00
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.96	0.95	0.98	0.99	0.99

Table 20. Precision for 'Breastc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.88	0.94	1.00	0.96	0.90
AdaS_svm	1.00	1.00	1.00	0.99	0.92
Joint BFGS	0.96	1.00	1.00	0.92	0.91
Joint MM	0.96	1.00	1.00	0.93	0.91
LassoJoint_BFGS	0.98	1.00	1.00	0.92	0.91
LassoJoint_BFGS_lambda.1se	0.91	1.00	0.99	0.93	0.90
LassoJoint_BFGS_lambda.min	0.93	1.00	1.00	0.92	0.91
LassoJoint_MM	0.94	1.00	1.00	0.93	0.91
LassoJoint_MM_lambda.1se	0.96	1.00	1.00	0.94	0.92
LassoJoint_MM_lambda.min	0.98	1.00	1.00	0.93	0.91
Naive	1.00		1.00	1.00	0.96
Oracle	0.97	0.97	0.97	0.97	0.97
Weighted BFGS	0.84	0.95	0.99	0.94	0.92

Table 21. Precision for 'Credit_a' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.89	0.82	0.82	0.83	0.84
AdaS_svm	0.73	0.88	0.93	0.96	0.93
Joint BFGS		0.00	0.86	0.82	0.99
Joint MM	0.84	0.83	0.84	0.86	0.91
LassoJoint_BFGS	0.86	0.83	0.92	0.83	0.98
LassoJoint_BFGS_lambda.1se		0.92		0.87	0.91
LassoJoint_BFGS_lambda.min	0.78	0.91	0.92	0.85	0.98
LassoJoint_MM	0.80	0.89	0.84	0.90	0.91
LassoJoint_MM_lambda.1se		0.89	0.93	0.89	0.96
LassoJoint_MM_lambda.min	0.92	0.91	0.90	0.90	0.92
Naive		0.89	0.90	0.95	0.92
Oracle	0.94	0.94	0.94	0.94	0.94
Weighted BFGS		0.00	0.88	0.83	0.97

Table 22. Precision for 'Credit_g' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.77	0.77	0.78	0.78	0.81
AdaS_svm	0.85	0.86	0.90	0.84	0.84
Joint BFGS	0.76	0.75	0.74	0.81	0.83
Joint MM	0.90	0.81	0.80	0.83	0.83
LassoJoint_BFGS	0.76	0.76	0.73	0.81	0.83
LassoJoint_BFGS_lambda.1se	0.68	0.70	0.76	1.00	0.83
LassoJoint_BFGS_lambda.min	0.91	0.79	0.83	0.85	0.83
LassoJoint_MM	0.91	0.81	0.81	0.84	0.83
LassoJoint_MM_lambda.1se			0.87	0.82	0.82
LassoJoint_MM_lambda.min	0.91	0.83	0.82	0.82	0.83
Naive		1.00	0.94	0.87	0.83
Oracle	0.82	0.82	0.82	0.82	0.82
Weighted BFGS	0.81	0.79	0.77	0.80	0.83

Table 23. Precision for 'dhfr' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.64	0.74	0.75	0.79	0.79
AdaS_svm	0.27	0.70	0.90	0.94	0.89
Joint BFGS	0.84	0.99	0.97	0.96	0.91
Joint MM	0.63	0.75	0.82	0.79	0.87
LassoJoint_BFGS	0.91	1.00	0.91	0.91	0.86
LassoJoint_BFGS_lambda.1se	0.59	0.81	0.91	0.94	0.97
LassoJoint_BFGS_lambda.min	0.83	0.95	0.91	0.95	0.91
LassoJoint_MM	1.00	1.00	0.98	0.93	0.94
LassoJoint_MM_lambda.1se		0.86	0.92	0.93	0.95
LassoJoint_MM_lambda.min	1.00	0.94	0.93	0.93	0.94
Naive	0.85	0.98	0.95	0.92	0.91
Oracle	0.95	0.95	0.95	0.95	0.95
Weighted BFGS	0.88	0.98	0.93	0.91	0.89

Table 24. Precision for 'Diabetes' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.66	0.87	0.92	0.81	0.79
AdaS_svm	0.63	0.92	0.92	0.82	0.80
Joint BFGS	0.77	0.84	0.80	0.78	0.93
Joint MM	0.80	0.85	0.82	0.78	0.76
LassoJoint_BFGS	0.75	0.84	0.80	0.78	0.93
LassoJoint_BFGS_lambda.1se			0.77	0.72	0.74
LassoJoint_BFGS_lambda.min	0.73	0.83	0.82	0.78	0.93
LassoJoint_MM	0.79	0.85	0.82	0.79	0.76
LassoJoint_MM_lambda.1se		0.81	0.78	0.72	0.74
LassoJoint_MM_lambda.min	0.79	0.84	0.83	0.79	0.76
Naive		1.00	0.86	0.80	
Oracle	0.83	0.83	0.83	0.83	0.83
Weighted BFGS	0.73	0.83	0.81	0.78	0.89

Table 25. Precision for 'Spambase' dataset

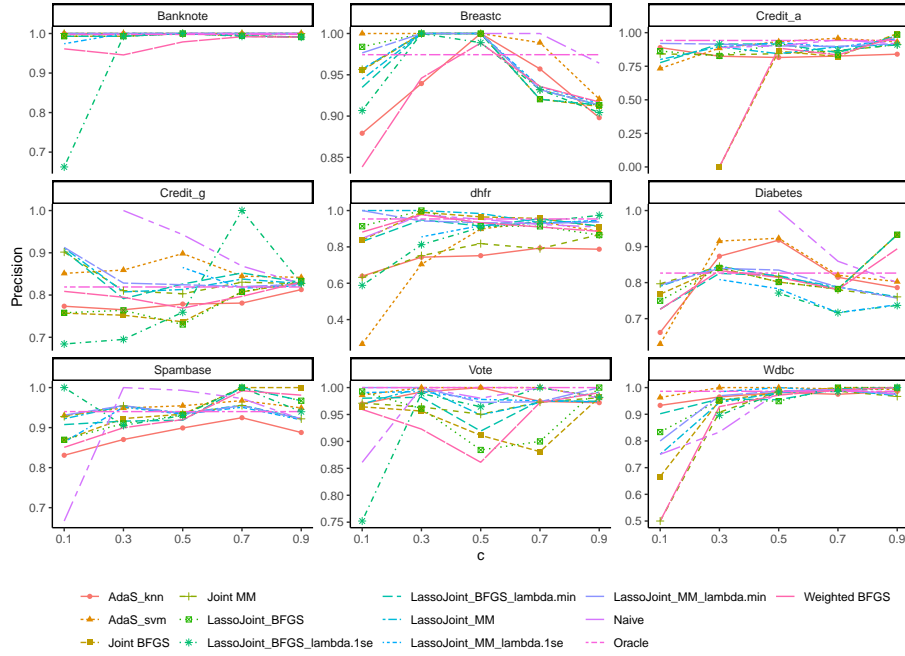
method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.83	0.87	0.90	0.92	0.89
AdaS_svm	0.93	0.95	0.95	0.97	0.95
Joint BFGS	0.87	0.92	0.93	1.00	1.00
Joint MM	0.93	0.95	0.94	0.96	0.92
LassoJoint_BFGS	0.87	0.91	0.93	1.00	0.97
LassoJoint_BFGS_lambda.1se	1.00	0.91	0.93	1.00	0.94
LassoJoint_BFGS_lambda.min	0.91	0.92	0.92	1.00	0.97
LassoJoint_MM	0.92	0.95	0.94	0.96	0.92
LassoJoint_MM_lambda.1se	0.86	0.95	0.93	0.95	0.92
LassoJoint_MM_lambda.min	0.93	0.95	0.93	0.95	0.92
Naive	0.67	1.00	0.99	0.97	0.92
Oracle	0.94	0.94	0.94	0.94	0.94
Weighted BFGS	0.85	0.90	0.92	0.99	0.98

Table 26. Precision for 'Vote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.97	0.99	1.00	0.97	0.97
AdaS_svm	0.99	1.00	1.00	1.00	0.98
Joint BFGS	0.96	0.96	0.91	0.88	0.98
Joint MM	0.97	0.96	0.95	0.97	0.98
LassoJoint_BFGS	0.99	0.96	0.88	0.90	1.00
LassoJoint_BFGS_lambda.1se	0.75	0.99	0.96	1.00	0.98
LassoJoint_BFGS_lambda.min	0.98	0.98	0.92	0.98	0.97
LassoJoint_MM	0.97	1.00	0.95	0.97	0.99
LassoJoint_MM_lambda.1se	0.99	0.99	0.98	0.98	0.97
LassoJoint_MM_lambda.min	1.00	1.00	0.97	0.97	1.00
Naive	0.86	1.00	0.98	1.00	0.98
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.96	0.92	0.86	0.97	0.99

Table 27. Precision for 'Wdbc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.93	0.96	0.98	0.97	0.99
AdaS_svm	0.96	1.00	1.00	0.99	0.99
Joint BFGS	0.67	0.95	0.98	1.00	1.00
Joint MM	0.50	0.91	0.99	0.99	0.97
LassoJoint_BFGS	0.83	0.95	0.95	1.00	1.00
LassoJoint_BFGS_lambda.1se		0.90	0.98	0.99	1.00
LassoJoint_BFGS_lambda.min	0.90	0.96	0.95	0.99	1.00
LassoJoint_MM	0.75	0.94	0.98	0.99	0.97
LassoJoint_MM_lambda.1se		0.98	1.00	0.99	0.98
LassoJoint_MM_lambda.min	0.80	0.97	0.99	0.99	0.97
Naive	0.75	0.83	0.98	0.99	0.98
Oracle	0.99	0.99	0.99	0.99	0.99
Weighted BFGS	0.50	0.93	0.97	0.99	1.00

**Fig. 3.** The precision for the test datasets

F1 score**Table 28.** F1 score for 'Banknote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.86	0.82	0.94	0.99	0.99
AdaS_svm	0.90	0.89	0.97	0.98	1.00
Joint BFGS	1.00	1.00	0.99	1.00	0.99
Joint MM	0.98	0.98	0.98	0.99	0.99
LassoJoint_BFGS	1.00	1.00	0.99	1.00	0.99
LassoJoint_BFGS_lambda.1se	0.76	1.00	0.99	1.00	0.99
LassoJoint_BFGS_lambda.min	1.00	1.00	0.99	1.00	0.99
LassoJoint_MM	0.98	0.98	0.98	0.99	0.99
LassoJoint_MM_lambda.1se	0.84	0.98	0.98	0.99	0.99
LassoJoint_MM_lambda.min	0.98	0.98	0.98	0.99	0.99
Naive			0.57	0.94	0.99
Oracle	1.00	1.00	1.00	1.00	1.00
Weighted BFGS	0.97	0.96	0.97	0.99	0.99

Table 29. F1 score for 'Breastc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.67	0.84	0.96	0.95	0.89
AdaS_svm	0.77	0.86	0.88	0.95	0.89
Joint BFGS	0.89	0.91	0.98	0.94	0.88
Joint MM	0.83	0.83	0.97	0.94	0.89
LassoJoint_BFGS	0.90	0.92	0.98	0.94	0.89
LassoJoint_BFGS_lambda.1se	0.86	0.92	0.96	0.94	0.89
LassoJoint_BFGS_lambda.min	0.89	0.92	0.98	0.94	0.89
LassoJoint_MM	0.82	0.83	0.97	0.94	0.89
LassoJoint_MM_lambda.1se	0.82	0.89	0.95	0.94	0.89
LassoJoint_MM_lambda.min	0.86	0.86	0.96	0.94	0.89
Naive	0.05		0.60	0.94	0.90
Oracle	0.96	0.96	0.96	0.96	0.96
Weighted BFGS	0.77	0.90	0.96	0.94	0.89

Table 30. F1 score for 'Credit_a' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.49	0.73	0.78	0.76	0.86
AdaS_svm	0.26	0.75	0.83	0.86	0.88
Joint BFGS			0.65	0.84	0.36
Joint MM	0.36	0.24	0.82	0.84	0.91
LassoJoint_BFGS	0.72	0.85	0.40	0.84	0.72
LassoJoint_BFGS_lambda.1se		0.83		0.86	0.83
LassoJoint_BFGS_lambda.min	0.85	0.73	0.66	0.86	0.74
LassoJoint_MM	0.35	0.38	0.83	0.84	0.91
LassoJoint_MM_lambda.1se		0.71	0.87	0.84	0.90
LassoJoint_MM_lambda.min	0.48	0.73	0.86	0.86	0.90
Naive		0.20	0.50	0.67	0.90
Oracle	0.93	0.93	0.93	0.93	0.93
Weighted BFGS			0.44	0.84	0.61

Table 31. F1 score for 'Credit_g' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.64	0.55	0.64	0.66	0.71
AdaS_svm	0.52	0.50	0.61	0.71	0.72
Joint BFGS	0.70	0.75	0.81	0.79	0.79
Joint MM	0.61	0.72	0.79	0.73	0.81
LassoJoint_BFGS	0.71	0.74	0.80	0.77	0.78
LassoJoint_BFGS_lambda.1se	0.81	0.82	0.80	0.14	0.81
LassoJoint_BFGS_lambda.min	0.47	0.73	0.65	0.65	0.78
LassoJoint_MM	0.57	0.71	0.75	0.74	0.81
LassoJoint_MM_lambda.1se			0.68	0.67	0.82
LassoJoint_MM_lambda.min	0.28	0.64	0.75	0.68	0.81
Naive		0.03	0.31	0.71	0.81
Oracle	0.86	0.86	0.86	0.86	0.86
Weighted BFGS	0.74	0.79	0.82	0.77	0.81

Table 32. F1 score for 'dhfr' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.68	0.60	0.77	0.81	0.83
AdaS_svm	0.08	0.72	0.72	0.86	0.81
Joint BFGS	0.36	0.34	0.61	0.79	0.82
Joint MM	0.40	0.52	0.64	0.71	0.72
LassoJoint_BFGS	0.31	0.20	0.72	0.75	0.81
LassoJoint_BFGS_lambda.1se	0.74	0.78	0.81	0.94	0.93
LassoJoint_BFGS_lambda.min	0.54	0.44	0.75	0.81	0.83
LassoJoint_MM	0.18	0.25	0.60	0.78	0.83
LassoJoint_MM_lambda.1se		0.75	0.85	0.93	0.89
LassoJoint_MM_lambda.min	0.28	0.44	0.81	0.87	0.81
Naive	0.29	0.41	0.65	0.76	0.80
Oracle	0.94	0.94	0.94	0.94	0.94
Weighted BFGS	0.36	0.46	0.68	0.73	0.81

Table 33. F1 score for 'Diabetes' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.56	0.71	0.73	0.75	0.77
AdaS_svm	0.29	0.66	0.69	0.74	0.75
Joint BFGS	0.82	0.77	0.86	0.81	0.38
Joint MM	0.79	0.76	0.85	0.80	0.82
LassoJoint_BFGS	0.82	0.77	0.86	0.81	0.32
LassoJoint_BFGS_lambda.1se			0.84	0.80	0.81
LassoJoint_BFGS_lambda.min	0.82	0.75	0.86	0.81	0.30
LassoJoint_MM	0.79	0.76	0.85	0.80	0.82
LassoJoint_MM_lambda.1se		0.77	0.85	0.80	0.81
LassoJoint_MM_lambda.min	0.79	0.74	0.85	0.80	0.82
Naive		0.15	0.69	0.82	
Oracle	0.87	0.87	0.87	0.87	0.87
Weighted BFGS	0.81	0.77	0.86	0.82	0.49

Table 34. F1 score for 'Spambase' dataset

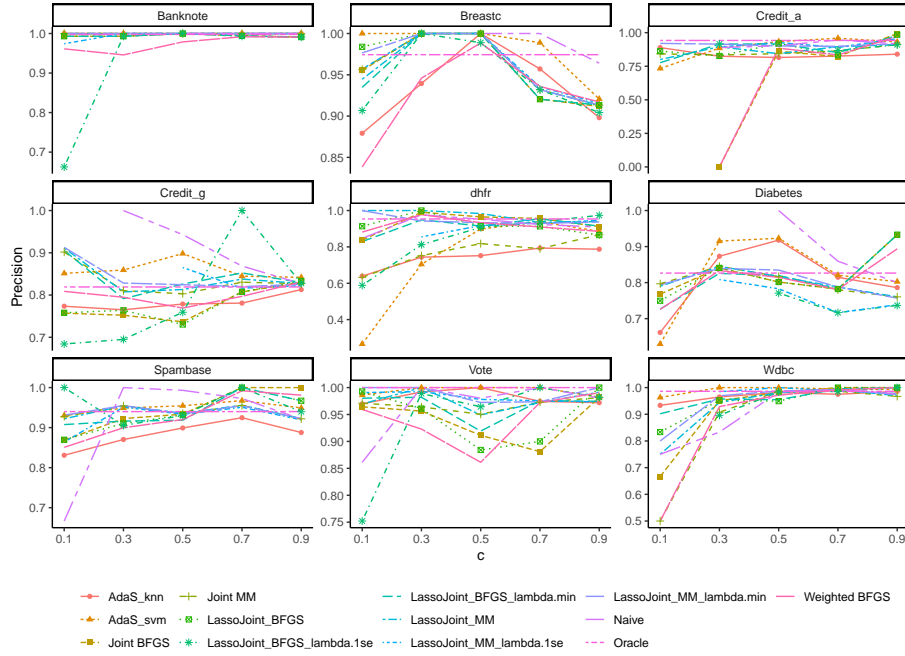
method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.59	0.79	0.84	0.88	0.90
AdaS_svm	0.54	0.80	0.86	0.91	0.94
Joint BFGS	0.85	0.92	0.79	0.03	0.01
Joint MM	0.59	0.87	0.91	0.94	0.93
LassoJoint_BFGS	0.86	0.92	0.78	0.02	0.48
LassoJoint_BFGS_lambda.1se	0.00	0.92	0.80	0.03	0.90
LassoJoint_BFGS_lambda.min	0.80	0.92	0.92	0.03	0.48
LassoJoint_MM	0.58	0.87	0.91	0.94	0.93
LassoJoint_MM_lambda.1se	0.46	0.87	0.91	0.94	0.93
LassoJoint_MM_lambda.min	0.50	0.86	0.91	0.94	0.93
Naive	0.01	0.04	0.44	0.91	0.92
Oracle	0.95	0.95	0.95	0.95	0.95
Weighted BFGS	0.83	0.90	0.79	0.14	0.19

Table 35. F1 score for 'Vote' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.82	0.89	0.86	0.94	0.90
AdaS_svm	0.72	0.79	0.83	0.95	0.93
Joint BFGS	0.68	0.49	0.81	0.88	0.92
Joint MM	0.37	0.48	0.83	0.91	0.91
LassoJoint_BFGS	0.62	0.59	0.80	0.88	0.92
LassoJoint_BFGS_lambda.1se	0.82	0.85	0.89	0.95	0.93
LassoJoint_BFGS_lambda.min	0.76	0.52	0.85	0.96	0.94
LassoJoint_MM	0.40	0.41	0.82	0.90	0.93
LassoJoint_MM_lambda.1se	0.91	0.82	0.89	0.96	0.93
LassoJoint_MM_lambda.min	0.60	0.42	0.87	0.93	0.94
Naive	0.07	0.28	0.60	0.78	0.89
Oracle	0.97	0.97	0.97	0.97	0.97
Weighted BFGS	0.64	0.50	0.78	0.90	0.89

Table 36. F1 score for 'Wdbc' dataset

method	$c = 0.1$	0.3	0.5	0.7	0.9
AdaS_knn	0.72	0.87	0.86	0.96	0.98
AdaS_svm	0.83	0.88	0.83	0.94	0.99
Joint BFGS	0.05	0.89	0.88	0.11	0.38
Joint MM	0.03	0.79	0.84	0.95	0.96
LassoJoint_BFGS	0.13	0.90	0.87	0.27	0.43
LassoJoint_BFGS_lambda.1se		0.94	0.92	0.76	0.62
LassoJoint_BFGS_lambda.min	0.75	0.96	0.87	0.76	0.40
LassoJoint_MM	0.08	0.82	0.85	0.96	0.97
LassoJoint_MM_lambda.1se		0.94	0.88	0.97	0.98
LassoJoint_MM_lambda.min	0.11	0.93	0.85	0.96	0.97
Naive	0.08	0.13	0.45	0.91	0.97
Oracle	0.97	0.97	0.97	0.97	0.97
Weighted BFGS	0.03	0.83	0.86	0.26	0.77

**Fig. 4.** The F1 score for the test datasets