

# Supplement to the paper 'PU classification under Non-SCAR: clustering-assisted logistic model with oversampling enhancement'

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This supplement contains 3 sections. In Section 1, tables for all classification metrics across 14 datasets and figures for the non-SCAR scheme with the executing time of considered algorithms are presented. Analogous results for the SCAR scheme are presented in Section 2. Section 3 presents the computation times, and Section 4 describes the non-SCAR labeling function. In all tables, we reported mean and standard deviations (in brackets). The best results are marked.

## 1 Non-SCAR Scheme

### 1.1 Tables for all classification metrics for 14 datasets.

q	naive acc	clust acc	strict lassclust acc	non strict lassclust acc	lasso joint acc	naive f1	clust f1	strict lassclust f1	non strict lassclust f1	lasso joint f1	naive auc	clust auc	strict lassclust auc	non strict lassclust auc	lasso joint auc
0.25	<b>0.64 (0.16)</b>	<b>0.71 (0.16)</b>	0.7 (0.15)	<b>0.71 (0.16)</b>	<b>0.53 (0.15)</b>	<b>0.63 (0.18)</b>	0.54 (0.25)	0.5 (0.25)	0.54 (0.25)	0.56 (0.14)	<b>0.77 (0.13)</b>	<b>0.73 (0.17)</b>	<b>0.75 (0.16)</b>	<b>0.75 (0.16)</b>	<b>0.79 (0.15)</b>
0.5	<b>0.64 (0.16)</b>	<b>0.71 (0.16)</b>	0.69 (0.15)	<b>0.71 (0.16)</b>	<b>0.53 (0.15)</b>	<b>0.63 (0.18)</b>	0.54 (0.24)	0.52 (0.23)	0.54 (0.25)	0.56 (0.14)	<b>0.77 (0.13)</b>	<b>0.73 (0.17)</b>	<b>0.75 (0.16)</b>	<b>0.75 (0.16)</b>	0.78 (0.15)
1	<b>0.64 (0.16)</b>	<b>0.71 (0.16)</b>	<b>0.71 (0.16)</b>	<b>0.71 (0.16)</b>	<b>0.53 (0.15)</b>	<b>0.63 (0.18)</b>	<b>0.56 (0.24)</b>	<b>0.56 (0.24)</b>	<b>0.56 (0.24)</b>	<b>0.57 (0.15)</b>	<b>0.77 (0.13)</b>	<b>0.73 (0.17)</b>	<b>0.75 (0.16)</b>	<b>0.75 (0.16)</b>	<b>0.79 (0.15)</b>

**Table 1.** Summary of Mean and Standard Deviation for Accuracy, F1, and AUC Metrics by q (Highest Mean in Bold); non-SCAR scheme

**Table 2.** Summary Statistics for df = adult; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.769 (0.005)</b>	<b>0.769 (0.005)</b>	<b>0.769 (0.005)</b>	<b>0.454 (0.005)</b>	<b>0.454 (0.005)</b>	<b>0.454 (0.005)</b>	<b>0.462 (0.006)</b>	<b>0.462 (0.006)</b>	<b>0.462 (0.006)</b>
0.3	clust	0.588 (0.008)	0.761 (0.045)	<b>0.763 (0.006)</b>	0.646 (0.006)	<b>0.724 (0.030)</b>	0.621 (0.006)	0.279 (0.005)	0.502 (0.060)	<b>0.513 (0.006)</b>
0.3	strict-lassclust	0.589 (0.008)	0.761 (0.044)	<b>0.763 (0.006)</b>	0.646 (0.006)	<b>0.724 (0.029)</b>	0.621 (0.006)	0.279 (0.005)	0.502 (0.060)	<b>0.513 (0.006)</b>
0.3	non-strict-lassclust	0.589 (0.008)	0.761 (0.044)	<b>0.763 (0.006)</b>	0.646 (0.006)	<b>0.724 (0.029)</b>	0.621 (0.006)	0.279 (0.005)	0.502 (0.060)	<b>0.513 (0.006)</b>
0.3	lassojoint	<b>0.751 (0.014)</b>	<b>0.751 (0.014)</b>	<b>0.751 (0.014)</b>	<b>0.363 (0.050)</b>	<b>0.363 (0.050)</b>	<b>0.363 (0.050)</b>	<b>0.427 (0.018)</b>	<b>0.427 (0.018)</b>	<b>0.427 (0.018)</b>
0.5	naive	<b>0.771 (0.003)</b>	<b>0.771 (0.003)</b>	<b>0.771 (0.003)</b>	<b>0.578 (0.003)</b>	<b>0.578 (0.003)</b>	<b>0.578 (0.003)</b>	<b>0.504 (0.006)</b>	<b>0.504 (0.006)</b>	<b>0.504 (0.006)</b>
0.5	clust	0.704 (0.064)	<b>0.780 (0.009)</b>	0.766 (0.004)	0.711 (0.033)	<b>0.731 (0.008)</b>	0.595 (0.001)	0.361 (0.052)	<b>0.522 (0.010)</b>	0.511 (0.006)
0.5	strict-lassclust	0.704 (0.063)	<b>0.780 (0.009)</b>	0.766 (0.004)	0.711 (0.032)	<b>0.732 (0.008)</b>	0.595 (0.001)	0.357 (0.051)	<b>0.522 (0.009)</b>	0.511 (0.006)
0.5	non-strict-lassclust	0.704 (0.063)	<b>0.780 (0.009)</b>	0.766 (0.004)	0.711 (0.032)	<b>0.732 (0.008)</b>	0.595 (0.001)	0.357 (0.051)	<b>0.522 (0.009)</b>	0.511 (0.006)
0.5	lassojoint	<b>0.766 (0.003)</b>	<b>0.766 (0.003)</b>	<b>0.766 (0.003)</b>	<b>0.586 (0.024)</b>	<b>0.586 (0.024)</b>	<b>0.586 (0.024)</b>	<b>0.501 (0.009)</b>	<b>0.501 (0.009)</b>	<b>0.501 (0.009)</b>
0.8	naive	<b>0.779 (0.000)</b>	<b>0.779 (0.000)</b>	<b>0.779 (0.000)</b>	<b>0.714 (0.002)</b>	<b>0.714 (0.002)</b>	<b>0.714 (0.002)</b>	<b>0.543 (0.002)</b>	<b>0.543 (0.002)</b>	<b>0.543 (0.002)</b>
0.8	clust	<b>0.787 (0.002)</b>	0.774 (0.003)	0.770 (0.001)	<b>0.749 (0.009)</b>	0.675 (0.003)	0.455 (0.004)	0.530 (0.001)	<b>0.536 (0.002)</b>	0.469 (0.003)
0.8	strict-lassclust	<b>0.787 (0.002)</b>	0.775 (0.003)	0.770 (0.001)	<b>0.749 (0.008)</b>	0.675 (0.003)	0.454 (0.004)	0.530 (0.002)	<b>0.536 (0.002)</b>	0.469 (0.003)
0.8	non-strict-lassclust	<b>0.787 (0.001)</b>	0.775 (0.003)	0.770 (0.001)	<b>0.749 (0.010)</b>	0.675 (0.003)	0.454 (0.004)	0.529 (0.003)	<b>0.536 (0.002)</b>	0.469 (0.003)
0.8	lassojoint	<b>0.775 (0.001)</b>	<b>0.775 (0.001)</b>	<b>0.775 (0.001)</b>	<b>0.735 (0.002)</b>	<b>0.735 (0.002)</b>	<b>0.735 (0.002)</b>	<b>0.531 (0.002)</b>	<b>0.531 (0.002)</b>	<b>0.531 (0.002)</b>

**Table 3.** Summary Statistics for df = artif; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.764 (0.017)</b>	<b>0.764 (0.017)</b>	<b>0.764 (0.017)</b>	<b>0.585 (0.018)</b>	<b>0.585 (0.018)</b>	<b>0.585 (0.018)</b>	<b>0.694 (0.016)</b>	<b>0.694 (0.016)</b>	<b>0.694 (0.016)</b>
0.3	clust	<b>0.623 (0.081)</b>	0.580 (0.068)	0.552 (0.039)	0.487 (0.104)	0.515 (0.074)	<b>0.518 (0.036)</b>	0.452 (0.119)	0.495 (0.081)	<b>0.591 (0.037)</b>
0.3	strict-lassclust	<b>0.617 (0.080)</b>	0.577 (0.066)	0.552 (0.039)	0.491 (0.095)	0.514 (0.067)	<b>0.520 (0.034)</b>	0.430 (0.154)	0.451 (0.153)	<b>0.580 (0.087)</b>
0.3	non-strict-lassclust	<b>0.619 (0.080)</b>	0.579 (0.067)	0.553 (0.040)	0.489 (0.100)	0.516 (0.073)	<b>0.522 (0.036)</b>	0.453 (0.113)	0.498 (0.081)	<b>0.589 (0.040)</b>
0.3	lassojoint	0.721 (0.025)	0.723 (0.023)	<b>0.725 (0.021)</b>	0.543 (0.052)	0.547 (0.050)	<b>0.550 (0.050)</b>	0.675 (0.024)	0.676 (0.023)	<b>0.677 (0.023)</b>
0.5	naive	<b>0.850 (0.011)</b>	<b>0.850 (0.011)</b>	<b>0.850 (0.011)</b>	<b>0.674 (0.004)</b>	<b>0.674 (0.004)</b>	<b>0.674 (0.004)</b>	<b>0.741 (0.006)</b>	<b>0.741 (0.006)</b>	<b>0.741 (0.006)</b>
0.5	clust	<b>0.660 (0.014)</b>	0.598 (0.102)	0.564 (0.012)	<b>0.610 (0.005)</b>	0.507 (0.105)	0.526 (0.003)	0.566 (0.012)	0.494 (0.108)	<b>0.633 (0.008)</b>
0.5	strict-lassclust	<b>0.640 (0.005)</b>	0.573 (0.095)	0.573 (0.013)	<b>0.587 (0.007)</b>	0.517 (0.070)	0.504 (0.014)	0.556 (0.066)	0.647 (0.041)	<b>0.648 (0.009)</b>
0.5	non-strict-lassclust	<b>0.650 (0.024)</b>	0.594 (0.104)	0.566 (0.008)	<b>0.608 (0.000)</b>	0.519 (0.093)	0.524 (0.005)	0.555 (0.036)	0.432 (0.124)	<b>0.607 (0.021)</b>
0.5	lassojoint	<b>0.843 (0.015)</b>	<b>0.843 (0.015)</b>	<b>0.843 (0.015)</b>	0.675 (0.006)	<b>0.676 (0.005)</b>	<b>0.676 (0.006)</b>	0.738 (0.006)	<b>0.739 (0.006)</b>	<b>0.739 (0.006)</b>
0.8	naive	<b>0.942 (0.000)</b>	<b>0.942 (0.000)</b>	<b>0.942 (0.000)</b>	<b>0.820 (0.000)</b>	<b>0.820 (0.000)</b>	<b>0.820 (0.000)</b>	<b>0.841 (0.000)</b>	<b>0.841 (0.000)</b>	<b>0.841 (0.000)</b>
0.8	clust	<b>0.707 (0.000)</b>	0.674 (0.000)	0.641 (0.000)	<b>0.660 (0.000)</b>	0.625 (0.000)	0.525 (0.000)	0.669 (0.000)	0.639 (0.000)	<b>0.675 (0.000)</b>
0.8	strict-lassclust	0.706 (0.000)	<b>0.725 (0.000)</b>	0.653 (0.000)	<b>0.658 (0.000)</b>	0.657 (0.000)	0.552 (0.000)	0.667 (0.000)	0.672 (0.000)	<b>0.679 (0.000)</b>
0.8	non-strict-lassclust	<b>0.706 (0.000)</b>	0.658 (0.000)	0.637 (0.000)	<b>0.658 (0.000)</b>	0.618 (0.000)	0.513 (0.000)	0.667 (0.000)	0.636 (0.000)	<b>0.670 (0.000)</b>
0.8	lassojoint	0.847 (0.000)	<b>0.877 (0.000)</b>	0.847 (0.000)	0.513 (0.000)	<b>0.757 (0.000)</b>	0.513 (0.000)	0.671 (0.000)	<b>0.793 (0.000)</b>	0.671 (0.000)

**Table 4.** Summary Statistics for df = bank-marketing; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.560 (0.028)</b>	<b>0.560 (0.028)</b>	<b>0.560 (0.028)</b>	<b>0.300 (0.010)</b>	<b>0.300 (0.010)</b>	<b>0.300 (0.010)</b>	<b>0.160 (0.012)</b>	<b>0.160 (0.012)</b>	<b>0.160 (0.012)</b>
0.3	clust	<b>0.710 (0.020)</b>	<b>0.710 (0.020)</b>	0.702 (0.020)	<b>0.282 (0.011)</b>	<b>0.282 (0.011)</b>	0.280 (0.011)	0.084 (0.011)	0.084 (0.011)	<b>0.088 (0.011)</b>
0.3	strict-lassclust	<b>0.710 (0.021)</b>	<b>0.710 (0.021)</b>	<b>0.710 (0.021)</b>	<b>0.282 (0.011)</b>	<b>0.282 (0.011)</b>	<b>0.282 (0.011)</b>	<b>0.084 (0.011)</b>	<b>0.084 (0.011)</b>	<b>0.084 (0.011)</b>
0.3	non-strict-lassclust	<b>0.710 (0.021)</b>	<b>0.710 (0.021)</b>	<b>0.710 (0.021)</b>	<b>0.282 (0.011)</b>	<b>0.282 (0.011)</b>	<b>0.282 (0.011)</b>	<b>0.084 (0.011)</b>	<b>0.084 (0.011)</b>	<b>0.084 (0.011)</b>
0.3	lassojoint	0.600 (0.041)	0.601 (0.040)	0.604 (0.041)	<b>0.210 (0.089)</b>	0.207 (0.090)	0.195 (0.089)	0.180 (0.036)	0.181 (0.033)	<b>0.182 (0.036)</b>
0.5	naive	<b>0.561 (0.014)</b>	<b>0.561 (0.014)</b>	<b>0.561 (0.014)</b>	<b>0.380 (0.005)</b>	<b>0.380 (0.005)</b>	<b>0.380 (0.005)</b>	<b>0.126 (0.008)</b>	<b>0.126 (0.008)</b>	<b>0.126 (0.008)</b>
0.5	clust	<b>0.734 (0.021)</b>	<b>0.734 (0.021)</b>	0.433 (0.196)	<b>0.240 (0.033)</b>	<b>0.240 (0.032)</b>	0.119 (0.018)	0.072 (0.010)	0.072 (0.010)	<b>0.106 (0.018)</b>
0.5	strict-lassclust	<b>0.791 (0.016)</b>	<b>0.791 (0.016)</b>	0.776 (0.018)	<b>0.290 (0.005)</b>	<b>0.290 (0.005)</b>	<b>0.290 (0.005)</b>	<b>0.073 (0.006)</b>	<b>0.073 (0.006)</b>	<b>0.073 (0.006)</b>
0.5	non-strict-lassclust	<b>0.791 (0.016)</b>	<b>0.791 (0.016)</b>	0.776 (0.018)	<b>0.290 (0.005)</b>	<b>0.290 (0.005)</b>	<b>0.290 (0.005)</b>	<b>0.073 (0.006)</b>	<b>0.073 (0.006)</b>	<b>0.073 (0.006)</b>
0.5	lassojoint	<b>0.612 (0.015)</b>	<b>0.612 (0.015)</b>	<b>0.612 (0.015)</b>	0.533 (0.008)	0.533 (0.008)	0.533 (0.008)	0.126 (0.013)	0.126 (0.013)	0.126 (0.013)
0.8	naive	<b>0.648 (0.013)</b>	<b>0.648 (0.013)</b>	<b>0.648 (0.013)</b>	<b>0.774 (0.005)</b>	<b>0.774 (0.005)</b>	<b>0.774 (0.005)</b>	<b>0.261 (0.009)</b>	<b>0.261 (0.009)</b>	<b>0.261 (0.009)</b>
0.8	clust	<b>0.673 (0.004)</b>	<b>0.673 (0.004)</b>	0.461 (0.009)	<b>0.300 (0.005)</b>	<b>0.300 (0.005)</b>	0.107 (0.001)	0.094 (0.004)	0.094 (0.004)	<b>0.168 (0.007)</b>
0.8	strict-lassclust	0.665 (0.003)	0.665 (0.003)	<b>0.672 (0.003)</b>	<b>0.300 (0.005)</b>	<b>0.300 (0.005)</b>	<b>0.300 (0.005)</b>	<b>0.094 (0.003)</b>	<b>0.094 (0.003)</b>	<b>0.094 (0.003)</b>
0.8	non-strict-lassclust	0.665 (0.003)	0.665 (0.003)	<b>0.672 (0.003)</b>	<b>0.300 (0.005)</b>	<b>0.300 (0.005)</b>	<b>0.300 (0.005)</b>	<b>0.094 (0.003)</b>	<b>0.094 (0.003)</b>	<b>0.094 (0.003)</b>
0.8	lassojoint	<b>0.547 (0.013)</b>	<b>0.547 (0.013)</b>	0.547 (0.013)	<b>0.773 (0.004)</b>	<b>0.773 (0.004)</b>	<b>0.773 (0.004)</b>	0.200 (0.003)	0.200 (0.003)	0.200 (0.003)

**Table 5.** Summary Statistics for df = banknote; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.810 (0.024)</b>	<b>0.810 (0.024)</b>	<b>0.810 (0.024)</b>	<b>0.470 (0.022)</b>	<b>0.470 (0.022)</b>	<b>0.470 (0.022)</b>	<b>0.620 (0.021)</b>	<b>0.620 (0.021)</b>	<b>0.620 (0.021)</b>
0.3	clust	<b>0.778 (0.047)</b>	0.753 (0.042)	0.728 (0.063)	0.315 (0.038)	<b>0.333 (0.041)</b>	0.324 (0.039)	0.357 (0.039)	0.348 (0.028)	<b>0.437 (0.033)</b>
0.3	strict-lassclust	<b>0.768 (0.044)</b>	0.741 (0.035)	0.722 (0.036)	0.326 (0.034)	<b>0.347 (0.032)</b>	0.326 (0.045)	0.361 (0.037)	0.353 (0.026)	<b>0.426 (0.026)</b>
0.3	non-strict-lassclust	<b>0.767 (0.044)</b>	0.741 (0.036)	0.723 (0.037)	0.328 (0.032)	<b>0.347 (0.033)</b>	0.328 (0.045)	0.360 (0.038)	0.353 (0.027)	<b>0.428 (0.033)</b>
0.3	lassojoint	0.605 (0.157)	<b>0.610 (0.164)</b>	0.603 (0.160)	<b>0.417 (0.092)</b>	0.408 (0.098)	0.413 (0.094)	<b>0.474 (0.155)</b>	0.461 (0.165)	0.469 (0.158)
0.5	naive	<b>0.915 (0.000)</b>	<b>0.915 (0.000)</b>	<b>0.915 (0.000)</b>	<b>0.591 (0.009)</b>	<b>0.591 (0.009)</b>	<b>0.591 (0.009)</b>	<b>0.679 (0.007)</b>	<b>0.679 (0.007)</b>	<b>0.679 (0.007)</b>
0.5	clust	<b>0.906 (0.001)</b>	0.905 (0.001)	0.803 (0.002)	0.280 (0.005)	0.276 (0.005)	<b>0.341 (0.007)</b>	0.407 (0.007)	0.400 (0.006)	<b>0.495 (0.010)</b>
0.5	strict-lassclust	<b>0.902 (0.001)</b>	0.901 (0.001)	0.801 (0.001)	0.280 (0.005)	0.276 (0.002)	<b>0.341 (0.007)</b>	0.407 (0.007)	0.400 (0.005)	<b>0.495 (0.010)</b>
0.5	non-strict-lassclust	<b>0.902 (0.001)</b>	0.901 (0.001)	0.801 (0.001)	0.280 (0.005)	0.276 (0.002)	<b>0.341 (0.007)</b>	0.407 (0.007)	0.400 (0.005)	<b>0.495 (0.010)</b>
0.5	lassojoint	<b>0.926 (0.000)</b>	<b>0.926 (0.000)</b>	<b>0.926 (0.000)</b>	<b>0.509 (0.006)</b>	<b>0.509 (0.006)</b>	<b>0.509 (0.006)</b>	<b>0.645 (0.006)</b>	<b>0.645 (0.006)</b>	<b>0.645 (0.006)</b>
0.8	naive	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	<b>0.990 (0.000)</b>	<b>0.990 (0.000)</b>	<b>0.990 (0.000)</b>	<b>0.988 (0.000)</b>	<b>0.988 (0.000)</b>	<b>0.988 (0.000)</b>
0.8	clust	<b>0.610 (0.000)</b>	0.594 (0.000)	0.571 (0.000)	<b>0.628 (0.000)</b>	0.616 (0.000)	0.506 (0.000)	0.481 (0.000)	0.506 (0.000)	<b>0.609 (0.000)</b>
0.8	strict-lassclust	<b>0.659 (0.000)</b>	0.626 (0.000)	0.586 (0.000)	<b>0.637 (0.000)</b>	0.582 (0.000)	0.482 (0.000)	0.488 (0.000)	0.494 (0.000)	<b>0.600 (0.000)</b>
0.8	non-strict-lassclust	<b>0.659 (0.000)</b>	0.626 (0.000)	0.586 (0.000)	<b>0.637 (0.000)</b>	0.582 (0.000)	0.482 (0.000)	0.488 (0.000)	0.494 (0.000)	<b>0.600 (0.000)</b>
0.8	lassojoint	<b>0.985 (0.000)</b>	<b>0.985 (0.000)</b>	<b>0.985 (0.000)</b>	0.839 (0.000)	0.839 (0.000)	0.839 (0.000)	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>

**Table 6.** Summary Statistics for df = breastc; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.924 (0.013)</b>	<b>0.924 (0.013)</b>	<b>0.924 (0.013)</b>	<b>0.464 (0.032)</b>	<b>0.464 (0.032)</b>	<b>0.464 (0.032)</b>	<b>0.565 (0.031)</b>	<b>0.565 (0.031)</b>	<b>0.565 (0.031)</b>
0.3	clust	<b>0.965 (0.015)</b>	0.964 (0.015)	0.957 (0.021)	0.957 (0.015)	<b>0.958 (0.015)</b>	0.953 (0.018)	0.937 (0.022)	<b>0.939 (0.022)</b>	0.930 (0.029)
0.3	strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.960 (0.014)</b>	<b>0.960 (0.014)</b>	0.959 (0.015)	<b>0.941 (0.020)</b>	<b>0.941 (0.021)</b>	<b>0.941 (0.022)</b>
0.3	non-strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.960 (0.014)</b>	<b>0.960 (0.014)</b>	0.959 (0.015)	<b>0.942 (0.020)</b>	<b>0.942 (0.021)</b>	0.941 (0.022)
0.3	lassojoint	<b>0.987 (0.007)</b>	<b>0.987 (0.007)</b>	<b>0.987 (0.007)</b>	0.365 (0.060)	0.365 (0.059)	0.364 (0.059)	<b>0.524 (0.039)</b>	<b>0.524 (0.039)</b>	0.523 (0.039)
0.5	naive	<b>0.938 (0.002)</b>	<b>0.938 (0.002)</b>	<b>0.938 (0.002)</b>	<b>0.753 (0.014)</b>	<b>0.753 (0.014)</b>	<b>0.753 (0.014)</b>	<b>0.744 (0.014)</b>	<b>0.744 (0.014)</b>	<b>0.744 (0.014)</b>
0.5	clust	0.968 (0.003)	0.968 (0.004)	<b>0.976 (0.007)</b>	0.962 (0.002)	0.962 (0.002)	<b>0.970 (0.004)</b>	0.945 (0.003)	0.945 (0.004)	<b>0.956 (0.006)</b>
0.5	strict-lassclust	0.997 (0.000)	0.997 (0.000)	<b>0.998 (0.000)</b>	0.967 (0.002)	0.967 (0.002)	<b>0.975 (0.001)</b>	0.953 (0.003)	0.953 (0.003)	<b>0.966 (0.002)</b>
0.5	non-strict-lassclust	0.997 (0.000)	0.997 (0.000)	<b>0.998 (0.000)</b>	0.967 (0.002)	0.967 (0.002)	<b>0.975 (0.001)</b>	0.953 (0.003)	0.953 (0.003)	<b>0.966 (0.002)</b>
0.5	lassojoint	<b>0.998 (0.001)</b>	<b>0.998 (0.001)</b>	<b>0.998 (0.001)</b>	<b>0.359 (0.006)</b>	<b>0.359 (0.006)</b>	<b>0.359 (0.006)</b>	<b>0.528 (0.006)</b>	<b>0.528 (0.006)</b>	<b>0.528 (0.006)</b>
0.8	naive	<b>0.990 (0.001)</b>	<b>0.990 (0.001)</b>	<b>0.990 (0.001)</b>	<b>0.935 (0.003)</b>	<b>0.935 (0.003)</b>	<b>0.935 (0.003)</b>	<b>0.910 (0.004)</b>	<b>0.910 (0.004)</b>	<b>0.910 (0.004)</b>
0.8	clust	0.948 (0.004)	0.956 (0.005)	<b>0.969 (0.002)</b>	0.960 (0.003)	0.962 (0.003)	<b>0.969 (0.007)</b>	0.936 (0.004)	0.939 (0.005)	<b>0.952 (0.011)</b>
0.8	strict-lassclust	<b>0.997 (0.001)</b>	<b>0.997 (0.001)</b>	0.996 (0.000)	<b>0.961 (0.000)</b>	<b>0.961 (0.002)</b>	0.960 (0.006)	<b>0.937 (0.001)</b>	<b>0.937 (0.004)</b>	<b>0.937 (0.009)</b>
0.8	non-strict-lassclust	<b>0.997 (0.001)</b>	<b>0.997 (0.000)</b>	0.996 (0.000)	0.961 (0.000)	<b>0.962 (0.003)</b>	0.960 (0.006)	0.937 (0.001)	<b>0.939 (0.006)</b>	0.937 (0.009)
0.8	lassojoint	0.993 (0.000)	0.993 (0.001)	<b>0.993 (0.000)</b>	0.854 (0.034)	0.854 (0.033)	0.854 (0.034)	<b>0.819 (0.041)</b>	0.818 (0.039)	<b>0.819 (0.041)</b>

**Table 7.** Summary Statistics for df = credit-a; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.714 (0.035)</b>	<b>0.714 (0.035)</b>	<b>0.714 (0.035)</b>	<b>0.542 (0.027)</b>	<b>0.542 (0.027)</b>	<b>0.542 (0.027)</b>	<b>0.647 (0.028)</b>	<b>0.647 (0.028)</b>	<b>0.647 (0.028)</b>
0.3	clust	0.609 (0.028)	0.613 (0.027)	<b>0.622 (0.027)</b>	0.633 (0.031)	0.636 (0.031)	<b>0.644 (0.029)</b>	0.376 (0.062)	0.387 (0.062)	<b>0.413 (0.056)</b>
0.3	strict-lassclust	0.714 (0.042)	<b>0.717 (0.042)</b>	0.715 (0.040)	0.631 (0.029)	0.634 (0.030)	<b>0.643 (0.030)</b>	0.373 (0.057)	0.382 (0.059)	<b>0.410 (0.057)</b>
0.3	non-strict-lassclust	0.714 (0.042)	<b>0.718 (0.042)</b>	0.715 (0.040)	0.631 (0.029)	0.634 (0.030)	<b>0.643 (0.030)</b>	0.373 (0.057)	0.383 (0.059)	<b>0.410 (0.057)</b>
0.3	lassojoint	0.679 (0.035)	<b>0.680 (0.035)</b>	0.679 (0.035)	<b>0.529 (0.045)</b>	<b>0.529 (0.045)</b>	0.529 (0.045)	<b>0.639 (0.028)</b>	<b>0.639 (0.028)</b>	0.639 (0.028)
0.5	naive	<b>0.721 (0.008)</b>	<b>0.721 (0.008)</b>	<b>0.721 (0.008)</b>	<b>0.574 (0.006)</b>	<b>0.574 (0.006)</b>	<b>0.574 (0.006)</b>	<b>0.639 (0.006)</b>	<b>0.639 (0.006)</b>	<b>0.639 (0.006)</b>
0.5	clust	0.585 (0.004)	0.586 (0.005)	<b>0.589 (0.007)</b>	0.605 (0.002)	0.607 (0.005)	<b>0.616 (0.004)</b>	0.297 (0.011)	0.311 (0.018)	<b>0.353 (0.017)</b>
0.5	strict-lassclust	0.725 (0.006)	<b>0.731 (0.005)</b>	0.728 (0.008)	0.605 (0.002)	0.602 (0.006)	<b>0.622 (0.003)</b>	0.298 (0.014)	0.297 (0.022)	<b>0.366 (0.013)</b>
0.5	non-strict-lassclust	0.725 (0.006)	<b>0.731 (0.005)</b>	0.728 (0.008)	0.605 (0.002)	0.602 (0.006)	<b>0.622 (0.003)</b>	0.298 (0.014)	0.297 (0.022)	<b>0.366 (0.013)</b>
0.5	lassojoint	<b>0.705 (0.010)</b>	<b>0.705 (0.010)</b>	<b>0.705 (0.010)</b>	<b>0.609 (0.026)</b>	<b>0.609 (0.026)</b>	<b>0.609 (0.026)</b>	<b>0.653 (0.005)</b>	<b>0.653 (0.005)</b>	<b>0.653 (0.005)</b>
0.8	naive	<b>0.827 (0.000)</b>	<b>0.827 (0.000)</b>	<b>0.827 (0.000)</b>	<b>0.687 (0.000)</b>					
0.8	clust	0.634 (0.000)	0.642 (0.000)	<b>0.649 (0.000)</b>	0.687 (0.000)	0.692 (0.000)	<b>0.703 (0.000)</b>	0.396 (0.000)	0.412 (0.000)	<b>0.463 (0.000)</b>
0.8	strict-lassclust	0.786 (0.000)	0.778 (0.000)	<b>0.794 (0.000)</b>	0.692 (0.000)	0.692 (0.000)	<b>0.703 (0.000)</b>	0.412 (0.000)	0.423 (0.000)	<b>0.453 (0.000)</b>
0.8	non-strict-lassclust	0.786 (0.000)	0.778 (0.000)	<b>0.794 (0.000)</b>	0.692 (0.000)	0.692 (0.000)	<b>0.703 (0.000)</b>	0.412 (0.000)	0.423 (0.000)	<b>0.453 (0.000)</b>
0.8	lassojoint	<b>0.824 (0.000)</b>	<b>0.824 (0.000)</b>	0.824 (0.000)	<b>0.738 (0.000)</b>	<b>0.738 (0.000)</b>	0.738 (0.000)	<b>0.721 (0.000)</b>	<b>0.721 (0.000)</b>	0.721 (0.000)

**Table 8.** Summary Statistics for df = credit-g; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.579 (0.036)</b>	<b>0.579 (0.036)</b>	<b>0.579 (0.036)</b>	<b>0.340 (0.023)</b>	<b>0.340 (0.023)</b>	<b>0.340 (0.023)</b>	<b>0.420 (0.028)</b>	<b>0.420 (0.028)</b>	<b>0.420 (0.028)</b>
0.3	clust	0.566 (0.044)	<b>0.568 (0.048)</b>	0.567 (0.044)	0.644 (0.045)	<b>0.653 (0.035)</b>	0.600 (0.034)	0.328 (0.050)	0.339 (0.048)	<b>0.387 (0.039)</b>
0.3	strict-lassclust	0.570 (0.040)	<b>0.572 (0.046)</b>	<b>0.572 (0.042)</b>	0.665 (0.031)	<b>0.666 (0.031)</b>	0.617 (0.033)	0.324 (0.085)	0.338 (0.078)	<b>0.380 (0.040)</b>
0.3	non-strict-lassclust	0.568 (0.045)	<b>0.574 (0.046)</b>	0.571 (0.043)	0.638 (0.070)	<b>0.644 (0.073)</b>	0.605 (0.051)	0.336 (0.047)	0.344 (0.046)	<b>0.383 (0.039)</b>
0.3	lassojoint	<b>0.602 (0.033)</b>	0.602 (0.033)	<b>0.602 (0.034)</b>	<b>0.394 (0.026)</b>	0.394 (0.026)	<b>0.394 (0.027)</b>	<b>0.344 (0.033)</b>	<b>0.344 (0.033)</b>	0.344 (0.033)
0.5	naive	<b>0.569 (0.024)</b>	<b>0.569 (0.024)</b>	<b>0.569 (0.024)</b>	<b>0.408 (0.002)</b>	<b>0.408 (0.002)</b>	<b>0.408 (0.002)</b>	<b>0.371 (0.024)</b>	<b>0.371 (0.024)</b>	<b>0.371 (0.024)</b>
0.5	clust	<b>0.549 (0.025)</b>	0.530 (0.020)	0.519 (0.021)	0.623 (0.042)	<b>0.663 (0.014)</b>	0.492 (0.046)	0.311 (0.053)	0.336 (0.007)	<b>0.367 (0.006)</b>
0.5	strict-lassclust	<b>0.548 (0.026)</b>	0.541 (0.007)	0.522 (0.019)	0.647 (0.050)	<b>0.665 (0.006)</b>	0.498 (0.044)	0.307 (0.047)	0.257 (0.102)	<b>0.370 (0.005)</b>
0.5	non-strict-lassclust	0.529 (0.035)	<b>0.539 (0.017)</b>	0.522 (0.019)	0.547 (0.103)	<b>0.643 (0.039)</b>	0.498 (0.044)	0.321 (0.062)	0.323 (0.012)	<b>0.370 (0.005)</b>
0.5	lassojoint	0.624 (0.012)	0.624 (0.012)	<b>0.625 (0.013)</b>	<b>0.437 (0.007)</b>	<b>0.437 (0.007)</b>	<b>0.437 (0.007)</b>	<b>0.255 (0.030)</b>	<b>0.255 (0.030)</b>	0.255 (0.030)
0.8	naive	<b>0.524 (0.009)</b>	<b>0.524 (0.009)</b>	<b>0.524 (0.009)</b>	<b>0.579 (0.005)</b>	<b>0.579 (0.005)</b>	<b>0.579 (0.005)</b>	<b>0.280 (0.018)</b>	<b>0.280 (0.018)</b>	<b>0.280 (0.018)</b>
0.8	clust	<b>0.559 (0.065)</b>	0.519 (0.014)	0.528 (0.029)	0.585 (0.068)	<b>0.616 (0.015)</b>	0.363 (0.013)	0.283 (0.063)	0.317 (0.032)	<b>0.423 (0.010)</b>
0.8	strict-lassclust	<b>0.572 (0.073)</b>	0.521 (0.005)	0.540 (0.018)	0.606 (0.071)	<b>0.635 (0.019)</b>	0.364 (0.008)	0.195 (0.058)	0.320 (0.036)	<b>0.420 (0.008)</b>
0.8	non-strict-lassclust	<b>0.555 (0.061)</b>	0.521 (0.010)	0.540 (0.018)	0.576 (0.061)	<b>0.618 (0.016)</b>	0.364 (0.008)	0.278 (0.059)	0.313 (0.029)	<b>0.420 (0.008)</b>
0.8	lassojoint	<b>0.643 (0.012)</b>	<b>0.643 (0.012)</b>	<b>0.643 (0.012)</b>	<b>0.610 (0.000)</b>	<b>0.610 (0.000)</b>	<b>0.610 (0.000)</b>	<b>0.083 (0.000)</b>	<b>0.083 (0.000)</b>	0.083 (0.000)

**Table 9.** Summary Statistics for df = dhfr; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.538 (0.048)</b>	<b>0.538 (0.048)</b>	<b>0.538 (0.048)</b>	<b>0.466 (0.051)</b>	<b>0.466 (0.051)</b>	<b>0.466 (0.051)</b>	<b>0.481 (0.059)</b>	<b>0.481 (0.059)</b>	<b>0.481 (0.059)</b>
0.3	clust	<b>0.683 (0.111)</b>	0.657 (0.084)	0.567 (0.120)	0.303 (0.082)	0.340 (0.074)	<b>0.357 (0.096)</b>	0.323 (0.087)	0.341 (0.091)	<b>0.422 (0.068)</b>
0.3	strict-lassclust	0.635 (0.101)	<b>0.646 (0.094)</b>	0.590 (0.079)	<b>0.492 (0.138)</b>	<b>0.492 (0.113)</b>	0.446 (0.065)	<b>0.538 (0.243)</b>	0.426 (0.244)	0.381 (0.088)
0.3	non-strict-lassclust	<b>0.624 (0.090)</b>	0.612 (0.056)	0.582 (0.070)	0.442 (0.111)	<b>0.483 (0.099)</b>	0.449 (0.054)	0.372 (0.175)	0.306 (0.184)	<b>0.392 (0.079)</b>
0.3	lassojoint	<b>0.662 (0.061)</b>	0.648 (0.049)	0.660 (0.064)	0.453 (0.087)	0.490 (0.048)	<b>0.504 (0.085)</b>	0.552 (0.041)	0.556 (0.033)	<b>0.562 (0.025)</b>
0.5	naive	<b>0.728 (0.000)</b>	<b>0.728 (0.000)</b>	<b>0.728 (0.000)</b>	<b>0.629 (0.000)</b>	<b>0.629 (0.000)</b>	<b>0.629 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>
0.5	clust	0.518 (0.000)	0.518 (0.000)	<b>0.552 (0.000)</b>	0.433 (0.000)	0.433 (0.000)	<b>0.454 (0.000)</b>	0.396 (0.000)	0.396 (0.000)	<b>0.505 (0.000)</b>
0.5	strict-lassclust	0.606 (0.000)	<b>0.615 (0.000)</b>	0.594 (0.000)	<b>0.515 (0.000)</b>	0.454 (0.000)	0.371 (0.000)	0.373 (0.000)	0.361 (0.000)	<b>0.396 (0.000)</b>
0.5	non-strict-lassclust	0.583 (0.000)	0.587 (0.000)	<b>0.592 (0.000)</b>	0.392 (0.000)	<b>0.485 (0.000)</b>	0.351 (0.000)	0.366 (0.000)	<b>0.405 (0.000)</b>	0.364 (0.000)
0.5	lassojoint	<b>0.706 (0.000)</b>	0.704 (0.000)	0.704 (0.000)	<b>0.588 (0.000)</b>	0.464 (0.000)	0.464 (0.000)	<b>0.661 (0.000)</b>	0.612 (0.000)	0.612 (0.000)
0.8	naive	<b>0.653 (0.000)</b>	<b>0.653 (0.000)</b>	<b>0.653 (0.000)</b>	<b>0.608 (0.000)</b>	<b>0.608 (0.000)</b>	<b>0.608 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>
0.8	clust	0.500 (0.000)	<b>0.547 (0.000)</b>	0.512 (0.000)	<b>0.474 (0.000)</b>	0.433 (0.000)	0.412 (0.000)	0.495 (0.000)	0.409 (0.000)	<b>0.571 (0.000)</b>
0.8	strict-lassclust	0.507 (0.000)	0.492 (0.000)	<b>0.610 (0.000)</b>	0.433 (0.000)	0.433 (0.000)	<b>0.454 (0.000)</b>	<b>0.604 (0.000)</b>	<b>0.604 (0.000)</b>	0.583 (0.000)
0.8	non-strict-lassclust	<b>0.622 (0.000)</b>	0.603 (0.000)	0.581 (0.000)	<b>0.629 (0.000)</b>	0.608 (0.000)	0.423 (0.000)	0.538 (0.000)	0.387 (0.000)	<b>0.582 (0.000)</b>
0.8	lassojoint	0.839 (0.000)	<b>0.845 (0.000)</b>	<b>0.845 (0.000)</b>	0.691 (0.000)	0.680 (0.000)	<b>0.732 (0.000)</b>	0.706 (0.000)	0.710 (0.000)	<b>0.740 (0.000)</b>

**Table 10.** Summary Statistics for df = diabetes; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.705 (0.028)</b>	<b>0.705 (0.028)</b>	<b>0.705 (0.028)</b>	<b>0.500 (0.029)</b>	<b>0.500 (0.029)</b>	<b>0.500 (0.029)</b>	<b>0.566 (0.033)</b>	<b>0.566 (0.033)</b>	<b>0.566 (0.033)</b>
0.3	clust	0.677 (0.073)	<b>0.690 (0.055)</b>	<b>0.690 (0.055)</b>	0.665 (0.046)	<b>0.676 (0.031)</b>	<b>0.676 (0.025)</b>	0.527 (0.054)	0.545 (0.047)	<b>0.564 (0.047)</b>
0.3	strict-lassclust	0.686 (0.072)	0.711 (0.046)	<b>0.722 (0.040)</b>	0.667 (0.042)	<b>0.680 (0.032)</b>	0.677 (0.026)	0.485 (0.113)	0.533 (0.065)	<b>0.562 (0.051)</b>
0.3	non-strict-lassclust	0.691 (0.068)	0.712 (0.048)	<b>0.723 (0.041)</b>	0.661 (0.053)	<b>0.678 (0.032)</b>	0.675 (0.028)	0.532 (0.057)	0.550 (0.048)	<b>0.567 (0.049)</b>
0.3	lassojoint	<b>0.717 (0.027)</b>	<b>0.717 (0.027)</b>	<b>0.717 (0.027)</b>	<b>0.379 (0.032)</b>	<b>0.379 (0.032)</b>	<b>0.379 (0.032)</b>	<b>0.526 (0.031)</b>	<b>0.526 (0.031)</b>	<b>0.526 (0.031)</b>
0.5	naive	<b>0.700 (0.012)</b>	<b>0.700 (0.012)</b>	<b>0.700 (0.012)</b>	<b>0.595 (0.013)</b>	<b>0.595 (0.013)</b>	<b>0.595 (0.013)</b>	<b>0.604 (0.008)</b>	<b>0.604 (0.008)</b>	<b>0.604 (0.008)</b>
0.5	clust	<b>0.702 (0.052)</b>	0.660 (0.051)	0.628 (0.013)	0.659 (0.065)	<b>0.664 (0.026)</b>	0.656 (0.007)	0.476 (0.077)	0.497 (0.054)	<b>0.521 (0.013)</b>
0.5	strict-lassclust	0.687 (0.046)	<b>0.708 (0.035)</b>	0.692 (0.012)	0.664 (0.058)	<b>0.669 (0.023)</b>	0.653 (0.007)	0.367 (0.192)	0.380 (0.203)	<b>0.522 (0.036)</b>
0.5	non-strict-lassclust	0.696 (0.048)	<b>0.702 (0.017)</b>	0.690 (0.011)	0.654 (0.059)	<b>0.658 (0.020)</b>	0.655 (0.009)	0.496 (0.073)	0.520 (0.049)	<b>0.521 (0.034)</b>
0.5	lassojoint	<b>0.694 (0.010)</b>	0.693 (0.011)	0.693 (0.009)	0.453 (0.122)	0.453 (0.122)	<b>0.454 (0.120)</b>	0.547 (0.053)	0.546 (0.052)	<b>0.548 (0.053)</b>
0.8	naive	<b>0.758 (0.010)</b>	<b>0.758 (0.010)</b>	<b>0.758 (0.010)</b>	<b>0.697 (0.015)</b>	<b>0.697 (0.015)</b>	<b>0.697 (0.015)</b>	<b>0.627 (0.020)</b>	<b>0.627 (0.020)</b>	<b>0.627 (0.020)</b>
0.8	clust	0.604 (0.031)	0.658 (0.013)	<b>0.695 (0.020)</b>	0.630 (0.019)	<b>0.643 (0.010)</b>	0.613 (0.043)	0.427 (0.031)	0.467 (0.020)	<b>0.575 (0.004)</b>
0.8	strict-lassclust	0.561 (0.014)	0.667 (0.016)	<b>0.693 (0.020)</b>	0.625 (0.022)	<b>0.651 (0.017)</b>	0.610 (0.041)	0.246 (0.284)	0.487 (0.031)	<b>0.566 (0.012)</b>
0.8	non-strict-lassclust	0.618 (0.037)	0.657 (0.015)	<b>0.696 (0.020)</b>	0.622 (0.017)	<b>0.645 (0.011)</b>	0.607 (0.040)	0.485 (0.040)	0.471 (0.021)	<b>0.566 (0.011)</b>
0.8	lassojoint	0.751 (0.004)	0.754 (0.006)	<b>0.759 (0.010)</b>	0.690 (0.010)	0.695 (0.007)	<b>0.696 (0.005)</b>	0.613 (0.014)	<b>0.621 (0.010)</b>	0.620 (0.010)

**Table 11.** Summary Statistics for df = heart-c; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.584 (0.056)</b>	<b>0.584 (0.056)</b>	<b>0.584 (0.056)</b>	<b>0.494 (0.042)</b>	<b>0.494 (0.042)</b>	<b>0.494 (0.042)</b>	<b>0.622 (0.040)</b>	<b>0.622 (0.040)</b>	<b>0.622 (0.040)</b>
0.3	clust	<b>0.699 (0.046)</b>	0.697 (0.047)	0.693 (0.047)	<b>0.658 (0.044)</b>	0.654 (0.044)	0.627 (0.045)	0.630 (0.053)	0.637 (0.051)	<b>0.666 (0.045)</b>
0.3	strict-lassclust	<b>0.700 (0.046)</b>	0.697 (0.047)	0.692 (0.048)	<b>0.662 (0.044)</b>	0.657 (0.043)	0.624 (0.047)	0.634 (0.053)	0.640 (0.049)	<b>0.665 (0.044)</b>
0.3	non-strict-lassclust	<b>0.700 (0.046)</b>	0.697 (0.047)	0.692 (0.048)	<b>0.662 (0.045)</b>	0.657 (0.043)	0.624 (0.047)	0.635 (0.053)	0.641 (0.048)	<b>0.665 (0.044)</b>
0.3	lassojoint	0.564 (0.063)	<b>0.566 (0.064)</b>	0.565 (0.062)	<b>0.468 (0.047)</b>	0.467 (0.047)	0.467 (0.046)	<b>0.540 (0.066)</b>	0.539 (0.065)	0.538 (0.065)
0.5	naive	<b>0.570 (0.000)</b>	<b>0.570 (0.000)</b>	<b>0.570 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.678 (0.000)</b>	<b>0.678 (0.000)</b>	<b>0.678 (0.000)</b>
0.5	clust	0.642 (0.000)	<b>0.645 (0.000)</b>	0.640 (0.000)	0.611 (0.000)	<b>0.633 (0.000)</b>	0.600 (0.000)	0.646 (0.000)	0.673 (0.000)	<b>0.700 (0.000)</b>
0.5	strict-lassclust	0.641 (0.000)	<b>0.642 (0.000)</b>	0.635 (0.000)	0.600 (0.000)	<b>0.633 (0.000)</b>	0.600 (0.000)	0.633 (0.000)	0.673 (0.000)	<b>0.700 (0.000)</b>
0.5	non-strict-lassclust	0.641 (0.000)	<b>0.642 (0.000)</b>	0.635 (0.000)	0.600 (0.000)	<b>0.633 (0.000)</b>	0.600 (0.000)	0.633 (0.000)	0.673 (0.000)	<b>0.700 (0.000)</b>
0.5	lassojoint	<b>0.632 (0.000)</b>	<b>0.632 (0.000)</b>	0.594 (0.000)	0.444 (0.000)	0.444 (0.000)	<b>0.589 (0.000)</b>	0.479 (0.000)	0.479 (0.000)	<b>0.694 (0.000)</b>
0.8	naive	<b>0.754 (0.000)</b>	<b>0.754 (0.000)</b>	<b>0.754 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.732 (0.000)</b>	<b>0.732 (0.000)</b>	<b>0.732 (0.000)</b>
0.8	clust	0.683 (0.000)	<b>0.701 (0.000)</b>	0.685 (0.000)	<b>0.689 (0.000)</b>	0.678 (0.000)	0.567 (0.000)	<b>0.745 (0.000)</b>	0.739 (0.000)	0.715 (0.000)
0.8	strict-lassclust	<b>0.688 (0.000)</b>	0.683 (0.000)	0.686 (0.000)	<b>0.678 (0.000)</b>	0.656 (0.000)	0.567 (0.000)	<b>0.743 (0.000)</b>	0.739 (0.000)	0.715 (0.000)
0.8	non-strict-lassclust	0.693 (0.000)	<b>0.704 (0.000)</b>	0.686 (0.000)	<b>0.678 (0.000)</b>	0.667 (0.000)	0.567 (0.000)	<b>0.734 (0.000)</b>	0.727 (0.000)	0.715 (0.000)
0.8	lassojoint	<b>0.759 (0.000)</b>	<b>0.759 (0.000)</b>	<b>0.759 (0.000)</b>	<b>0.700 (0.000)</b>	<b>0.700 (0.000)</b>	<b>0.700 (0.000)</b>	<b>0.773 (0.000)</b>	<b>0.773 (0.000)</b>	<b>0.773 (0.000)</b>

**Table 12.** Summary Statistics for df = qsar-biodeg; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.633 (0.026)</b>	<b>0.633 (0.026)</b>	<b>0.633 (0.026)</b>	<b>0.484 (0.027)</b>	<b>0.484 (0.027)</b>	<b>0.484 (0.027)</b>	<b>0.547 (0.030)</b>	<b>0.547 (0.030)</b>	<b>0.547 (0.030)</b>
0.3	clust	0.765 (0.028)	<b>0.766 (0.027)</b>	0.761 (0.034)	<b>0.670 (0.031)</b>	0.666 (0.032)	0.575 (0.050)	<b>0.626 (0.033)</b>	0.625 (0.032)	0.582 (0.055)
0.3	strict-lassclust	0.760 (0.043)	0.762 (0.031)	<b>0.763 (0.035)</b>	0.662 (0.079)	<b>0.668 (0.071)</b>	0.623 (0.091)	0.477 (0.195)	0.481 (0.191)	<b>0.515 (0.153)</b>
0.3	non-strict-lassclust	0.740 (0.055)	<b>0.741 (0.055)</b>	0.739 (0.052)	<b>0.542 (0.130)</b>	0.535 (0.129)	0.490 (0.093)	0.566 (0.082)	<b>0.573 (0.055)</b>	0.548 (0.078)
0.3	lassojoint	0.662 (0.033)	<b>0.664 (0.030)</b>	0.662 (0.033)	0.436 (0.031)	0.436 (0.031)	<b>0.437 (0.032)</b>	0.534 (0.028)	<b>0.535 (0.029)</b>	<b>0.535 (0.028)</b>
0.5	naive	<b>0.712 (0.001)</b>	<b>0.712 (0.001)</b>	<b>0.712 (0.001)</b>	<b>0.561 (0.013)</b>	<b>0.561 (0.013)</b>	<b>0.561 (0.013)</b>	<b>0.560 (0.002)</b>	<b>0.560 (0.002)</b>	<b>0.560 (0.002)</b>
0.5	clust	0.759 (0.008)	0.761 (0.010)	<b>0.763 (0.009)</b>	<b>0.685 (0.012)</b>	0.674 (0.029)	0.548 (0.012)	<b>0.638 (0.019)</b>	0.629 (0.029)	0.572 (0.013)
0.5	strict-lassclust	0.745 (0.015)	0.759 (0.009)	<b>0.763 (0.010)</b>	<b>0.612 (0.096)</b>	0.599 (0.092)	0.536 (0.039)	0.586 (0.044)	<b>0.597 (0.044)</b>	0.571 (0.022)
0.5	non-strict-lassclust	0.758 (0.002)	0.751 (0.019)	<b>0.760 (0.008)</b>	0.631 (0.045)	<b>0.667 (0.009)</b>	0.475 (0.040)	0.592 (0.009)	<b>0.612 (0.020)</b>	0.550 (0.008)
0.5	lassojoint	0.699 (0.015)	0.699 (0.015)	<b>0.707 (0.005)</b>	0.434 (0.071)	0.440 (0.078)	<b>0.463 (0.038)</b>	0.529 (0.015)	0.531 (0.017)	<b>0.540 (0.003)</b>
0.8	naive	<b>0.815 (0.007)</b>	<b>0.815 (0.007)</b>	<b>0.815 (0.007)</b>	<b>0.734 (0.000)</b>	<b>0.734 (0.000)</b>	<b>0.734 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>
0.8	clust	<b>0.801 (0.009)</b>	0.791 (0.010)	0.779 (0.009)	<b>0.739 (0.029)</b>	0.700 (0.021)	0.513 (0.007)	<b>0.658 (0.030)</b>	0.644 (0.023)	0.566 (0.002)
0.8	strict-lassclust	<b>0.774 (0.027)</b>	<b>0.774 (0.007)</b>	0.765 (0.009)	<b>0.696 (0.052)</b>	0.659 (0.007)	0.444 (0.019)	0.623 (0.010)	<b>0.630 (0.001)</b>	0.538 (0.007)
0.8	non-strict-lassclust	0.778 (0.002)	<b>0.786 (0.011)</b>	0.765 (0.010)	0.677 (0.040)	<b>0.698 (0.019)</b>	0.426 (0.008)	<b>0.631 (0.017)</b>	0.625 (0.033)	0.531 (0.003)
0.8	lassojoint	0.746 (0.003)	0.742 (0.003)	<b>0.750 (0.011)</b>	0.586 (0.021)	0.583 (0.021)	<b>0.592 (0.030)</b>	<b>0.574 (0.010)</b>	0.571 (0.008)	<b>0.574 (0.011)</b>

**Table 13.** Summary Statistics for df = spambase; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.685 (0.010)</b>	<b>0.685 (0.010)</b>	<b>0.685 (0.010)</b>	<b>0.552 (0.016)</b>	<b>0.552 (0.016)</b>	<b>0.552 (0.016)</b>	<b>0.632 (0.013)</b>	<b>0.632 (0.013)</b>	<b>0.632 (0.013)</b>
	clust	0.831 (0.066)	0.844 (0.074)	<b>0.876 (0.066)</b>	0.604 (0.187)	0.693 (0.179)	<b>0.814 (0.113)</b>	0.661 (0.099)	0.710 (0.092)	<b>0.777 (0.063)</b>
	strict-lassclust	0.847 (0.051)	0.865 (0.053)	<b>0.905 (0.024)</b>	0.593 (0.168)	0.665 (0.170)	<b>0.802 (0.135)</b>	0.659 (0.088)	0.694 (0.089)	<b>0.772 (0.073)</b>
	non-strict-lassclust	0.849 (0.047)	0.868 (0.043)	<b>0.904 (0.026)</b>	0.579 (0.158)	0.653 (0.168)	<b>0.801 (0.134)</b>	0.653 (0.083)	0.692 (0.089)	<b>0.772 (0.073)</b>
	lassojoint	<b>0.806 (0.015)</b>	<b>0.806 (0.015)</b>	0.806 (0.016)	<b>0.433 (0.017)</b>	<b>0.433 (0.017)</b>	0.433 (0.017)	<b>0.579 (0.013)</b>	<b>0.579 (0.013)</b>	0.579 (0.013)
0.5	naive	<b>0.786 (0.004)</b>	<b>0.786 (0.004)</b>	<b>0.786 (0.004)</b>	<b>0.671 (0.004)</b>	<b>0.671 (0.004)</b>	<b>0.671 (0.004)</b>	<b>0.689 (0.005)</b>	<b>0.689 (0.005)</b>	<b>0.689 (0.005)</b>
	clust	0.810 (0.037)	0.818 (0.028)	<b>0.911 (0.004)</b>	0.536 (0.135)	0.519 (0.149)	<b>0.861 (0.004)</b>	0.638 (0.069)	0.387 (0.267)	<b>0.816 (0.006)</b>
	strict-lassclust	0.790 (0.047)	0.736 (0.090)	<b>0.907 (0.003)</b>	0.518 (0.147)	0.590 (0.122)	<b>0.861 (0.005)</b>	0.630 (0.074)	0.442 (0.222)	<b>0.818 (0.008)</b>
	non-strict-lassclust	0.822 (0.031)	0.832 (0.028)	<b>0.907 (0.003)</b>	0.530 (0.135)	0.591 (0.111)	<b>0.861 (0.005)</b>	0.636 (0.069)	0.660 (0.053)	<b>0.818 (0.008)</b>
	lassojoint	0.827 (0.001)	<b>0.828 (0.002)</b>	<b>0.828 (0.002)</b>	0.429 (0.003)	<b>0.432 (0.004)</b>	<b>0.432 (0.004)</b>	0.587 (0.001)	<b>0.588 (0.001)</b>	<b>0.588 (0.001)</b>
0.8	naive	<b>0.863 (0.000)</b>	<b>0.863 (0.000)</b>	<b>0.863 (0.000)</b>	<b>0.801 (0.000)</b>	<b>0.801 (0.000)</b>	<b>0.801 (0.000)</b>	<b>0.778 (0.000)</b>	<b>0.778 (0.000)</b>	<b>0.778 (0.000)</b>
	clust	0.722 (0.000)	0.739 (0.000)	<b>0.905 (0.000)</b>	0.630 (0.000)	0.666 (0.000)	<b>0.849 (0.000)</b>	0.210 (0.000)	0.413 (0.000)	<b>0.810 (0.000)</b>
	strict-lassclust	0.568 (0.000)	0.772 (0.000)	<b>0.902 (0.000)</b>	0.607 (0.000)	0.709 (0.000)	<b>0.841 (0.000)</b>	0.756 (0.000)	0.685 (0.000)	<b>0.805 (0.000)</b>
	non-strict-lassclust	0.828 (0.000)	0.803 (0.000)	<b>0.902 (0.000)</b>	0.746 (0.000)	0.537 (0.000)	<b>0.842 (0.000)</b>	0.724 (0.000)	0.621 (0.000)	<b>0.805 (0.000)</b>
	lassojoint	<b>0.816 (0.000)</b>	<b>0.816 (0.000)</b>	0.816 (0.000)	<b>0.395 (0.000)</b>	<b>0.395 (0.000)</b>	0.395 (0.000)	<b>0.565 (0.000)</b>	<b>0.565 (0.000)</b>	0.565 (0.000)

**Table 14.** Summary Statistics for df = wdbc; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.643 (0.028)</b>	<b>0.643 (0.028)</b>	<b>0.643 (0.028)</b>	<b>0.515 (0.038)</b>	<b>0.515 (0.038)</b>	<b>0.515 (0.038)</b>	<b>0.603 (0.033)</b>	<b>0.603 (0.033)</b>	<b>0.603 (0.033)</b>
	clust	0.889 (0.023)	0.895 (0.025)	<b>0.898 (0.026)</b>	0.879 (0.022)	0.883 (0.023)	<b>0.885 (0.025)</b>	0.822 (0.034)	0.831 (0.036)	<b>0.832 (0.040)</b>
	strict-lassclust	0.946 (0.033)	0.946 (0.024)	<b>0.956 (0.015)</b>	0.839 (0.066)	0.834 (0.075)	<b>0.891 (0.037)</b>	0.728 (0.161)	0.711 (0.189)	<b>0.840 (0.086)</b>
	non-strict-lassclust	0.956 (0.014)	0.955 (0.015)	<b>0.958 (0.014)</b>	0.889 (0.023)	0.888 (0.046)	<b>0.898 (0.024)</b>	0.845 (0.033)	0.850 (0.046)	<b>0.858 (0.033)</b>
	lassojoint	0.963 (0.014)	0.963 (0.013)	<b>0.964 (0.013)</b>	0.395 (0.033)	0.395 (0.034)	<b>0.398 (0.035)</b>	0.552 (0.031)	0.552 (0.031)	<b>0.553 (0.031)</b>
0.5	naive	<b>0.811 (0.004)</b>	<b>0.811 (0.004)</b>	<b>0.811 (0.004)</b>	<b>0.682 (0.004)</b>	<b>0.682 (0.004)</b>	<b>0.682 (0.004)</b>	<b>0.675 (0.001)</b>	<b>0.675 (0.001)</b>	<b>0.675 (0.001)</b>
	clust	0.915 (0.000)	0.923 (0.002)	<b>0.956 (0.004)</b>	0.918 (0.003)	0.906 (0.001)	<b>0.928 (0.005)</b>	0.868 (0.003)	0.849 (0.000)	<b>0.892 (0.008)</b>
	strict-lassclust	0.971 (0.001)	0.961 (0.001)	<b>0.979 (0.001)</b>	0.828 (0.006)	0.726 (0.017)	<b>0.941 (0.003)</b>	0.673 (0.015)	0.304 (0.054)	<b>0.911 (0.004)</b>
	non-strict-lassclust	0.977 (0.001)	<b>0.978 (0.001)</b>	<b>0.978 (0.001)</b>	0.918 (0.000)	0.906 (0.001)	<b>0.941 (0.003)</b>	0.877 (0.001)	0.875 (0.003)	<b>0.911 (0.004)</b>
	lassojoint	<b>0.983 (0.001)</b>	<b>0.983 (0.001)</b>	<b>0.983 (0.001)</b>	<b>0.557 (0.021)</b>	<b>0.557 (0.021)</b>	<b>0.557 (0.021)</b>	<b>0.598 (0.008)</b>	<b>0.598 (0.008)</b>	<b>0.598 (0.008)</b>
0.8	naive	<b>0.919 (0.000)</b>	<b>0.919 (0.000)</b>	<b>0.919 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.881 (0.000)</b>	<b>0.881 (0.000)</b>	<b>0.881 (0.000)</b>
	clust	0.919 (0.000)	0.923 (0.000)	<b>0.960 (0.000)</b>	0.906 (0.000)	0.912 (0.000)	<b>0.929 (0.000)</b>	0.855 (0.000)	0.862 (0.000)	<b>0.895 (0.000)</b>
	strict-lassclust	0.982 (0.000)	0.982 (0.000)	<b>0.987 (0.000)</b>	0.782 (0.000)	0.835 (0.000)	<b>0.935 (0.000)</b>	0.565 (0.000)	0.702 (0.000)	<b>0.906 (0.000)</b>
	non-strict-lassclust	0.985 (0.000)	0.984 (0.000)	<b>0.987 (0.000)</b>	<b>0.941 (0.000)</b>	0.935 (0.000)	0.935 (0.000)	<b>0.921 (0.000)</b>	0.913 (0.000)	0.906 (0.000)
	lassojoint	<b>0.995 (0.000)</b>	<b>0.995 (0.000)</b>	<b>0.995 (0.000)</b>	<b>0.382 (0.000)</b>	0.371 (0.000)	<b>0.382 (0.000)</b>	<b>0.537 (0.000)</b>	0.533 (0.000)	<b>0.537 (0.000)</b>

**Table 15.** Summary Statistics for df = wine-quality; nonSCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.796 (0.034)</b>	<b>0.796 (0.034)</b>	<b>0.796 (0.034)</b>	<b>0.380 (0.018)</b>	<b>0.380 (0.018)</b>	<b>0.380 (0.018)</b>	<b>0.296 (0.022)</b>	<b>0.296 (0.022)</b>	<b>0.296 (0.022)</b>
	clust	0.649 (0.034)	0.667 (0.034)	<b>0.682 (0.033)</b>	0.685 (0.018)	<b>0.686 (0.019)</b>	0.673 (0.025)	0.325 (0.029)	0.341 (0.029)	<b>0.354 (0.030)</b>
	strict-lassclust	0.646 (0.034)	0.664 (0.034)	<b>0.682 (0.033)</b>	0.685 (0.018)	<b>0.686 (0.020)</b>	0.673 (0.025)	0.325 (0.029)	0.341 (0.028)	<b>0.354 (0.029)</b>
	non-strict-lassclust	0.647 (0.034)	0.665 (0.034)	<b>0.682 (0.033)</b>	<b>0.686 (0.018)</b>	<b>0.686 (0.018)</b>	0.673 (0.024)	0.327 (0.029)	0.341 (0.029)	<b>0.353 (0.029)</b>
	lassojoint	<b>0.813 (0.026)</b>	<b>0.813 (0.027)</b>	0.813 (0.027)	<b>0.211 (0.070)</b>	0.207 (0.069)	<b>0.211 (0.071)</b>	0.254 (0.027)	0.254 (0.027)	<b>0.255 (0.027)</b>
0.5	naive	<b>0.820 (0.017)</b>	<b>0.820 (0.017)</b>	<b>0.820 (0.017)</b>	<b>0.566 (0.005)</b>	<b>0.566 (0.005)</b>	<b>0.566 (0.005)</b>	<b>0.362 (0.009)</b>	<b>0.362 (0.009)</b>	<b>0.362 (0.009)</b>
	clust	0.656 (0.007)	0.714 (0.010)	<b>0.720 (0.010)</b>	<b>0.700 (0.010)</b>	0.682 (0.018)	0.675 (0.019)	0.323 (0.011)	0.370 (0.011)	<b>0.373 (0.016)</b>
	strict-lassclust	0.652 (0.008)	<b>0.726 (0.011)</b>	0.721 (0.009)	0.701 (0.005)	<b>0.737 (0.015)</b>	0.676 (0.012)	0.319 (0.012)	<b>0.398 (0.008)</b>	0.375 (0.013)
	non-strict-lassclust	0.656 (0.006)	0.712 (0.012)	<b>0.721 (0.009)</b>	<b>0.701 (0.009)</b>	0.680 (0.026)	0.678 (0.015)	0.328 (0.005)	<b>0.380 (0.012)</b>	0.376 (0.014)
	lassojoint	<b>0.814 (0.017)</b>	<b>0.814 (0.017)</b>	0.814 (0.018)	<b>0.564 (0.024)</b>	0.555 (0.073)	0.551 (0.072)	<b>0.358 (0.012)</b>	0.356 (0.021)	0.355 (0.020)
0.8	naive	<b>0.854 (0.001)</b>	<b>0.854 (0.001)</b>	<b>0.854 (0.001)</b>	<b>0.754 (0.001)</b>	<b>0.754 (0.001)</b>	<b>0.754 (0.001)</b>	<b>0.483 (0.003)</b>	<b>0.483 (0.003)</b>	<b>0.483 (0.003)</b>
	clust	0.802 (0.007)	0.809 (0.005)	<b>0.817 (0.005)</b>	<b>0.779 (0.002)</b>	0.760 (0.001)	0.666 (0.000)	<b>0.453 (0.005)</b>	0.444 (0.002)	0.407 (0.001)
	strict-lassclust	0.801 (0.008)	0.808 (0.005)	<b>0.818 (0.006)</b>	<b>0.776 (0.003)</b>	0.763 (0.004)	0.650 (0.004)	0.445 (0.004)	<b>0.454 (0.001)</b>	0.397 (0.004)
	non-strict-lassclust	0.801 (0.007)	0.809 (0.005)	<b>0.817 (0.006)</b>	<b>0.772 (0.000)</b>	0.762 (0.001)	0.664 (0.001)	0.440 (0.004)	<b>0.447 (0.002)</b>	0.406 (0.002)
	lassojoint	0.849 (0.001)	<b>0.850 (0.002)</b>	0.850 (0.002)	0.829 (0.002)	<b>0.831 (0.002)</b>	<b>0.831 (0.002)</b>	0.512 (0.001)	<b>0.515 (0.000)</b>	<b>0.515 (0.000)</b>

## 1.2 nonSCAR scheme - with SMOTE algorithm; pecking-part = 1

**Table 16.** Summary Statistics for df = adult; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.769 (0.005)</b>	0.762 (0.006)	0.454 (0.005)	<b>0.462 (0.005)</b>	0.462 (0.006)	<b>0.465 (0.006)</b>
	clust	0.763 (0.006)	<b>0.779 (0.005)</b>	<b>0.621 (0.006)</b>	0.588 (0.005)	<b>0.513 (0.006)</b>	0.510 (0.006)
	strict-lassclust	0.763 (0.006)	<b>0.779 (0.005)</b>	<b>0.621 (0.006)</b>	0.588 (0.005)	<b>0.513 (0.006)</b>	0.510 (0.006)
	non-strict-lassclust	0.763 (0.006)	<b>0.779 (0.005)</b>	<b>0.621 (0.006)</b>	0.588 (0.005)	<b>0.513 (0.006)</b>	0.510 (0.006)
	lassojoint	0.751 (0.014)	<b>0.772 (0.005)</b>	0.363 (0.050)	<b>0.456 (0.005)</b>	0.427 (0.018)	<b>0.462 (0.006)</b>
	spy		0.695 (0.006)		0.375 (0.006)		0.433 (0.006)
0.5	naive	<b>0.771 (0.003)</b>	<b>0.771 (0.003)</b>	<b>0.578 (0.003)</b>	<b>0.578 (0.003)</b>	<b>0.504 (0.006)</b>	<b>0.504 (0.006)</b>
	clust	0.766 (0.004)	<b>0.768 (0.004)</b>	0.595 (0.001)	<b>0.657 (0.002)</b>	0.511 (0.006)	<b>0.528 (0.007)</b>
	strict-lassclust	0.766 (0.004)	<b>0.768 (0.004)</b>	0.595 (0.001)	<b>0.657 (0.002)</b>	0.511 (0.006)	<b>0.528 (0.007)</b>
	non-strict-lassclust	0.766 (0.004)	<b>0.768 (0.004)</b>	0.595 (0.001)	<b>0.657 (0.002)</b>	0.511 (0.006)	<b>0.528 (0.007)</b>
	lassojoint	<b>0.766 (0.003)</b>	<b>0.766 (0.003)</b>	<b>0.586 (0.024)</b>	<b>0.586 (0.024)</b>	<b>0.501 (0.009)</b>	<b>0.501 (0.009)</b>
	spy		0.695 (0.004)		0.485 (0.015)		0.474 (0.008)
0.8	naive	<b>0.779 (0.000)</b>	<b>0.779 (0.000)</b>	<b>0.714 (0.002)</b>	<b>0.714 (0.002)</b>	<b>0.543 (0.002)</b>	<b>0.543 (0.002)</b>
	clust	0.770 (0.001)	<b>0.777 (0.000)</b>	0.455 (0.004)	<b>0.729 (0.002)</b>	0.469 (0.003)	<b>0.536 (0.002)</b>
	strict-lassclust	0.770 (0.001)	<b>0.777 (0.000)</b>	0.454 (0.004)	<b>0.729 (0.002)</b>	0.469 (0.003)	<b>0.536 (0.002)</b>
	non-strict-lassclust	0.770 (0.001)	<b>0.777 (0.000)</b>	0.454 (0.004)	<b>0.729 (0.002)</b>	0.469 (0.003)	<b>0.536 (0.002)</b>
	lassojoint	<b>0.775 (0.001)</b>	<b>0.775 (0.001)</b>	<b>0.735 (0.002)</b>	<b>0.735 (0.002)</b>	<b>0.531 (0.002)</b>	<b>0.531 (0.002)</b>
	spy		0.676 (0.006)		0.697 (0.004)		0.231 (0.018)

**Table 17.** Summary Statistics for df = artif; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.764 (0.017)</b>	0.750 (0.017)	0.585 (0.018)	<b>0.617 (0.018)</b>	0.694 (0.016)	<b>0.700 (0.017)</b>
	clust	0.552 (0.039)	<b>0.747 (0.031)</b>	0.518 (0.036)	<b>0.683 (0.023)</b>	0.591 (0.037)	<b>0.703 (0.038)</b>
	strict-lassclust	0.552 (0.039)	<b>0.759 (0.028)</b>	0.520 (0.034)	<b>0.680 (0.027)</b>	0.580 (0.087)	<b>0.699 (0.045)</b>
	non-strict-lassclust	0.553 (0.040)	<b>0.759 (0.028)</b>	0.522 (0.036)	<b>0.683 (0.023)</b>	0.589 (0.040)	<b>0.702 (0.036)</b>
	lassojoint	<b>0.725 (0.021)</b>	<b>0.725 (0.025)</b>	<b>0.550 (0.050)</b>	0.546 (0.045)	<b>0.677 (0.023)</b>	0.674 (0.017)
	spy		0.591 (0.062)		0.492 (0.017)		0.658 (0.015)
0.5	naive	<b>0.850 (0.011)</b>	0.848 (0.010)	0.674 (0.004)	<b>0.698 (0.003)</b>	0.741 (0.006)	<b>0.749 (0.005)</b>
	clust	0.564 (0.012)	<b>0.782 (0.017)</b>	0.526 (0.003)	<b>0.686 (0.024)</b>	<b>0.633 (0.008)</b>	0.590 (0.065)
	strict-lassclust	0.573 (0.013)	<b>0.779 (0.017)</b>	0.504 (0.014)	<b>0.710 (0.012)</b>	0.648 (0.009)	<b>0.676 (0.023)</b>
	non-strict-lassclust	0.566 (0.008)	<b>0.782 (0.016)</b>	0.524 (0.005)	<b>0.679 (0.026)</b>	<b>0.607 (0.021)</b>	0.563 (0.076)
	lassojoint	<b>0.843 (0.015)</b>	0.835 (0.024)	0.676 (0.006)	<b>0.697 (0.017)</b>	0.739 (0.006)	<b>0.749 (0.003)</b>
	spy		0.698 (0.051)		0.492 (0.017)		0.657 (0.015)
0.8	naive	<b>0.942 (0.000)</b>	<b>0.942 (0.000)</b>	<b>0.820 (0.000)</b>	<b>0.820 (0.000)</b>	<b>0.841 (0.000)</b>	<b>0.841 (0.000)</b>
	clust	0.641 (0.000)	<b>0.901 (0.000)</b>	0.525 (0.000)	<b>0.768 (0.000)</b>	0.675 (0.000)	<b>0.717 (0.000)</b>
	strict-lassclust	0.653 (0.000)	<b>0.899 (0.000)</b>	0.552 (0.000)	<b>0.803 (0.000)</b>	0.679 (0.000)	<b>0.794 (0.000)</b>
	non-strict-lassclust	0.637 (0.000)	<b>0.903 (0.000)</b>	0.513 (0.000)	<b>0.768 (0.000)</b>	0.670 (0.000)	<b>0.709 (0.000)</b>
	lassojoint	<b>0.847 (0.000)</b>	<b>0.847 (0.000)</b>	<b>0.513 (0.000)</b>	<b>0.513 (0.000)</b>	<b>0.671 (0.000)</b>	<b>0.671 (0.000)</b>
	spy		0.834 (0.016)		0.737 (0.028)		0.751 (0.022)

**Table 18.** Summary Statistics for df = bank-marketing; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.560 (0.028)	<b>0.561 (0.027)</b>	<b>0.300 (0.010)</b>	0.295 (0.011)	<b>0.160 (0.012)</b>	0.127 (0.013)
0.3	clust	0.702 (0.020)	<b>0.704 (0.023)</b>	0.280 (0.011)	<b>0.293 (0.012)</b>	<b>0.088 (0.011)</b>	0.082 (0.011)
0.3	strict-lassclust	<b>0.710 (0.021)</b>	0.709 (0.021)	0.282 (0.011)	<b>0.293 (0.012)</b>	<b>0.084 (0.011)</b>	0.083 (0.011)
0.3	non-strict-lassclust	<b>0.710 (0.021)</b>	0.709 (0.021)	0.282 (0.011)	<b>0.293 (0.012)</b>	<b>0.084 (0.011)</b>	0.083 (0.011)
0.3	lassojoint	<b>0.604 (0.041)</b>	0.591 (0.039)	<b>0.195 (0.089)</b>	0.159 (0.075)	0.182 (0.036)	<b>0.187 (0.038)</b>
0.3	spy	0.705 (0.020)		0.281 (0.011)		0.083 (0.011)	
0.5	naive	<b>0.561 (0.014)</b>	<b>0.561 (0.014)</b>	<b>0.380 (0.005)</b>	<b>0.380 (0.005)</b>	<b>0.126 (0.008)</b>	<b>0.126 (0.008)</b>
0.5	clust	0.433 (0.196)	<b>0.633 (0.104)</b>	0.119 (0.018)	<b>0.526 (0.019)</b>	<b>0.106 (0.018)</b>	0.089 (0.006)
0.5	strict-lassclust	<b>0.776 (0.018)</b>	0.698 (0.018)	0.290 (0.005)	<b>0.562 (0.075)</b>	0.073 (0.006)	<b>0.079 (0.010)</b>
0.5	non-strict-lassclust	<b>0.776 (0.018)</b>	0.698 (0.020)	0.290 (0.005)	<b>0.341 (0.073)</b>	0.073 (0.006)	<b>0.077 (0.010)</b>
0.5	lassojoint	<b>0.612 (0.015)</b>	<b>0.612 (0.015)</b>	<b>0.533 (0.008)</b>	<b>0.533 (0.008)</b>	<b>0.126 (0.013)</b>	<b>0.126 (0.013)</b>
0.5	spy	0.688 (0.015)		0.367 (0.012)		0.081 (0.010)	
0.8	naive	0.648 (0.013)	<b>0.685 (0.012)</b>	<b>0.774 (0.005)</b>	0.738 (0.003)	0.261 (0.009)	<b>0.316 (0.000)</b>
0.8	clust	0.461 (0.009)	<b>0.609 (0.001)</b>	0.107 (0.001)	<b>0.729 (0.002)</b>	<b>0.168 (0.007)</b>	0.159 (0.003)
0.8	strict-lassclust	<b>0.672 (0.003)</b>	0.599 (0.003)	0.300 (0.005)	<b>0.731 (0.002)</b>	0.094 (0.003)	<b>0.156 (0.002)</b>
0.8	non-strict-lassclust	<b>0.672 (0.003)</b>	0.599 (0.003)	0.300 (0.005)	<b>0.731 (0.002)</b>	0.094 (0.003)	<b>0.156 (0.002)</b>
0.8	lassojoint	0.547 (0.013)	<b>0.553 (0.014)</b>	<b>0.773 (0.004)</b>	0.768 (0.003)	0.200 (0.003)	<b>0.246 (0.001)</b>
0.8	spy	0.745 (0.032)		0.702 (0.039)		0.341 (0.039)	

**Table 19.** Summary Statistics for df = banknote; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.810 (0.024)</b>	0.755 (0.028)	0.470 (0.022)	<b>0.583 (0.024)</b>	0.620 (0.021)	<b>0.635 (0.025)</b>
0.3	clust	<b>0.728 (0.063)</b>	0.596 (0.033)	0.324 (0.039)	<b>0.463 (0.022)</b>	<b>0.437 (0.033)</b>	0.412 (0.027)
0.3	strict-lassclust	<b>0.722 (0.036)</b>	0.597 (0.033)	0.326 (0.045)	<b>0.462 (0.022)</b>	<b>0.426 (0.026)</b>	0.410 (0.027)
0.3	non-strict-lassclust	<b>0.723 (0.037)</b>	0.598 (0.033)	0.328 (0.045)	<b>0.462 (0.022)</b>	<b>0.428 (0.033)</b>	0.411 (0.027)
0.3	lassojoint	<b>0.603 (0.160)</b>	0.560 (0.085)	0.413 (0.094)	<b>0.452 (0.037)</b>	0.469 (0.158)	<b>0.509 (0.035)</b>
0.3	spy	0.639 (0.031)		0.402 (0.033)		0.431 (0.047)	
0.5	naive	0.915 (0.000)	<b>0.918 (0.000)</b>	0.591 (0.009)	<b>0.761 (0.004)</b>	0.679 (0.007)	<b>0.775 (0.004)</b>
0.5	clust	<b>0.803 (0.002)</b>	0.458 (0.037)	0.341 (0.007)	<b>0.503 (0.005)</b>	<b>0.495 (0.010)</b>	0.424 (0.011)
0.5	strict-lassclust	<b>0.801 (0.001)</b>	0.457 (0.037)	0.341 (0.007)	<b>0.503 (0.005)</b>	<b>0.495 (0.010)</b>	0.424 (0.011)
0.5	non-strict-lassclust	<b>0.801 (0.001)</b>	0.457 (0.037)	0.341 (0.007)	<b>0.503 (0.005)</b>	<b>0.495 (0.010)</b>	0.424 (0.011)
0.5	lassojoint	0.926 (0.000)	<b>0.934 (0.000)</b>	0.509 (0.006)	<b>0.675 (0.013)</b>	0.645 (0.006)	<b>0.727 (0.010)</b>
0.5	spy	0.575 (0.050)		0.483 (0.047)		0.389 (0.074)	
0.8	naive	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	<b>0.990 (0.000)</b>	<b>0.990 (0.000)</b>	<b>0.988 (0.000)</b>	<b>0.988 (0.000)</b>
0.8	clust	0.571 (0.000)	<b>0.829 (0.000)</b>	0.506 (0.000)	<b>0.813 (0.000)</b>	0.609 (0.000)	<b>0.707 (0.000)</b>
0.8	strict-lassclust	0.586 (0.000)	<b>0.838 (0.000)</b>	0.482 (0.000)	<b>0.813 (0.000)</b>	0.600 (0.000)	<b>0.707 (0.000)</b>
0.8	non-strict-lassclust	0.586 (0.000)	<b>0.838 (0.000)</b>	0.482 (0.000)	<b>0.813 (0.000)</b>	0.600 (0.000)	<b>0.707 (0.000)</b>
0.8	lassojoint	<b>0.985 (0.000)</b>	<b>0.985 (0.000)</b>	<b>0.839 (0.000)</b>	<b>0.839 (0.000)</b>	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>
0.8	spy	0.747 (0.086)		0.646 (0.048)		0.475 (0.077)	

**Table 20.** Summary Statistics for df = breastc; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.924 (0.013)</b>	<b>0.924 (0.016)</b>	0.464 (0.032)	<b>0.669 (0.038)</b>	0.565 (0.031)	<b>0.678 (0.036)</b>
	clust	0.957 (0.021)	<b>0.966 (0.013)</b>	0.953 (0.018)	<b>0.959 (0.014)</b>	0.930 (0.029)	<b>0.940 (0.020)</b>
	strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	0.959 (0.015)	<b>0.962 (0.013)</b>	0.941 (0.022)	<b>0.944 (0.018)</b>
	non-strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	0.959 (0.015)	<b>0.962 (0.013)</b>	0.941 (0.022)	<b>0.945 (0.018)</b>
	lassojoint	0.987 (0.007)	<b>0.989 (0.007)</b>	0.364 (0.059)	<b>0.379 (0.097)</b>	0.523 (0.039)	<b>0.532 (0.055)</b>
	spy		0.988 (0.007)		0.918 (0.025)		0.895 (0.031)
0.5	naive	<b>0.938 (0.002)</b>	<b>0.938 (0.002)</b>	0.753 (0.014)	<b>0.821 (0.007)</b>	0.744 (0.014)	<b>0.800 (0.008)</b>
	clust	0.976 (0.007)	<b>0.978 (0.002)</b>	0.970 (0.004)	<b>0.971 (0.001)</b>	0.956 (0.006)	<b>0.958 (0.002)</b>
	strict-lassclust	<b>0.998 (0.000)</b>	<b>0.998 (0.000)</b>	<b>0.975 (0.001)</b>	0.966 (0.001)	<b>0.966 (0.002)</b>	0.952 (0.002)
	non-strict-lassclust	<b>0.998 (0.000)</b>	<b>0.998 (0.000)</b>	<b>0.975 (0.001)</b>	0.966 (0.001)	<b>0.966 (0.002)</b>	0.952 (0.002)
	lassojoint	<b>0.998 (0.001)</b>	<b>0.998 (0.001)</b>	<b>0.359 (0.006)</b>	<b>0.359 (0.006)</b>	<b>0.528 (0.006)</b>	<b>0.528 (0.006)</b>
	spy		0.989 (0.006)		0.920 (0.022)		0.897 (0.027)
0.8	naive	<b>0.990 (0.001)</b>	<b>0.990 (0.001)</b>	<b>0.935 (0.003)</b>	<b>0.935 (0.003)</b>	<b>0.910 (0.004)</b>	<b>0.910 (0.004)</b>
	clust	<b>0.969 (0.002)</b>	0.967 (0.002)	0.969 (0.007)	<b>0.971 (0.001)</b>	0.952 (0.011)	<b>0.955 (0.002)</b>
	strict-lassclust	<b>0.996 (0.000)</b>	<b>0.996 (0.000)</b>	0.960 (0.006)	<b>0.971 (0.001)</b>	0.937 (0.009)	<b>0.955 (0.001)</b>
	non-strict-lassclust	<b>0.996 (0.000)</b>	<b>0.996 (0.000)</b>	0.960 (0.006)	<b>0.971 (0.001)</b>	0.937 (0.009)	<b>0.955 (0.001)</b>
	lassojoint	<b>0.993 (0.000)</b>	<b>0.993 (0.000)</b>	<b>0.854 (0.034)</b>	<b>0.854 (0.034)</b>	<b>0.819 (0.041)</b>	<b>0.819 (0.041)</b>
	spy		0.989 (0.007)		0.903 (0.020)		0.878 (0.025)

**Table 21.** Summary Statistics for df = credit-a; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.714 (0.035)</b>	0.708 (0.035)	0.542 (0.027)	<b>0.563 (0.027)</b>	0.647 (0.028)	<b>0.649 (0.027)</b>
	clust	0.622 (0.027)	<b>0.657 (0.029)</b>	0.644 (0.029)	<b>0.674 (0.030)</b>	0.413 (0.056)	<b>0.509 (0.057)</b>
	strict-lassclust	0.715 (0.040)	<b>0.726 (0.033)</b>	0.643 (0.030)	<b>0.674 (0.030)</b>	0.410 (0.057)	<b>0.509 (0.058)</b>
	non-strict-lassclust	0.715 (0.040)	<b>0.726 (0.033)</b>	0.643 (0.030)	<b>0.674 (0.030)</b>	0.410 (0.057)	<b>0.509 (0.058)</b>
	lassojoint	<b>0.679 (0.035)</b>	<b>0.679 (0.037)</b>	<b>0.529 (0.045)</b>	0.488 (0.057)	<b>0.639 (0.028)</b>	0.632 (0.031)
	spy		0.735 (0.044)		0.682 (0.036)		0.641 (0.052)
0.5	naive	<b>0.721 (0.008)</b>	0.719 (0.008)	0.574 (0.006)	<b>0.610 (0.008)</b>	0.639 (0.006)	<b>0.652 (0.006)</b>
	clust	0.589 (0.007)	<b>0.601 (0.007)</b>	0.616 (0.004)	<b>0.623 (0.006)</b>	0.353 (0.017)	<b>0.379 (0.022)</b>
	strict-lassclust	0.728 (0.008)	<b>0.748 (0.015)</b>	<b>0.622 (0.003)</b>	<b>0.622 (0.005)</b>	0.366 (0.013)	<b>0.379 (0.021)</b>
	non-strict-lassclust	0.728 (0.008)	<b>0.748 (0.015)</b>	<b>0.622 (0.003)</b>	<b>0.622 (0.005)</b>	0.366 (0.013)	<b>0.379 (0.021)</b>
	lassojoint	<b>0.705 (0.010)</b>	0.669 (0.011)	<b>0.609 (0.026)</b>	0.475 (0.019)	<b>0.653 (0.005)</b>	0.622 (0.009)
	spy		0.737 (0.042)		0.686 (0.032)		0.651 (0.043)
0.8	naive	<b>0.827 (0.000)</b>	<b>0.827 (0.000)</b>	<b>0.687 (0.000)</b>	<b>0.687 (0.000)</b>	<b>0.687 (0.000)</b>	<b>0.687 (0.000)</b>
	clust	<b>0.649 (0.000)</b>	<b>0.649 (0.000)</b>	<b>0.703 (0.000)</b>	<b>0.703 (0.000)</b>	<b>0.463 (0.000)</b>	<b>0.463 (0.000)</b>
	strict-lassclust	<b>0.794 (0.000)</b>	0.792 (0.000)	<b>0.703 (0.000)</b>	0.697 (0.000)	<b>0.453 (0.000)</b>	0.449 (0.000)
	non-strict-lassclust	<b>0.794 (0.000)</b>	0.792 (0.000)	<b>0.703 (0.000)</b>	0.697 (0.000)	<b>0.453 (0.000)</b>	0.449 (0.000)
	lassojoint	<b>0.824 (0.000)</b>	<b>0.824 (0.000)</b>	<b>0.738 (0.000)</b>	<b>0.738 (0.000)</b>	<b>0.721 (0.000)</b>	<b>0.721 (0.000)</b>
	spy		0.751 (0.048)		0.699 (0.039)		0.618 (0.071)

**Table 22.** Summary Statistics for df = credit-g; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.579 (0.036)	<b>0.587 (0.034)</b>	0.340 (0.023)	<b>0.399 (0.025)</b>	<b>0.420 (0.028)</b>	0.380 (0.032)
0.3	clust	<b>0.567 (0.044)</b>	0.543 (0.038)	0.600 (0.034)	<b>0.625 (0.050)</b>	<b>0.387 (0.039)</b>	0.325 (0.043)
0.3	strict-lassclust	<b>0.572 (0.042)</b>	0.544 (0.038)	0.617 (0.033)	<b>0.629 (0.051)</b>	<b>0.380 (0.040)</b>	0.324 (0.044)
0.3	non-strict-lassclust	<b>0.571 (0.043)</b>	0.542 (0.038)	0.605 (0.051)	<b>0.624 (0.051)</b>	<b>0.383 (0.039)</b>	0.326 (0.043)
0.3	lassojoint	0.602 (0.034)	<b>0.603 (0.034)</b>	<b>0.394 (0.027)</b>	0.394 (0.026)	<b>0.344 (0.033)</b>	<b>0.344 (0.032)</b>
0.3	spy		0.574 (0.050)		0.473 (0.031)		0.243 (0.037)
0.5	naive		<b>0.569 (0.024)</b>	<b>0.569 (0.024)</b>	<b>0.408 (0.002)</b>	<b>0.408 (0.002)</b>	<b>0.371 (0.024)</b>
0.5	clust		0.519 (0.021)	<b>0.565 (0.024)</b>	0.492 (0.046)	<b>0.683 (0.014)</b>	<b>0.367 (0.006)</b>
0.5	strict-lassclust		0.522 (0.019)	<b>0.569 (0.022)</b>	0.498 (0.044)	<b>0.686 (0.013)</b>	<b>0.370 (0.005)</b>
0.5	non-strict-lassclust		0.522 (0.019)	<b>0.564 (0.033)</b>	0.498 (0.044)	<b>0.679 (0.031)</b>	<b>0.370 (0.005)</b>
0.5	lassojoint		<b>0.625 (0.013)</b>	0.624 (0.012)	<b>0.437 (0.007)</b>	<b>0.437 (0.007)</b>	<b>0.255 (0.030)</b>
0.5	spy		0.578 (0.050)		0.465 (0.024)		0.238 (0.036)
0.8	naive		<b>0.524 (0.009)</b>	<b>0.524 (0.009)</b>	<b>0.579 (0.005)</b>	<b>0.579 (0.005)</b>	<b>0.280 (0.018)</b>
0.8	clust		0.528 (0.029)	<b>0.595 (0.013)</b>	0.363 (0.013)	<b>0.717 (0.008)</b>	<b>0.423 (0.010)</b>
0.8	strict-lassclust		0.540 (0.018)	<b>0.598 (0.015)</b>	0.364 (0.008)	<b>0.717 (0.008)</b>	<b>0.420 (0.008)</b>
0.8	non-strict-lassclust		0.540 (0.018)	<b>0.598 (0.015)</b>	0.364 (0.008)	<b>0.717 (0.008)</b>	<b>0.420 (0.008)</b>
0.8	lassojoint		<b>0.643 (0.012)</b>	0.642 (0.010)	<b>0.610 (0.000)</b>	<b>0.610 (0.000)</b>	<b>0.033 (0.000)</b>
0.8	spy		0.573 (0.055)		0.581 (0.086)		0.375 (0.059)

**Table 23.** Summary Statistics for df = dhfr; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.538 (0.048)	<b>0.548 (0.048)</b>	0.466 (0.051)	<b>0.472 (0.056)</b>	0.481 (0.059)	<b>0.499 (0.058)</b>
0.3	clust	<b>0.567 (0.120)</b>	0.543 (0.056)	0.357 (0.096)	<b>0.532 (0.070)</b>	<b>0.422 (0.068)</b>	0.384 (0.090)
0.3	strict-lassclust	<b>0.590 (0.079)</b>	0.560 (0.063)	0.446 (0.065)	<b>0.550 (0.058)</b>	<b>0.381 (0.088)</b>	0.324 (0.082)
0.3	non-strict-lassclust	<b>0.582 (0.070)</b>	0.578 (0.060)	0.449 (0.054)	<b>0.564 (0.060)</b>	<b>0.392 (0.079)</b>	0.329 (0.090)
0.3	lassojoint	<b>0.660 (0.064)</b>	0.636 (0.050)	<b>0.504 (0.085)</b>	0.473 (0.049)	<b>0.562 (0.025)</b>	0.559 (0.037)
0.3	spy		0.658 (0.098)		0.656 (0.091)		0.519 (0.125)
0.5	naive	0.728 (0.000)	<b>0.730 (0.000)</b>	0.629 (0.000)	<b>0.680 (0.000)</b>	0.667 (0.000)	<b>0.699 (0.000)</b>
0.5	clust	0.552 (0.000)	<b>0.596 (0.000)</b>	0.454 (0.000)	<b>0.577 (0.000)</b>	<b>0.505 (0.000)</b>	0.494 (0.000)
0.5	strict-lassclust	<b>0.594 (0.000)</b>	0.532 (0.000)	0.371 (0.000)	<b>0.588 (0.000)</b>	0.396 (0.000)	<b>0.429 (0.000)</b>
0.5	non-strict-lassclust	<b>0.592 (0.000)</b>	0.536 (0.000)	0.351 (0.000)	<b>0.515 (0.000)</b>	0.364 (0.000)	<b>0.390 (0.000)</b>
0.5	lassojoint	0.704 (0.000)	<b>0.710 (0.000)</b>	0.464 (0.000)	<b>0.629 (0.000)</b>	0.612 (0.000)	<b>0.667 (0.000)</b>
0.5	spy		0.680 (0.057)		0.665 (0.039)		0.498 (0.038)
0.8	naive	<b>0.653 (0.000)</b>	<b>0.653 (0.000)</b>	<b>0.608 (0.000)</b>	<b>0.608 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>
0.8	clust	0.512 (0.000)	<b>0.713 (0.000)</b>	0.412 (0.000)	<b>0.691 (0.000)</b>	0.571 (0.000)	<b>0.615 (0.000)</b>
0.8	strict-lassclust	0.610 (0.000)	<b>0.748 (0.000)</b>	0.454 (0.000)	<b>0.639 (0.000)</b>	0.583 (0.000)	<b>0.624 (0.000)</b>
0.8	non-strict-lassclust	0.581 (0.000)	<b>0.761 (0.000)</b>	0.423 (0.000)	<b>0.722 (0.000)</b>	<b>0.582 (0.000)</b>	0.557 (0.000)
0.8	lassojoint	<b>0.845 (0.000)</b>	0.839 (0.000)	<b>0.732 (0.000)</b>	0.691 (0.000)	<b>0.740 (0.000)</b>	0.706 (0.000)
0.8	spy		0.685 (0.084)		0.645 (0.078)		0.534 (0.142)

**Table 24.** Summary Statistics for df = diabetes; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.705 (0.028)</b>	0.701 (0.028)	0.500 (0.029)	<b>0.527 (0.029)</b>	0.566 (0.033)	<b>0.577 (0.033)</b>
	clust	0.690 (0.055)	<b>0.725 (0.051)</b>	0.676 (0.025)	<b>0.694 (0.027)</b>	0.564 (0.047)	<b>0.603 (0.040)</b>
	strict-lassclust	0.722 (0.040)	<b>0.747 (0.035)</b>	0.677 (0.026)	<b>0.694 (0.027)</b>	0.562 (0.051)	<b>0.603 (0.040)</b>
	non-strict-lassclust	0.723 (0.041)	<b>0.747 (0.035)</b>	0.675 (0.028)	<b>0.695 (0.027)</b>	0.567 (0.049)	<b>0.603 (0.040)</b>
	lassojoint	0.717 (0.027)	<b>0.722 (0.029)</b>	0.379 (0.032)	<b>0.552 (0.070)</b>	0.526 (0.031)	<b>0.592 (0.039)</b>
	spy		0.722 (0.029)		0.637 (0.028)		0.615 (0.034)
0.5	naive	<b>0.700 (0.012)</b>	<b>0.700 (0.012)</b>	0.595 (0.013)	<b>0.599 (0.018)</b>	0.604 (0.008)	<b>0.605 (0.007)</b>
	clust	0.628 (0.013)	<b>0.644 (0.019)</b>	<b>0.656 (0.007)</b>	0.653 (0.008)	<b>0.521 (0.013)</b>	0.512 (0.028)
	strict-lassclust	0.692 (0.012)	<b>0.697 (0.008)</b>	0.653 (0.007)	<b>0.656 (0.007)</b>	<b>0.522 (0.036)</b>	0.514 (0.029)
	non-strict-lassclust	0.690 (0.011)	<b>0.698 (0.008)</b>	0.655 (0.009)	<b>0.658 (0.006)</b>	<b>0.521 (0.034)</b>	0.519 (0.023)
	lassojoint	<b>0.693 (0.009)</b>	<b>0.693 (0.012)</b>	<b>0.454 (0.120)</b>	0.451 (0.123)	<b>0.548 (0.053)</b>	0.545 (0.052)
	spy		0.719 (0.031)		0.644 (0.025)		0.615 (0.032)
0.8	naive	<b>0.758 (0.010)</b>	<b>0.758 (0.010)</b>	<b>0.697 (0.015)</b>	<b>0.697 (0.015)</b>	<b>0.627 (0.020)</b>	<b>0.627 (0.020)</b>
	clust	0.695 (0.020)	<b>0.716 (0.021)</b>	0.613 (0.043)	<b>0.671 (0.020)</b>	<b>0.575 (0.004)</b>	0.509 (0.045)
	strict-lassclust	0.693 (0.020)	<b>0.716 (0.022)</b>	0.610 (0.041)	<b>0.665 (0.022)</b>	<b>0.566 (0.012)</b>	0.499 (0.051)
	non-strict-lassclust	0.696 (0.020)	<b>0.716 (0.021)</b>	0.607 (0.040)	<b>0.664 (0.021)</b>	<b>0.566 (0.011)</b>	0.497 (0.048)
	lassojoint	0.759 (0.010)	<b>0.760 (0.008)</b>	<b>0.696 (0.005)</b>	0.694 (0.010)	<b>0.620 (0.010)</b>	0.617 (0.015)
	spy		0.712 (0.030)		0.662 (0.027)		0.614 (0.033)

**Table 25.** Summary Statistics for df = heart-c; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.584 (0.056)</b>	0.562 (0.048)	0.494 (0.042)	<b>0.517 (0.044)</b>	<b>0.622 (0.040)</b>	0.582 (0.045)
	clust	<b>0.693 (0.047)</b>	0.664 (0.045)	0.627 (0.045)	<b>0.639 (0.040)</b>	<b>0.666 (0.045)</b>	0.634 (0.047)
	strict-lassclust	<b>0.692 (0.048)</b>	0.663 (0.045)	0.624 (0.047)	<b>0.638 (0.040)</b>	<b>0.665 (0.044)</b>	0.632 (0.047)
	non-strict-lassclust	<b>0.692 (0.048)</b>	0.663 (0.045)	0.624 (0.047)	<b>0.638 (0.040)</b>	<b>0.665 (0.044)</b>	0.632 (0.047)
	lassojoint	0.565 (0.062)	<b>0.592 (0.075)</b>	0.467 (0.046)	<b>0.486 (0.061)</b>	0.538 (0.065)	<b>0.548 (0.080)</b>
	spy		0.688 (0.045)		0.628 (0.046)		0.655 (0.050)
0.5	naive	<b>0.570 (0.000)</b>	0.551 (0.000)	<b>0.578 (0.000)</b>	<b>0.578 (0.000)</b>	<b>0.678 (0.000)</b>	0.661 (0.000)
	clust	0.640 (0.000)	<b>0.642 (0.000)</b>	0.600 (0.000)	<b>0.633 (0.000)</b>	<b>0.700 (0.000)</b>	0.667 (0.000)
	strict-lassclust	0.635 (0.000)	<b>0.636 (0.000)</b>	0.600 (0.000)	<b>0.622 (0.000)</b>	<b>0.700 (0.000)</b>	0.653 (0.000)
	non-strict-lassclust	0.635 (0.000)	<b>0.636 (0.000)</b>	0.600 (0.000)	<b>0.622 (0.000)</b>	<b>0.700 (0.000)</b>	0.653 (0.000)
	lassojoint	0.594 (0.000)	<b>0.642 (0.000)</b>	0.589 (0.000)	<b>0.622 (0.000)</b>	0.694 (0.000)	<b>0.712 (0.000)</b>
	spy		0.681 (0.052)		0.636 (0.048)		0.615 (0.137)
0.8	naive	<b>0.754 (0.000)</b>	<b>0.754 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.732 (0.000)</b>	<b>0.732 (0.000)</b>
	clust	0.685 (0.000)	<b>0.733 (0.000)</b>	0.567 (0.000)	<b>0.700 (0.000)</b>	<b>0.715 (0.000)</b>	0.710 (0.000)
	strict-lassclust	0.686 (0.000)	<b>0.729 (0.000)</b>	0.567 (0.000)	<b>0.678 (0.000)</b>	<b>0.715 (0.000)</b>	0.681 (0.000)
	non-strict-lassclust	0.686 (0.000)	<b>0.729 (0.000)</b>	0.567 (0.000)	<b>0.678 (0.000)</b>	<b>0.715 (0.000)</b>	0.681 (0.000)
	lassojoint	<b>0.759 (0.000)</b>	<b>0.759 (0.000)</b>	<b>0.700 (0.000)</b>	<b>0.700 (0.000)</b>	<b>0.773 (0.000)</b>	<b>0.773 (0.000)</b>
	spy		0.684 (0.051)		0.618 (0.047)		0.480 (0.145)

**Table 26.** Summary Statistics for df = qsar-biodeg; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.633 (0.026)</b>	0.628 (0.027)	0.484 (0.027)	<b>0.502 (0.028)</b>	<b>0.547 (0.030)</b>	0.546 (0.031)
	clust	0.761 (0.034)	<b>0.775 (0.058)</b>	0.575 (0.050)	<b>0.685 (0.066)</b>	0.582 (0.055)	<b>0.599 (0.151)</b>
	strict-lassclust	0.763 (0.035)	<b>0.779 (0.059)</b>	0.623 (0.091)	<b>0.666 (0.115)</b>	0.515 (0.153)	<b>0.571 (0.144)</b>
	non-strict-lassclust	0.739 (0.052)	<b>0.774 (0.058)</b>	0.490 (0.093)	<b>0.651 (0.098)</b>	0.548 (0.078)	<b>0.592 (0.146)</b>
	lassojoint	<b>0.662 (0.033)</b>	0.643 (0.030)	<b>0.437 (0.031)</b>	0.402 (0.029)	<b>0.534 (0.028)</b>	0.524 (0.029)
	spy		0.707 (0.099)		0.525 (0.115)		0.455 (0.173)
0.5	naive	<b>0.712 (0.001)</b>	0.710 (0.002)	0.561 (0.013)	<b>0.577 (0.027)</b>	0.560 (0.002)	<b>0.562 (0.002)</b>
	clust	0.763 (0.009)	<b>0.822 (0.007)</b>	0.548 (0.012)	<b>0.761 (0.014)</b>	0.572 (0.013)	<b>0.677 (0.025)</b>
	strict-lassclust	0.763 (0.010)	<b>0.824 (0.006)</b>	0.536 (0.039)	<b>0.772 (0.009)</b>	0.571 (0.022)	<b>0.668 (0.028)</b>
	non-strict-lassclust	0.760 (0.008)	<b>0.821 (0.006)</b>	0.475 (0.040)	<b>0.752 (0.025)</b>	0.550 (0.008)	<b>0.677 (0.026)</b>
	lassojoint	<b>0.707 (0.005)</b>	0.692 (0.008)	<b>0.463 (0.038)</b>	0.438 (0.074)	<b>0.540 (0.003)</b>	0.531 (0.016)
	spy		0.744 (0.113)		0.617 (0.092)		0.570 (0.132)
0.8	naive	<b>0.815 (0.007)</b>	<b>0.815 (0.007)</b>	<b>0.734 (0.000)</b>	<b>0.734 (0.000)</b>	<b>0.667 (0.000)</b>	<b>0.667 (0.000)</b>
	clust	0.779 (0.009)	<b>0.865 (0.004)</b>	0.513 (0.007)	<b>0.813 (0.010)</b>	0.566 (0.002)	<b>0.729 (0.009)</b>
	strict-lassclust	0.765 (0.009)	<b>0.868 (0.008)</b>	0.444 (0.019)	<b>0.812 (0.011)</b>	0.538 (0.007)	<b>0.710 (0.018)</b>
	non-strict-lassclust	0.765 (0.010)	<b>0.870 (0.006)</b>	0.426 (0.008)	<b>0.752 (0.068)</b>	0.531 (0.003)	<b>0.693 (0.034)</b>
	lassojoint	<b>0.750 (0.011)</b>	0.744 (0.005)	<b>0.592 (0.030)</b>	0.585 (0.023)	<b>0.574 (0.011)</b>	0.573 (0.011)
	spy		0.849 (0.023)		0.690 (0.027)		0.661 (0.027)

**Table 27.** Summary Statistics for df = spambase; nonSCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.685 (0.010)</b>	<b>0.685 (0.009)</b>	0.552 (0.016)	<b>0.637 (0.011)</b>	0.632 (0.013)	<b>0.668 (0.012)</b>
	clust	0.876 (0.066)	<b>0.915 (0.021)</b>	0.814 (0.113)	<b>0.849 (0.009)</b>	0.777 (0.063)	<b>0.780 (0.014)</b>
	strict-lassclust	0.905 (0.024)	<b>0.920 (0.007)</b>	0.802 (0.135)	<b>0.848 (0.009)</b>	0.772 (0.073)	<b>0.779 (0.015)</b>
	non-strict-lassclust	0.904 (0.026)	<b>0.919 (0.008)</b>	0.801 (0.134)	<b>0.847 (0.009)</b>	0.772 (0.073)	<b>0.778 (0.014)</b>
	lassojoint	0.806 (0.016)	<b>0.819 (0.010)</b>	0.433 (0.017)	<b>0.566 (0.036)</b>	0.579 (0.013)	<b>0.636 (0.019)</b>
	spy		0.797 (0.032)		0.618 (0.061)		0.652 (0.039)
0.5	naive	<b>0.786 (0.004)</b>	<b>0.786 (0.004)</b>	<b>0.671 (0.004)</b>	<b>0.671 (0.004)</b>	<b>0.689 (0.005)</b>	<b>0.689 (0.005)</b>
	clust	0.911 (0.004)	<b>0.920 (0.006)</b>	<b>0.861 (0.004)</b>	0.843 (0.003)	<b>0.816 (0.006)</b>	0.783 (0.006)
	strict-lassclust	0.907 (0.003)	<b>0.920 (0.004)</b>	<b>0.861 (0.005)</b>	0.848 (0.007)	<b>0.818 (0.008)</b>	0.789 (0.014)
	non-strict-lassclust	0.907 (0.003)	<b>0.916 (0.005)</b>	<b>0.861 (0.005)</b>	0.847 (0.005)	<b>0.818 (0.008)</b>	0.788 (0.012)
	lassojoint	<b>0.828 (0.002)</b>	0.827 (0.001)	<b>0.432 (0.004)</b>	0.429 (0.003)	<b>0.588 (0.001)</b>	0.587 (0.001)
	spy		0.819 (0.044)		0.684 (0.082)		0.684 (0.055)
0.8	naive	<b>0.863 (0.000)</b>	<b>0.863 (0.000)</b>	<b>0.801 (0.000)</b>	<b>0.801 (0.000)</b>	<b>0.778 (0.000)</b>	<b>0.778 (0.000)</b>
	clust	0.905 (0.000)	<b>0.926 (0.000)</b>	0.849 (0.000)	<b>0.855 (0.000)</b>	<b>0.810 (0.000)</b>	0.790 (0.000)
	strict-lassclust	0.902 (0.000)	<b>0.921 (0.000)</b>	0.841 (0.000)	<b>0.857 (0.000)</b>	<b>0.805 (0.000)</b>	0.793 (0.000)
	non-strict-lassclust	0.902 (0.000)	<b>0.921 (0.000)</b>	0.842 (0.000)	<b>0.857 (0.000)</b>	<b>0.805 (0.000)</b>	0.793 (0.000)
	lassojoint	0.816 (0.000)	<b>0.819 (0.000)</b>	<b>0.395 (0.000)</b>	<b>0.395 (0.000)</b>	<b>0.565 (0.000)</b>	<b>0.565 (0.000)</b>
	spy		0.828 (0.018)		0.737 (0.071)		0.727 (0.046)

**Table 28.** Summary Statistics for df = wdbc; nonSCAR scheme

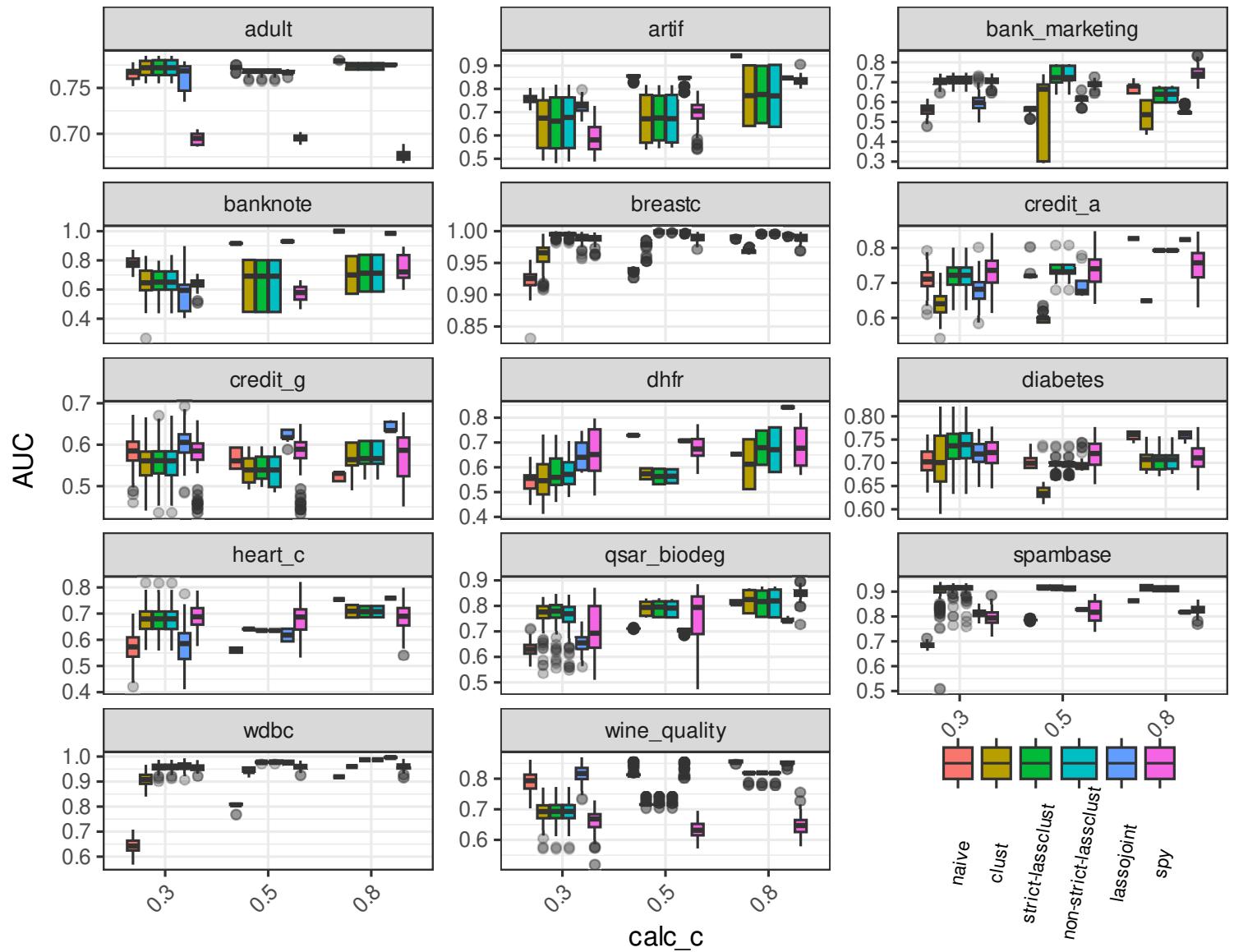
calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.643 (0.028)	<b>0.645 (0.027)</b>	0.515 (0.038)	<b>0.516 (0.038)</b>	<b>0.603 (0.033)</b>	<b>0.603 (0.033)</b>
	clust	0.898 (0.026)	<b>0.917 (0.022)</b>	0.885 (0.025)	<b>0.902 (0.021)</b>	0.832 (0.040)	<b>0.867 (0.029)</b>
	strict-lassclust	0.956 (0.015)	<b>0.957 (0.013)</b>	0.891 (0.037)	<b>0.904 (0.021)</b>	0.840 (0.086)	<b>0.868 (0.033)</b>
	non-strict-lassclust	<b>0.958 (0.014)</b>	0.957 (0.013)	0.898 (0.024)	<b>0.904 (0.025)</b>	0.858 (0.033)	<b>0.872 (0.030)</b>
	lassojoint	<b>0.964 (0.013)</b>	0.958 (0.016)	<b>0.398 (0.035)</b>	0.385 (0.033)	<b>0.553 (0.031)</b>	0.548 (0.030)
	spy	0.955 (0.012)		0.895 (0.019)		0.866 (0.026)	
0.5	naive	<b>0.811 (0.004)</b>	0.807 (0.004)	<b>0.682 (0.004)</b>	0.676 (0.003)	<b>0.675 (0.001)</b>	0.671 (0.000)
	clust	<b>0.956 (0.004)</b>	0.940 (0.001)	<b>0.928 (0.005)</b>	0.900 (0.001)	<b>0.892 (0.008)</b>	0.847 (0.003)
	strict-lassclust	<b>0.979 (0.001)</b>	0.976 (0.000)	<b>0.941 (0.003)</b>	0.935 (0.001)	<b>0.911 (0.004)</b>	0.903 (0.000)
	non-strict-lassclust	<b>0.978 (0.001)</b>	0.977 (0.000)	<b>0.941 (0.003)</b>	0.935 (0.001)	<b>0.911 (0.004)</b>	0.903 (0.000)
	lassojoint	<b>0.983 (0.001)</b>	0.974 (0.000)	<b>0.557 (0.021)</b>	0.335 (0.002)	<b>0.598 (0.008)</b>	0.498 (0.003)
	spy	0.958 (0.011)		0.896 (0.016)		0.866 (0.022)	
0.8	naive	<b>0.919 (0.000)</b>	<b>0.919 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.881 (0.000)</b>	<b>0.881 (0.000)</b>
	clust	<b>0.960 (0.000)</b>	<b>0.960 (0.000)</b>	0.929 (0.000)	<b>0.935 (0.000)</b>	0.895 (0.000)	<b>0.906 (0.000)</b>
	strict-lassclust	<b>0.987 (0.000)</b>	<b>0.987 (0.000)</b>	<b>0.935 (0.000)</b>	<b>0.935 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.906 (0.000)</b>
	non-strict-lassclust	<b>0.987 (0.000)</b>	<b>0.987 (0.000)</b>	<b>0.935 (0.000)</b>	<b>0.935 (0.000)</b>	<b>0.906 (0.000)</b>	<b>0.906 (0.000)</b>
	lassojoint	0.995 (0.000)	<b>0.997 (0.000)</b>	0.382 (0.000)	<b>0.388 (0.000)</b>	0.537 (0.000)	<b>0.540 (0.000)</b>
	spy	0.959 (0.013)		0.905 (0.019)		0.875 (0.027)	

**Table 29.** Summary Statistics for df = wine-quality; nonSCAR scheme

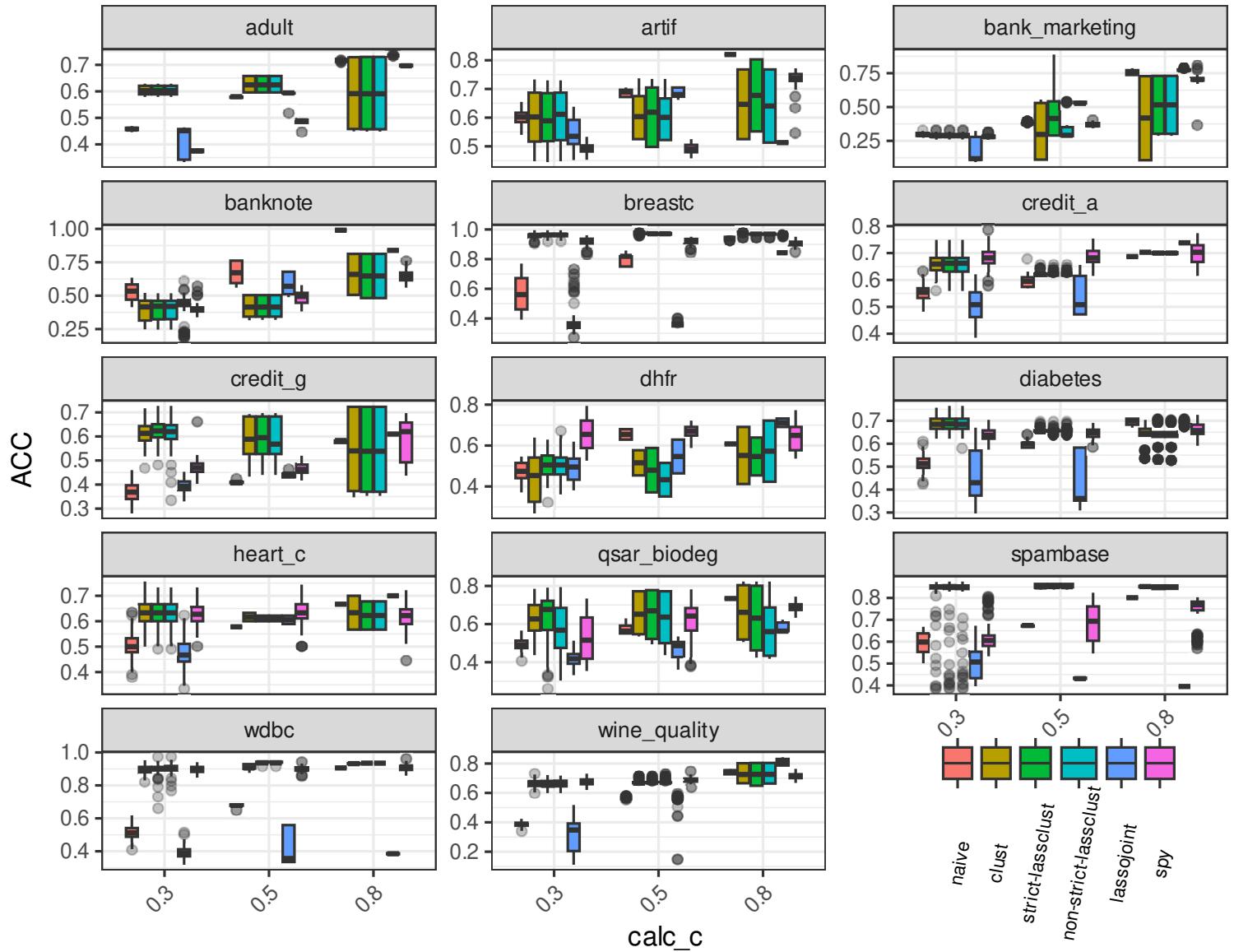
calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.796 (0.034)</b>	0.782 (0.032)	0.380 (0.018)	<b>0.387 (0.017)</b>	0.296 (0.022)	<b>0.299 (0.022)</b>
	clust	0.682 (0.033)	<b>0.701 (0.033)</b>	<b>0.673 (0.025)</b>	0.651 (0.020)	0.354 (0.030)	<b>0.357 (0.030)</b>
	strict-lassclust	0.682 (0.033)	<b>0.702 (0.033)</b>	<b>0.673 (0.025)</b>	0.651 (0.020)	0.354 (0.029)	<b>0.357 (0.030)</b>
	non-strict-lassclust	0.682 (0.033)	<b>0.702 (0.033)</b>	<b>0.673 (0.024)</b>	0.652 (0.020)	0.353 (0.029)	<b>0.358 (0.030)</b>
	lassojoint	0.813 (0.027)	<b>0.821 (0.025)</b>	0.211 (0.071)	<b>0.397 (0.039)</b>	0.255 (0.027)	<b>0.301 (0.024)</b>
	spy	0.664 (0.035)		0.677 (0.024)		0.301 (0.039)	
0.5	naive	<b>0.820 (0.017)</b>	<b>0.820 (0.017)</b>	<b>0.566 (0.005)</b>	<b>0.566 (0.005)</b>	<b>0.362 (0.009)</b>	<b>0.362 (0.009)</b>
	clust	<b>0.720 (0.010)</b>	<b>0.720 (0.009)</b>	<b>0.675 (0.019)</b>	0.672 (0.015)	<b>0.373 (0.016)</b>	0.369 (0.017)
	strict-lassclust	<b>0.721 (0.009)</b>	<b>0.721 (0.009)</b>	<b>0.676 (0.012)</b>	<b>0.676 (0.012)</b>	0.375 (0.013)	<b>0.376 (0.014)</b>
	non-strict-lassclust	<b>0.721 (0.009)</b>	<b>0.721 (0.009)</b>	<b>0.678 (0.015)</b>	0.677 (0.013)	<b>0.376 (0.014)</b>	<b>0.376 (0.014)</b>
	lassojoint	<b>0.814 (0.018)</b>	<b>0.814 (0.017)</b>	0.551 (0.072)	<b>0.564 (0.022)</b>	0.355 (0.020)	<b>0.358 (0.012)</b>
	spy	0.633 (0.030)		0.686 (0.017)		0.268 (0.035)	
0.8	naive	0.854 (0.001)	<b>0.858 (0.001)</b>	<b>0.754 (0.001)</b>	0.727 (0.001)	<b>0.483 (0.003)</b>	0.462 (0.004)
	clust	0.817 (0.005)	<b>0.819 (0.007)</b>	0.666 (0.000)	<b>0.801 (0.003)</b>	0.407 (0.001)	<b>0.474 (0.004)</b>
	strict-lassclust	<b>0.818 (0.006)</b>	<b>0.818 (0.007)</b>	0.650 (0.004)	<b>0.803 (0.004)</b>	0.397 (0.004)	<b>0.477 (0.005)</b>
	non-strict-lassclust	0.817 (0.006)	<b>0.818 (0.007)</b>	0.664 (0.001)	<b>0.803 (0.004)</b>	0.406 (0.002)	<b>0.477 (0.005)</b>
	lassojoint	0.850 (0.002)	<b>0.854 (0.004)</b>	<b>0.831 (0.002)</b>	0.787 (0.001)	<b>0.515 (0.000)</b>	0.514 (0.002)
	spy	0.646 (0.032)		0.713 (0.019)		0.292 (0.043)	

### 1.3 Graphs

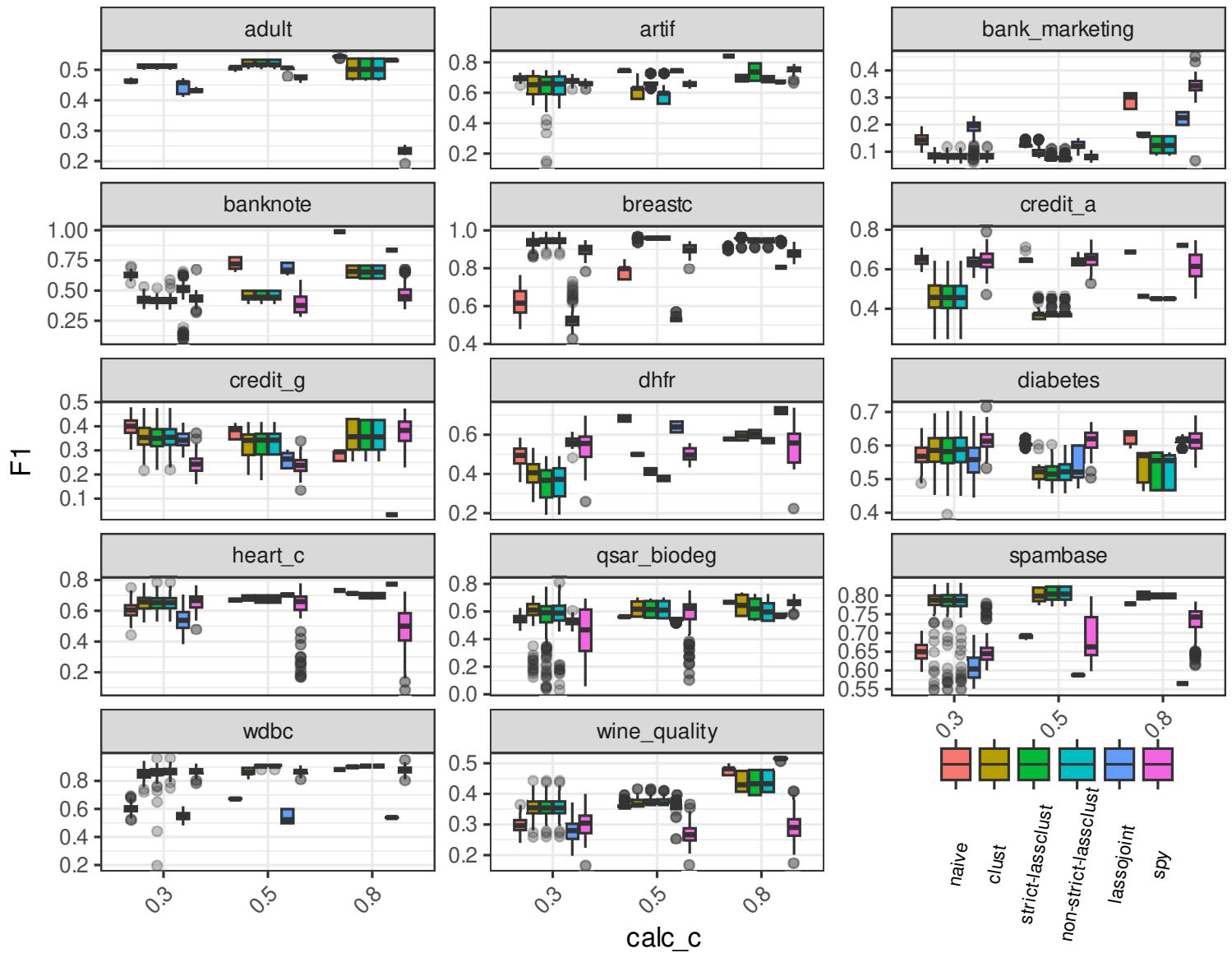
In this section, we present all boxplots for classification metrics for our methods. In addition, we present boxplots of the execution times of the algorithms used.



**Fig. 1.** AUC; SMOTE scheme; nonSCAR



**Fig. 2.** Accuracy; SMOTE scheme; nonSCAR



**Fig. 3.** F1 score; SMOTE scheme; nonSCAR

## 2 SCAR Scheme

### 2.1 Tables for all classification metrics for 14 datasets.

q	naive acc	clust acc	strict lassclust acc	non strict lassclust acc	lassojoint acc	naive f1	clust f1	strict lassclust f1	non strict lassclust f1	lassojoint f1	naive auc	clust auc	strict lassclust auc	non strict lassclust auc	lassojoint auc
0.25	<b>0.58</b> (0.23)	0.7 (0.13)	<b>0.7 (0.13)</b>	0.7 (0.13)	0.75 (0.21)	<b>0.61</b> (0.18)	0.58 (0.2)	0.57 (0.22)	<b>0.58</b> (0.2)	0.68 (0.22)	<b>0.88</b> (0.1)	0.75 (0.12)	<b>0.77</b> (0.12)	0.76 (0.13)	<b>0.88</b> (0.11)
0.5	<b>0.58</b> (0.23)	<b>0.71</b> (0.13)	<b>0.7 (0.12)</b>	0.7 (0.13)	<b>0.77</b> (0.2)	<b>0.61</b> (0.18)	0.58 (0.2)	0.55 (0.21)	<b>0.58</b> (0.2)	<b>0.69</b> (0.22)	<b>0.88</b> (0.1)	<b>0.76</b> (0.12)	<b>0.77</b> (0.13)	<b>0.88</b> (0.11)	
1	<b>0.58</b> (0.23)	0.6 (0.21)	0.6 (0.21)	0.59 (0.21)	<b>0.77</b> (0.2)	<b>0.61</b> (0.18)	<b>0.59</b> (0.21)	<b>0.58</b> (0.21)	<b>0.58</b> (0.21)	<b>0.69</b> (0.21)	<b>0.88</b> (0.1)	<b>0.76</b> (0.12)	<b>0.77</b> (0.13)	0.76 (0.13)	<b>0.88</b> (0.11)

Table 30. Summary of Mean and Standard Deviation for Accuracy, F1, and AUC Metrics by q (Highest Mean in Bold); SCAR scheme

Table 31. Summary Statistics for df = adult; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.797</b> (0.003)	<b>0.797</b> (0.003)	<b>0.797</b> (0.003)	<b>0.241</b> (0.005)	<b>0.241</b> (0.005)	<b>0.241</b> (0.005)	<b>0.388</b> (0.006)	<b>0.388</b> (0.006)	<b>0.388</b> (0.006)
	clust	<b>0.767</b> (0.004)	0.766 (0.004)	0.763 (0.005)	<b>0.582</b> (0.007)	0.577 (0.006)	0.406 (0.011)	<b>0.502</b> (0.007)	0.501 (0.007)	0.442 (0.008)
	strict-lassclust	<b>0.768</b> (0.004)	0.766 (0.004)	0.763 (0.005)	<b>0.582</b> (0.007)	0.577 (0.006)	0.405 (0.011)	<b>0.503</b> (0.007)	0.500 (0.007)	0.442 (0.008)
	non-strict-lassclust	<b>0.768</b> (0.004)	0.766 (0.004)	0.763 (0.005)	<b>0.582</b> (0.007)	0.577 (0.006)	0.405 (0.011)	<b>0.503</b> (0.007)	0.500 (0.007)	0.442 (0.008)
	lassojoint	<b>0.795</b> (0.003)	<b>0.795</b> (0.003)	<b>0.795</b> (0.003)	<b>0.792</b> (0.003)	<b>0.792</b> (0.003)	<b>0.792</b> (0.003)	0.480 (0.033)	<b>0.480</b> (0.033)	<b>0.480</b> (0.033)
0.5	naive	<b>0.804</b> (0.001)	<b>0.804</b> (0.001)	<b>0.804</b> (0.001)	<b>0.335</b> (0.006)	<b>0.335</b> (0.006)	<b>0.335</b> (0.006)	0.419 (0.006)	<b>0.419</b> (0.006)	<b>0.419</b> (0.006)
	clust	<b>0.771</b> (0.003)	0.767 (0.004)	0.761 (0.004)	<b>0.568</b> (0.004)	0.554 (0.002)	0.304 (0.002)	<b>0.497</b> (0.006)	0.492 (0.004)	0.407 (0.004)
	strict-lassclust	<b>0.771</b> (0.003)	0.768 (0.004)	0.761 (0.004)	<b>0.567</b> (0.004)	0.554 (0.002)	0.302 (0.002)	<b>0.497</b> (0.006)	0.492 (0.005)	0.407 (0.005)
	non-strict-lassclust	<b>0.771</b> (0.003)	0.768 (0.004)	0.761 (0.004)	<b>0.567</b> (0.004)	0.554 (0.002)	0.302 (0.002)	<b>0.497</b> (0.006)	0.492 (0.005)	0.407 (0.005)
	lassojoint	<b>0.804</b> (0.002)	<b>0.804</b> (0.002)	<b>0.804</b> (0.002)	0.794 (0.005)	<b>0.794</b> (0.005)	<b>0.794</b> (0.005)	0.504 (0.016)	0.504 (0.016)	0.504 (0.016)
0.8	naive	<b>0.802</b> (0.001)	<b>0.802</b> (0.001)	<b>0.802</b> (0.001)	<b>0.783</b> (0.001)	<b>0.783</b> (0.001)	<b>0.783</b> (0.001)	0.544 (0.001)	<b>0.544</b> (0.001)	<b>0.544</b> (0.001)
	clust	<b>0.769</b> (0.003)	0.762 (0.001)	0.755 (0.001)	<b>0.605</b> (0.009)	0.542 (0.002)	0.241 (0.003)	<b>0.499</b> (0.007)	0.480 (0.003)	0.383 (0.003)
	strict-lassclust	<b>0.769</b> (0.003)	0.762 (0.001)	0.755 (0.001)	<b>0.604</b> (0.010)	0.541 (0.002)	0.241 (0.002)	<b>0.499</b> (0.007)	0.480 (0.002)	0.383 (0.003)
	non-strict-lassclust	<b>0.769</b> (0.003)	0.762 (0.001)	0.755 (0.001)	<b>0.604</b> (0.010)	0.541 (0.002)	0.241 (0.002)	<b>0.499</b> (0.007)	0.480 (0.002)	0.383 (0.003)
	lassojoint	0.801 (0.002)	<b>0.801</b> (0.002)	<b>0.801</b> (0.002)	0.796 (0.002)	<b>0.796</b> (0.002)	<b>0.796</b> (0.002)	0.470 (0.003)	<b>0.470</b> (0.003)	<b>0.470</b> (0.003)

Table 32. Summary Statistics for df = artif; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.968</b> (0.010)	<b>0.968</b> (0.010)	<b>0.968</b> (0.010)	<b>0.520</b> (0.019)	<b>0.520</b> (0.019)	<b>0.520</b> (0.019)	<b>0.670</b> (0.016)	<b>0.670</b> (0.016)	<b>0.670</b> (0.016)
	clust	0.604 (0.064)	<b>0.610</b> (0.063)	0.599 (0.063)	0.571 (0.050)	<b>0.573</b> (0.052)	0.543 (0.037)	0.559 (0.049)	0.563 (0.054)	<b>0.631</b> (0.035)
	strict-lassclust	0.602 (0.064)	<b>0.607</b> (0.062)	0.597 (0.065)	<b>0.559</b> (0.050)	0.557 (0.049)	0.537 (0.043)	0.557 (0.116)	0.561 (0.105)	<b>0.617</b> (0.057)
	non-strict-lassclust	0.609 (0.063)	<b>0.613</b> (0.064)	0.602 (0.063)	0.574 (0.049)	<b>0.575</b> (0.051)	0.548 (0.039)	0.552 (0.052)	0.554 (0.055)	<b>0.630</b> (0.036)
	lassojoint	<b>0.989</b> (0.007)	<b>0.989</b> (0.009)	0.988 (0.011)	<b>0.944</b> (0.017)	<b>0.944</b> (0.016)	0.943 (0.016)	<b>0.942</b> (0.017)	<b>0.942</b> (0.017)	0.941 (0.019)
0.5	naive	<b>0.983</b> (0.005)	<b>0.983</b> (0.005)	<b>0.983</b> (0.005)	<b>0.627</b> (0.007)	<b>0.627</b> (0.007)	<b>0.627</b> (0.007)	<b>0.729</b> (0.006)	<b>0.729</b> (0.006)	<b>0.729</b> (0.006)
	clust	0.622 (0.025)	<b>0.637</b> (0.011)	0.555 (0.017)	<b>0.579</b> (0.016)	0.576 (0.021)	0.531 (0.002)	0.555 (0.018)	0.570 (0.018)	<b>0.653</b> (0.003)
	strict-lassclust	0.620 (0.031)	<b>0.624</b> (0.021)	0.561 (0.016)	<b>0.559</b> (0.017)	0.557 (0.023)	0.534 (0.007)	<b>0.643</b> (0.030)	0.583 (0.044)	0.577 (0.057)
	non-strict-lassclust	0.625 (0.027)	<b>0.642</b> (0.016)	0.550 (0.018)	<b>0.598</b> (0.020)	0.579 (0.028)	0.527 (0.004)	0.535 (0.020)	0.562 (0.015)	<b>0.655</b> (0.012)
	lassojoint	<b>0.993</b> (0.001)	<b>0.993</b> (0.001)	<b>0.993</b> (0.001)	0.943 (0.003)	<b>0.943</b> (0.003)	<b>0.943</b> (0.003)	<b>0.943</b> (0.003)	<b>0.943</b> (0.003)	0.943 (0.003)
0.8	naive	<b>0.988</b> (0.000)	<b>0.988</b> (0.000)	<b>0.988</b> (0.000)	<b>0.883</b> (0.005)	<b>0.883</b> (0.005)	<b>0.883</b> (0.005)	<b>0.890</b> (0.005)	<b>0.890</b> (0.005)	<b>0.890</b> (0.005)
	clust	0.580 (0.009)	0.575 (0.016)	<b>0.602</b> (0.012)	<b>0.564</b> (0.007)	0.553 (0.010)	0.477 (0.003)	0.519 (0.001)	0.525 (0.003)	<b>0.642</b> (0.002)
	strict-lassclust	0.586 (0.009)	0.596 (0.001)	<b>0.605</b> (0.010)	<b>0.573</b> (0.009)	0.568 (0.014)	0.479 (0.004)	0.441 (0.007)	0.338 (0.056)	<b>0.645</b> (0.001)
	non-strict-lassclust	0.581 (0.009)	0.579 (0.006)	<b>0.603</b> (0.013)	<b>0.567</b> (0.008)	0.547 (0.003)	0.478 (0.002)	0.547 (0.004)	0.548 (0.020)	<b>0.643</b> (0.002)
	lassojoint	0.974 (0.001)	<b>0.982</b> (0.003)	0.974 (0.000)	0.574 (0.003)	<b>0.618</b> (0.034)	0.576 (0.005)	0.692 (0.000)	<b>0.715</b> (0.022)	0.693 (0.004)

**Table 33.** Summary Statistics for df = bank-marketing; SCAR scheme

calc-c	method	AUC			ACC			F1			
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	
0.3	naive	<b>0.890 (0.023)</b>	<b>0.890 (0.023)</b>	<b>0.890 (0.023)</b>	<b>0.111 (0.006)</b>	<b>0.111 (0.006)</b>	<b>0.111 (0.006)</b>	<b>0.200 (0.010)</b>	<b>0.200 (0.010)</b>	<b>0.200 (0.010)</b>	
0.3	clust	0.712 (0.052)	<b>0.718 (0.049)</b>	<b>0.718 (0.049)</b>	<b>0.717 (0.013)</b>	0.713 (0.047)	0.623 (0.043)	0.349 (0.034)	<b>0.353 (0.035)</b>	0.305 (0.021)	
0.3	strict-lassclust	0.714 (0.049)	<b>0.718 (0.050)</b>	<b>0.718 (0.050)</b>	0.700 (0.106)	<b>0.711 (0.062)</b>	0.629 (0.028)	0.348 (0.037)	<b>0.354 (0.031)</b>	0.307 (0.019)	
0.3	non-strict-lassclust	0.706 (0.056)	0.715 (0.053)	<b>0.717 (0.050)</b>	0.693 (0.117)	<b>0.713 (0.065)</b>	0.628 (0.034)	0.344 (0.045)	<b>0.360 (0.065)</b>	0.307 (0.020)	
0.3	lassojoint	0.894 (0.032)	0.895 (0.032)	0.896 (0.023)	<b>0.802 (0.239)</b>	0.799 (0.241)	0.798 (0.243)	<b>0.440 (0.109)</b>	0.437 (0.110)	0.436 (0.110)	
0.5	naive	<b>0.910 (0.003)</b>	<b>0.910 (0.003)</b>	<b>0.910 (0.003)</b>	<b>0.407 (0.077)</b>	<b>0.407 (0.077)</b>	<b>0.407 (0.077)</b>	<b>0.265 (0.028)</b>	<b>0.265 (0.028)</b>	<b>0.265 (0.028)</b>	
0.5	clust	<b>0.739 (0.038)</b>	<b>0.739 (0.038)</b>	<b>0.739 (0.038)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	0.585 (0.104)	<b>0.339 (0.011)</b>	<b>0.339 (0.011)</b>	0.283 (0.026)
0.5	strict-lassclust	<b>0.740 (0.037)</b>	<b>0.740 (0.038)</b>	<b>0.740 (0.038)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	0.586 (0.099)	<b>0.339 (0.011)</b>	<b>0.339 (0.011)</b>	0.282 (0.026)
0.5	non-strict-lassclust	<b>0.739 (0.038)</b>	<b>0.739 (0.038)</b>	<b>0.739 (0.038)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	<b>0.714 (0.007)</b>	0.586 (0.099)	<b>0.339 (0.011)</b>	<b>0.339 (0.011)</b>	0.282 (0.026)
0.5	lassojoint	0.906 (0.006)	0.906 (0.006)	0.906 (0.006)	0.902 (0.003)	0.902 (0.004)	<b>0.902 (0.004)</b>	0.506 (0.029)	<b>0.509 (0.027)</b>	<b>0.509 (0.028)</b>	
0.8	naive	<b>0.920 (0.004)</b>	<b>0.920 (0.004)</b>	<b>0.920 (0.004)</b>	<b>0.909 (0.006)</b>	<b>0.909 (0.006)</b>	<b>0.909 (0.006)</b>	<b>0.547 (0.027)</b>	<b>0.547 (0.027)</b>	<b>0.547 (0.027)</b>	
0.8	clust	<b>0.680 (0.022)</b>	<b>0.680 (0.022)</b>	<b>0.680 (0.022)</b>	<b>0.708 (0.006)</b>	<b>0.708 (0.006)</b>	0.124 (0.033)	<b>0.349 (0.016)</b>	<b>0.349 (0.016)</b>	0.195 (0.010)	
0.8	strict-lassclust	<b>0.674 (0.031)</b>	0.673 (0.030)	<b>0.674 (0.033)</b>	<b>0.708 (0.006)</b>	<b>0.708 (0.006)</b>	0.133 (0.039)	<b>0.349 (0.016)</b>	<b>0.349 (0.016)</b>	0.196 (0.011)	
0.8	non-strict-lassclust	<b>0.669 (0.022)</b>	0.668 (0.020)	<b>0.669 (0.023)</b>	<b>0.708 (0.006)</b>	<b>0.708 (0.006)</b>	0.116 (0.021)	<b>0.349 (0.016)</b>	<b>0.349 (0.016)</b>	0.194 (0.007)	
0.8	lassojoint	0.920 (0.005)	<b>0.922 (0.005)</b>	0.921 (0.004)	<b>0.915 (0.004)</b>	0.912 (0.006)	<b>0.915 (0.004)</b>	0.511 (0.031)	0.487 (0.055)	<b>0.511 (0.032)</b>	

**Table 34.** Summary Statistics for df = banknote; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.997 (0.002)</b>	<b>0.997 (0.002)</b>	<b>0.997 (0.002)</b>	<b>0.462 (0.019)</b>	<b>0.462 (0.019)</b>	<b>0.462 (0.019)</b>	<b>0.624 (0.018)</b>	<b>0.624 (0.018)</b>	<b>0.624 (0.018)</b>
0.3	clust	0.671 (0.057)	0.669 (0.054)	<b>0.680 (0.040)</b>	<b>0.606 (0.077)</b>	0.588 (0.067)	0.586 (0.059)	0.547 (0.077)	0.539 (0.073)	<b>0.578 (0.033)</b>
0.3	strict-lassclust	<b>0.708 (0.110)</b>	0.678 (0.073)	0.677 (0.038)	<b>0.583 (0.061)</b>	0.580 (0.051)	0.580 (0.050)	<b>0.579 (0.127)</b>	0.560 (0.085)	0.575 (0.030)
0.3	non-strict-lassclust	0.663 (0.053)	0.665 (0.050)	<b>0.677 (0.038)</b>	0.577 (0.074)	0.573 (0.060)	<b>0.580 (0.050)</b>	0.562 (0.056)	0.547 (0.057)	<b>0.574 (0.030)</b>
0.3	lassojoint	<b>0.999 (0.001)</b>	<b>0.999 (0.001)</b>	<b>0.999 (0.001)</b>	<b>0.985 (0.007)</b>	<b>0.985 (0.007)</b>	<b>0.985 (0.007)</b>	<b>0.983 (0.008)</b>	<b>0.983 (0.008)</b>	<b>0.983 (0.008)</b>
0.5	naive	<b>0.997 (0.001)</b>	<b>0.997 (0.001)</b>	<b>0.997 (0.001)</b>	<b>0.723 (0.013)</b>	<b>0.723 (0.013)</b>	<b>0.723 (0.013)</b>	<b>0.757 (0.009)</b>	<b>0.757 (0.009)</b>	<b>0.757 (0.009)</b>
0.5	clust	<b>0.666 (0.020)</b>	0.658 (0.029)	0.663 (0.028)	<b>0.607 (0.029)</b>	0.590 (0.031)	0.565 (0.023)	0.535 (0.015)	0.537 (0.027)	<b>0.575 (0.018)</b>
0.5	strict-lassclust	<b>0.665 (0.022)</b>	0.656 (0.029)	0.660 (0.028)	<b>0.608 (0.031)</b>	0.587 (0.031)	0.561 (0.021)	0.535 (0.018)	0.535 (0.027)	<b>0.575 (0.018)</b>
0.5	non-strict-lassclust	<b>0.665 (0.022)</b>	0.655 (0.029)	0.660 (0.028)	<b>0.605 (0.030)</b>	0.586 (0.030)	0.561 (0.021)	0.534 (0.018)	0.535 (0.027)	<b>0.575 (0.018)</b>
0.5	lassojoint	<b>0.999 (0.000)</b>	<b>0.999 (0.000)</b>	<b>0.999 (0.000)</b>	<b>0.982 (0.006)</b>	<b>0.982 (0.006)</b>	<b>0.982 (0.006)</b>	<b>0.980 (0.007)</b>	<b>0.980 (0.007)</b>	<b>0.980 (0.007)</b>
0.8	naive	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	<b>0.949 (0.000)</b>	<b>0.949 (0.000)</b>	<b>0.949 (0.000)</b>	<b>0.945 (0.000)</b>	<b>0.945 (0.000)</b>	<b>0.945 (0.000)</b>
0.8	clust	0.651 (0.027)	<b>0.688 (0.017)</b>	0.687 (0.018)	0.590 (0.032)	<b>0.598 (0.022)</b>	0.522 (0.024)	0.563 (0.019)	0.588 (0.010)	<b>0.611 (0.005)</b>
0.8	strict-lassclust	<b>0.809 (0.005)</b>	0.681 (0.015)	0.681 (0.014)	0.562 (0.031)	<b>0.593 (0.020)</b>	0.529 (0.015)	<b>0.714 (0.014)</b>	0.584 (0.008)	0.618 (0.001)
0.8	non-strict-lassclust	0.622 (0.028)	<b>0.681 (0.015)</b>	<b>0.681 (0.014)</b>	0.553 (0.033)	<b>0.593 (0.020)</b>	0.529 (0.015)	0.612 (0.004)	0.584 (0.008)	<b>0.618 (0.001)</b>
0.8	lassojoint	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	<b>0.988 (0.000)</b>	0.981 (0.002)	0.981 (0.002)	<b>0.986 (0.001)</b>	0.978 (0.002)	0.978 (0.002)

**Table 35.** Summary Statistics for df = breastc; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.984 (0.011)</b>	<b>0.984 (0.011)</b>	<b>0.984 (0.011)</b>	<b>0.348 (0.031)</b>	<b>0.348 (0.031)</b>	<b>0.348 (0.031)</b>	<b>0.514 (0.034)</b>	<b>0.514 (0.034)</b>	<b>0.514 (0.034)</b>
0.3	clust	0.975 (0.022)	0.976 (0.022)	<b>0.979 (0.020)</b>	0.956 (0.012)	0.957 (0.012)	<b>0.964 (0.013)</b>	0.935 (0.018)	0.936 (0.019)	<b>0.947 (0.020)</b>
0.3	strict-lassclust	<b>0.995 (0.003)</b>	0.994 (0.003)	0.994 (0.003)	0.962 (0.012)	0.962 (0.012)	<b>0.966 (0.016)</b>	0.944 (0.018)	0.944 (0.018)	<b>0.951 (0.023)</b>
0.3	non-strict-lassclust	<b>0.995 (0.003)</b>	0.994 (0.003)	0.994 (0.003)	0.962 (0.011)	0.963 (0.011)	<b>0.966 (0.016)</b>	0.944 (0.018)	0.945 (0.017)	<b>0.951 (0.023)</b>
0.3	lassojoint	0.982 (0.016)	<b>0.983 (0.015)</b>	<b>0.983 (0.016)</b>	<b>0.879 (0.176)</b>	0.868 (0.191)	0.868 (0.191)	<b>0.875 (0.125)</b>	0.867 (0.134)	0.867 (0.134)
0.5	naive	<b>0.993 (0.003)</b>	<b>0.993 (0.003)</b>	<b>0.993 (0.003)</b>	<b>0.706 (0.032)</b>	<b>0.706 (0.032)</b>	<b>0.706 (0.032)</b>	<b>0.691 (0.024)</b>	<b>0.691 (0.024)</b>	<b>0.691 (0.024)</b>
0.5	clust	<b>0.991 (0.008)</b>	<b>0.991 (0.007)</b>	0.988 (0.009)	0.966 (0.007)	<b>0.970 (0.006)</b>	0.963 (0.006)	0.949 (0.012)	<b>0.955 (0.010)</b>	0.946 (0.008)
0.5	strict-lassclust	<b>0.997 (0.001)</b>	0.996 (0.001)	0.995 (0.001)	<b>0.978 (0.004)</b>	<b>0.978 (0.006)</b>	0.965 (0.006)	<b>0.968 (0.007)</b>	0.967 (0.008)	0.949 (0.009)
0.5	non-strict-lassclust	<b>0.997 (0.001)</b>	0.996 (0.001)	0.995 (0.001)	<b>0.978 (0.004)</b>	<b>0.978 (0.006)</b>	0.965 (0.006)	<b>0.968 (0.007)</b>	0.967 (0.008)	0.949 (0.009)
0.5	lassojoint	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	<b>0.958 (0.010)</b>	<b>0.958 (0.010)</b>	<b>0.958 (0.010)</b>	0.940 (0.014)	<b>0.940 (0.014)</b>	<b>0.940 (0.014)</b>
0.8	naive	<b>0.992 (0.003)</b>	<b>0.992 (0.003)</b>	<b>0.992 (0.003)</b>	<b>0.941 (0.015)</b>	<b>0.941 (0.015)</b>	<b>0.941 (0.015)</b>	<b>0.921 (0.016)</b>	<b>0.921 (0.016)</b>	<b>0.921 (0.016)</b>
0.8	clust	<b>0.962 (0.015)</b>	0.961 (0.021)	<b>0.962 (0.016)</b>	0.957 (0.007)	<b>0.959 (0.009)</b>	0.940 (0.038)	0.936 (0.012)	<b>0.941 (0.018)</b>	0.919 (0.047)
0.8	strict-lassclust	<b>0.992 (0.002)</b>	0.991 (0.003)	0.988 (0.004)	0.963 (0.006)	<b>0.967 (0.005)</b>	0.867 (0.083)	0.945 (0.009)	<b>0.953 (0.008)</b>	0.841 (0.078)
0.8	non-strict-lassclust	<b>0.992 (0.002)</b>	0.991 (0.003)	0.988 (0.004)	0.963 (0.006)	<b>0.967 (0.005)</b>	0.867 (0.083)	0.945 (0.009)	<b>0.953 (0.008)</b>	0.841 (0.078)
0.8	lassojoint	0.993 (0.002)	<b>0.993 (0.002)</b>	<b>0.993 (0.002)</b>	<b>0.964 (0.005)</b>	0.934 (0.134)	0.934 (0.134)	<b>0.950 (0.005)</b>	0.929 (0.094)	0.929 (0.094)

**Table 36.** Summary Statistics for df = credit-a; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.813 (0.030)</b>	<b>0.813 (0.030)</b>	<b>0.813 (0.030)</b>	<b>0.457 (0.029)</b>	<b>0.457 (0.029)</b>	<b>0.457 (0.029)</b>	<b>0.626 (0.027)</b>	<b>0.626 (0.027)</b>	<b>0.626 (0.027)</b>
	clust	0.741 (0.055)	0.742 (0.055)	<b>0.752 (0.048)</b>	0.637 (0.033)	0.638 (0.032)	<b>0.659 (0.029)</b>	0.400 (0.062)	0.403 (0.061)	<b>0.477 (0.064)</b>
	strict-lassclust	0.756 (0.033)	0.758 (0.034)	<b>0.762 (0.033)</b>	0.636 (0.034)	0.637 (0.033)	<b>0.652 (0.031)</b>	0.393 (0.066)	0.396 (0.064)	<b>0.451 (0.065)</b>
	non-strict-lassclust	0.756 (0.033)	0.758 (0.034)	<b>0.762 (0.033)</b>	0.636 (0.034)	0.637 (0.033)	<b>0.652 (0.031)</b>	0.392 (0.064)	0.395 (0.063)	<b>0.451 (0.065)</b>
	lassojoint	<b>0.808 (0.033)</b>	0.807 (0.033)	<b>0.808 (0.032)</b>	0.570 (0.137)	0.573 (0.138)	<b>0.575 (0.139)</b>	0.642 (0.046)	0.642 (0.046)	<b>0.643 (0.048)</b>
0.5	naive	<b>0.800 (0.017)</b>	<b>0.800 (0.017)</b>	<b>0.800 (0.017)</b>	<b>0.450 (0.007)</b>	<b>0.450 (0.007)</b>	<b>0.450 (0.007)</b>	<b>0.618 (0.007)</b>	<b>0.618 (0.007)</b>	<b>0.618 (0.007)</b>
	clust	0.745 (0.005)	0.747 (0.006)	<b>0.750 (0.006)</b>	0.621 (0.004)	0.621 (0.002)	<b>0.648 (0.012)</b>	0.312 (0.013)	0.313 (0.008)	<b>0.425 (0.057)</b>
	strict-lassclust	0.751 (0.006)	0.753 (0.007)	<b>0.756 (0.007)</b>	0.612 (0.006)	0.613 (0.007)	<b>0.634 (0.009)</b>	0.276 (0.015)	0.276 (0.017)	<b>0.356 (0.047)</b>
	non-strict-lassclust	0.751 (0.006)	0.753 (0.007)	<b>0.756 (0.007)</b>	0.612 (0.006)	0.613 (0.007)	<b>0.634 (0.009)</b>	0.276 (0.015)	0.276 (0.017)	<b>0.356 (0.047)</b>
	lassojoint	0.800 (0.018)	0.800 (0.017)	<b>0.804 (0.015)</b>	<b>0.481 (0.093)</b>	0.480 (0.092)	0.480 (0.092)	<b>0.620 (0.008)</b>	<b>0.620 (0.008)</b>	<b>0.620 (0.008)</b>
0.8	naive	<b>0.837 (0.000)</b>	<b>0.837 (0.000)</b>	<b>0.837 (0.000)</b>	<b>0.764 (0.000)</b>	<b>0.764 (0.000)</b>	<b>0.764 (0.000)</b>	<b>0.744 (0.000)</b>	<b>0.744 (0.000)</b>	<b>0.744 (0.000)</b>
	clust	0.794 (0.000)	0.797 (0.000)	<b>0.804 (0.000)</b>	0.636 (0.000)	0.636 (0.000)	<b>0.744 (0.000)</b>	0.403 (0.000)	0.403 (0.000)	<b>0.719 (0.000)</b>
	strict-lassclust	0.794 (0.000)	0.798 (0.000)	<b>0.807 (0.000)</b>	0.631 (0.000)	0.631 (0.000)	<b>0.733 (0.000)</b>	0.379 (0.000)	0.379 (0.000)	<b>0.683 (0.000)</b>
	non-strict-lassclust	0.794 (0.000)	0.798 (0.000)	<b>0.807 (0.000)</b>	0.631 (0.000)	0.631 (0.000)	<b>0.733 (0.000)</b>	0.379 (0.000)	0.379 (0.000)	<b>0.683 (0.000)</b>
	lassojoint	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>	<b>0.713 (0.000)</b>	<b>0.713 (0.000)</b>	<b>0.713 (0.000)</b>	<b>0.743 (0.000)</b>	<b>0.743 (0.000)</b>	<b>0.743 (0.000)</b>

**Table 37.** Summary Statistics for df = credit-g; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.679 (0.042)</b>	<b>0.679 (0.042)</b>	<b>0.679 (0.042)</b>	<b>0.299 (0.023)</b>	<b>0.299 (0.023)</b>	<b>0.299 (0.023)</b>	<b>0.460 (0.027)</b>	<b>0.460 (0.027)</b>	<b>0.460 (0.027)</b>
	clust	0.617 (0.045)	0.618 (0.041)	<b>0.619 (0.034)</b>	0.648 (0.107)	<b>0.667 (0.084)</b>	0.631 (0.096)	0.370 (0.049)	0.371 (0.044)	<b>0.414 (0.040)</b>
	strict-lassclust	0.613 (0.042)	<b>0.619 (0.035)</b>	0.617 (0.034)	0.646 (0.111)	<b>0.659 (0.099)</b>	0.637 (0.100)	0.381 (0.094)	0.367 (0.050)	<b>0.409 (0.056)</b>
	non-strict-lassclust	0.617 (0.049)	0.617 (0.043)	<b>0.619 (0.034)</b>	0.655 (0.103)	<b>0.670 (0.081)</b>	0.636 (0.103)	0.353 (0.050)	0.360 (0.041)	<b>0.403 (0.053)</b>
	lassojoint	<b>0.662 (0.063)</b>	0.661 (0.066)	0.652 (0.074)	<b>0.596 (0.178)</b>	<b>0.596 (0.179)</b>	<b>0.596 (0.179)</b>	0.420 (0.133)	0.417 (0.138)	<b>0.436 (0.147)</b>
0.5	naive	<b>0.748 (0.011)</b>	<b>0.748 (0.011)</b>	<b>0.748 (0.011)</b>	<b>0.387 (0.029)</b>	<b>0.387 (0.029)</b>	<b>0.387 (0.029)</b>	<b>0.476 (0.017)</b>	<b>0.476 (0.017)</b>	<b>0.476 (0.017)</b>
	clust	0.621 (0.023)	<b>0.666 (0.038)</b>	0.639 (0.012)	0.729 (0.020)	<b>0.733 (0.018)</b>	0.636 (0.021)	0.448 (0.060)	0.430 (0.033)	<b>0.457 (0.020)</b>
	strict-lassclust	0.630 (0.021)	<b>0.676 (0.028)</b>	0.643 (0.013)	<b>0.739 (0.022)</b>	<b>0.739 (0.016)</b>	0.653 (0.026)	0.444 (0.070)	0.424 (0.040)	<b>0.451 (0.021)</b>
	non-strict-lassclust	0.624 (0.020)	<b>0.666 (0.037)</b>	0.644 (0.010)	0.734 (0.022)	<b>0.735 (0.017)</b>	0.656 (0.021)	0.449 (0.063)	0.432 (0.042)	<b>0.452 (0.023)</b>
	lassojoint	<b>0.741 (0.018)</b>	<b>0.741 (0.018)</b>	<b>0.741 (0.018)</b>	<b>0.349 (0.148)</b>	<b>0.349 (0.148)</b>	<b>0.349 (0.148)</b>	<b>0.424 (0.068)</b>	<b>0.424 (0.068)</b>	<b>0.424 (0.068)</b>
0.8	naive	<b>0.751 (0.022)</b>	<b>0.751 (0.022)</b>	<b>0.751 (0.022)</b>	<b>0.754 (0.017)</b>	<b>0.754 (0.017)</b>	<b>0.754 (0.017)</b>	<b>0.584 (0.002)</b>	<b>0.584 (0.002)</b>	<b>0.584 (0.002)</b>
	clust	0.579 (0.023)	0.586 (0.023)	<b>0.592 (0.022)</b>	0.684 (0.014)	<b>0.687 (0.007)</b>	0.366 (0.028)	0.350 (0.023)	0.343 (0.019)	<b>0.454 (0.011)</b>
	strict-lassclust	0.602 (0.033)	0.609 (0.033)	<b>0.623 (0.037)</b>	0.697 (0.017)	<b>0.698 (0.015)</b>	0.454 (0.075)	0.341 (0.017)	0.342 (0.016)	<b>0.469 (0.021)</b>
	non-strict-lassclust	0.588 (0.029)	0.596 (0.021)	<b>0.611 (0.026)</b>	0.682 (0.015)	<b>0.690 (0.007)</b>	0.418 (0.040)	0.344 (0.020)	0.345 (0.019)	<b>0.464 (0.016)</b>
	lassojoint	0.731 (0.006)	0.731 (0.006)	<b>0.735 (0.010)</b>	0.725 (0.002)	0.725 (0.002)	<b>0.727 (0.004)</b>	<b>0.226 (0.016)</b>	<b>0.226 (0.016)</b>	0.220 (0.010)

**Table 38.** Summary Statistics for df = dhfr; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.592 (0.074)</b>	<b>0.592 (0.074)</b>	<b>0.592 (0.074)</b>	<b>0.534 (0.083)</b>	<b>0.534 (0.083)</b>	<b>0.534 (0.083)</b>	<b>0.559 (0.068)</b>	<b>0.559 (0.068)</b>	<b>0.559 (0.068)</b>
	clust	<b>0.639 (0.081)</b>	0.603 (0.075)	0.521 (0.117)	<b>0.505 (0.177)</b>	<b>0.505 (0.149)</b>	0.504 (0.164)	0.438 (0.090)	0.436 (0.079)	<b>0.475 (0.036)</b>
	strict-lassclust	0.617 (0.058)	<b>0.628 (0.062)</b>	0.622 (0.072)	0.547 (0.155)	<b>0.571 (0.105)</b>	0.566 (0.092)	<b>0.645 (0.125)</b>	0.635 (0.139)	0.525 (0.122)
	non-strict-lassclust	0.688 (0.066)	<b>0.703 (0.081)</b>	0.614 (0.077)	<b>0.637 (0.100)</b>	0.631 (0.113)	0.534 (0.094)	<b>0.509 (0.178)</b>	0.492 (0.200)	0.486 (0.081)
	lassojoint	<b>0.866 (0.047)</b>	0.831 (0.121)	0.837 (0.095)	<b>0.659 (0.174)</b>	0.585 (0.200)	0.643 (0.175)	<b>0.675 (0.095)</b>	0.640 (0.097)	0.646 (0.122)
0.5	naive	<b>0.647 (0.012)</b>	<b>0.647 (0.012)</b>	<b>0.647 (0.012)</b>	<b>0.596 (0.014)</b>	<b>0.596 (0.014)</b>	<b>0.596 (0.014)</b>	<b>0.631 (0.003)</b>	<b>0.631 (0.003)</b>	<b>0.631 (0.003)</b>
	clust	<b>0.531 (0.023)</b>	0.525 (0.010)	0.476 (0.009)	<b>0.497 (0.047)</b>	0.481 (0.013)	0.443 (0.023)	0.430 (0.023)	0.423 (0.039)	<b>0.465 (0.038)</b>
	strict-lassclust	0.603 (0.045)	0.545 (0.073)	<b>0.685 (0.022)</b>	<b>0.640 (0.021)</b>	0.591 (0.028)	0.460 (0.013)	0.265 (0.271)	<b>0.680 (0.123)</b>	0.546 (0.028)
	non-strict-lassclust	0.795 (0.081)	<b>0.808 (0.106)</b>	0.685 (0.032)	<b>0.725 (0.179)</b>	0.681 (0.098)	0.527 (0.056)	<b>0.712 (0.117)</b>	0.654 (0.115)	0.516 (0.004)
	lassojoint	0.951 (0.015)	<b>0.954 (0.022)</b>	<b>0.954 (0.027)</b>	0.710 (0.130)	0.748 (0.077)	<b>0.783 (0.048)</b>	0.737 (0.074)	0.755 (0.053)	<b>0.776 (0.027)</b>
0.8	naive	<b>0.652 (0.000)</b>	<b>0.652 (0.000)</b>	<b>0.652 (0.000)</b>	<b>0.619 (0.000)</b>	<b>0.619 (0.000)</b>	<b>0.619 (0.000)</b>	<b>0.584 (0.000)</b>	<b>0.584 (0.000)</b>	<b>0.584 (0.000)</b>
	clust	<b>0.556 (0.000)</b>	0.522 (0.000)	0.481 (0.000)	0.474 (0.000)	<b>0.526 (0.000)</b>	0.443 (0.000)	0.354 (0.000)	0.410 (0.000)	<b>0.426 (0.000)</b>
	strict-lassclust	0.500 (0.000)	<b>0.658 (0.000)</b>	<b>0.658 (0.000)</b>	<b>0.649 (0.000)</b>	0.567 (0.000)	0.412 (0.000)	<b>0.788 (0.000)</b>	0.512 (0.000)	0.513 (0.000)
	non-strict-lassclust	<b>0.710 (0.000)</b>	0.661 (0.000)	0.658 (0.000)	<b>0.722 (0.000)</b>	0.567 (0.000)	0.423 (0.000)	<b>0.597 (0.000)</b>	0.488 (0.000)	0.517 (0.000)
	lassojoint	0.929 (0.000)	<b>0.943 (0.000)</b>	0.929 (0.000)	0.660 (0.000)	<b>0.887 (0.000)</b>	0.567 (0.000)	0.667 (0.000)	<b>0.836 (0.000)</b>	0.611 (0.000)

**Table 39.** Summary Statistics for df = diabetes; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.794 (0.032)</b>	<b>0.794 (0.032)</b>	<b>0.794 (0.032)</b>	<b>0.352 (0.030)</b>	<b>0.352 (0.030)</b>	<b>0.352 (0.030)</b>	<b>0.516 (0.032)</b>	<b>0.516 (0.032)</b>	<b>0.516 (0.032)</b>
0.3	clust	0.729 (0.046)	<b>0.731 (0.047)</b>	0.727 (0.049)	<b>0.684 (0.033)</b>	0.682 (0.038)	0.626 (0.055)	0.570 (0.055)	0.572 (0.057)	<b>0.595 (0.049)</b>
0.3	strict-lassclust	0.725 (0.046)	<b>0.727 (0.045)</b>	0.725 (0.050)	<b>0.686 (0.031)</b>	0.682 (0.030)	0.634 (0.058)	0.541 (0.132)	0.526 (0.139)	<b>0.588 (0.055)</b>
0.3	non-strict-lassclust	0.732 (0.045)	<b>0.733 (0.047)</b>	0.731 (0.049)	<b>0.674 (0.048)</b>	0.671 (0.048)	0.610 (0.070)	0.578 (0.054)	0.581 (0.053)	<b>0.591 (0.047)</b>
0.3	lassojoint	0.796 (0.043)	<b>0.800 (0.032)</b>	<b>0.800 (0.033)</b>	0.682 (0.128)	<b>0.685 (0.124)</b>	0.684 (0.129)	0.593 (0.063)	<b>0.597 (0.061)</b>	0.595 (0.062)
0.5	naive	<b>0.791 (0.014)</b>	<b>0.791 (0.014)</b>	<b>0.791 (0.014)</b>	<b>0.533 (0.037)</b>	<b>0.533 (0.037)</b>	<b>0.533 (0.037)</b>	<b>0.588 (0.025)</b>	<b>0.588 (0.025)</b>	<b>0.588 (0.025)</b>
0.5	clust	<b>0.733 (0.046)</b>	0.730 (0.027)	0.723 (0.022)	<b>0.699 (0.036)</b>	0.684 (0.023)	0.551 (0.067)	0.584 (0.066)	0.563 (0.048)	<b>0.594 (0.033)</b>
0.5	strict-lassclust	0.682 (0.041)	0.720 (0.026)	<b>0.723 (0.021)</b>	0.653 (0.027)	<b>0.678 (0.023)</b>	0.539 (0.066)	<b>0.653 (0.137)</b>	0.543 (0.083)	0.590 (0.033)
0.5	non-strict-lassclust	<b>0.738 (0.049)</b>	0.734 (0.024)	0.725 (0.020)	0.669 (0.024)	<b>0.687 (0.019)</b>	0.535 (0.068)	0.599 (0.074)	<b>0.610 (0.039)</b>	0.588 (0.033)
0.5	lassojoint	<b>0.791 (0.015)</b>	<b>0.791 (0.015)</b>	<b>0.791 (0.015)</b>	<b>0.707 (0.041)</b>	0.705 (0.039)	<b>0.707 (0.041)</b>	<b>0.639 (0.012)</b>	<b>0.639 (0.013)</b>	<b>0.639 (0.012)</b>
0.8	naive	<b>0.797 (0.019)</b>	<b>0.797 (0.019)</b>	<b>0.797 (0.019)</b>	<b>0.724 (0.016)</b>	<b>0.724 (0.016)</b>	<b>0.724 (0.016)</b>	<b>0.653 (0.016)</b>	<b>0.653 (0.016)</b>	<b>0.653 (0.016)</b>
0.8	clust	<b>0.732 (0.013)</b>	0.716 (0.037)	0.712 (0.037)	<b>0.678 (0.015)</b>	0.666 (0.032)	0.346 (0.008)	<b>0.532 (0.009)</b>	0.512 (0.042)	0.507 (0.014)
0.8	strict-lassclust	<b>0.725 (0.010)</b>	0.709 (0.042)	0.703 (0.042)	0.671 (0.017)	<b>0.675 (0.033)</b>	0.348 (0.005)	0.193 (0.202)	0.499 (0.023)	<b>0.510 (0.015)</b>
0.8	non-strict-lassclust	<b>0.731 (0.012)</b>	0.712 (0.045)	0.707 (0.047)	<b>0.675 (0.018)</b>	0.672 (0.030)	0.344 (0.011)	<b>0.592 (0.048)</b>	0.534 (0.061)	0.509 (0.016)
0.8	lassojoint	<b>0.798 (0.015)</b>	<b>0.798 (0.015)</b>	<b>0.798 (0.015)</b>	0.353 (0.016)	<b>0.353 (0.016)</b>	0.352 (0.016)	0.512 (0.016)	<b>0.512 (0.016)</b>	<b>0.512 (0.016)</b>

**Table 40.** Summary Statistics for df = heart-c; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.708 (0.065)</b>	<b>0.708 (0.065)</b>	<b>0.708 (0.065)</b>	<b>0.466 (0.040)</b>	<b>0.466 (0.040)</b>	<b>0.466 (0.040)</b>	<b>0.633 (0.038)</b>	<b>0.633 (0.038)</b>	<b>0.633 (0.038)</b>
0.3	clust	0.696 (0.064)	0.706 (0.058)	<b>0.710 (0.055)</b>	0.630 (0.096)	<b>0.656 (0.064)</b>	0.603 (0.062)	0.621 (0.127)	0.664 (0.062)	<b>0.674 (0.058)</b>
0.3	strict-lassclust	0.696 (0.062)	0.705 (0.058)	<b>0.708 (0.055)</b>	0.627 (0.099)	<b>0.653 (0.067)</b>	0.600 (0.060)	0.611 (0.139)	0.661 (0.064)	<b>0.673 (0.058)</b>
0.3	non-strict-lassclust	0.696 (0.061)	0.704 (0.058)	<b>0.708 (0.055)</b>	0.626 (0.100)	<b>0.654 (0.065)</b>	0.600 (0.060)	0.606 (0.150)	0.662 (0.064)	<b>0.673 (0.058)</b>
0.3	lassojoint	0.671 (0.101)	<b>0.678 (0.103)</b>	0.677 (0.102)	0.554 (0.091)	0.554 (0.096)	<b>0.563 (0.096)</b>	0.616 (0.098)	<b>0.617 (0.099)</b>	0.608 (0.112)
0.5	naive	<b>0.739 (0.003)</b>	<b>0.739 (0.003)</b>	<b>0.739 (0.003)</b>	<b>0.433 (0.003)</b>	<b>0.433 (0.003)</b>	<b>0.433 (0.003)</b>	<b>0.605 (0.003)</b>	<b>0.605 (0.003)</b>	<b>0.605 (0.003)</b>
0.5	clust	0.715 (0.003)	0.725 (0.002)	<b>0.731 (0.005)</b>	<b>0.600 (0.001)</b>	<b>0.600 (0.001)</b>	0.456 (0.000)	0.640 (0.002)	<b>0.647 (0.001)</b>	0.608 (0.002)
0.5	strict-lassclust	0.714 (0.003)	0.723 (0.002)	<b>0.731 (0.005)</b>	<b>0.600 (0.001)</b>	0.589 (0.001)	0.444 (0.000)	0.640 (0.001)	<b>0.641 (0.002)</b>	0.603 (0.002)
0.5	non-strict-lassclust	0.714 (0.003)	0.723 (0.002)	<b>0.731 (0.005)</b>	<b>0.600 (0.001)</b>	0.589 (0.001)	0.444 (0.000)	0.640 (0.001)	<b>0.641 (0.002)</b>	0.603 (0.002)
0.5	lassojoint	0.727 (0.006)	<b>0.735 (0.005)</b>	0.727 (0.006)	<b>0.686 (0.029)</b>	0.598 (0.020)	<b>0.686 (0.029)</b>	<b>0.631 (0.006)</b>	0.617 (0.005)	<b>0.631 (0.006)</b>
0.8	naive	<b>0.746 (0.000)</b>	<b>0.746 (0.000)</b>	<b>0.746 (0.000)</b>	<b>0.611 (0.002)</b>	<b>0.611 (0.002)</b>	<b>0.611 (0.002)</b>	<b>0.599 (0.007)</b>	<b>0.599 (0.007)</b>	<b>0.599 (0.007)</b>
0.8	clust	0.773 (0.003)	0.784 (0.004)	<b>0.792 (0.005)</b>	0.711 (0.001)	<b>0.744 (0.002)</b>	0.400 (0.003)	0.650 (0.005)	<b>0.701 (0.002)</b>	0.571 (0.003)
0.8	strict-lassclust	0.773 (0.003)	0.782 (0.004)	<b>0.793 (0.005)</b>	<b>0.733 (0.003)</b>	<b>0.733 (0.001)</b>	0.400 (0.003)	0.684 (0.002)	<b>0.692 (0.003)</b>	0.571 (0.003)
0.8	non-strict-lassclust	0.773 (0.003)	0.782 (0.004)	<b>0.793 (0.005)</b>	<b>0.733 (0.003)</b>	<b>0.733 (0.001)</b>	0.400 (0.003)	0.684 (0.002)	<b>0.692 (0.003)</b>	0.571 (0.003)
0.8	lassojoint	<b>0.777 (0.003)</b>	<b>0.777 (0.003)</b>	<b>0.777 (0.003)</b>	<b>0.777 (0.011)</b>	<b>0.777 (0.011)</b>	<b>0.777 (0.011)</b>	<b>0.696 (0.014)</b>	<b>0.696 (0.014)</b>	<b>0.696 (0.014)</b>

**Table 41.** Summary Statistics for df = qsar-biodeg; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.815 (0.031)</b>	<b>0.815 (0.031)</b>	<b>0.815 (0.031)</b>	<b>0.372 (0.025)</b>	<b>0.372 (0.025)</b>	<b>0.372 (0.025)</b>	<b>0.516 (0.024)</b>	<b>0.516 (0.024)</b>	<b>0.516 (0.024)</b>
0.3	clust	<b>0.785 (0.026)</b>	0.784 (0.026)	0.778 (0.028)	<b>0.668 (0.032)</b>	0.661 (0.033)	0.546 (0.044)	<b>0.632 (0.031)</b>	0.629 (0.030)	0.583 (0.030)
0.3	strict-lassclust	<b>0.783 (0.030)</b>	<b>0.783 (0.029)</b>	0.781 (0.030)	<b>0.643 (0.076)</b>	0.642 (0.069)	0.543 (0.090)	0.583 (0.133)	<b>0.584 (0.120)</b>	0.551 (0.109)
0.3	non-strict-lassclust	<b>0.777 (0.052)</b>	<b>0.777 (0.045)</b>	0.773 (0.039)	<b>0.618 (0.114)</b>	0.614 (0.111)	0.506 (0.076)	0.604 (0.055)	<b>0.606 (0.052)</b>	0.568 (0.038)
0.3	lassojoint	0.837 (0.063)	<b>0.845 (0.039)</b>	0.841 (0.052)	0.754 (0.094)	<b>0.759 (0.089)</b>	0.746 (0.104)	<b>0.679 (0.059)</b>	0.678 (0.053)	0.674 (0.058)
0.5	naive	<b>0.866 (0.008)</b>	<b>0.866 (0.008)</b>	<b>0.866 (0.008)</b>	<b>0.512 (0.026)</b>	<b>0.512 (0.026)</b>	<b>0.512 (0.026)</b>	<b>0.583 (0.015)</b>	<b>0.583 (0.015)</b>	<b>0.583 (0.015)</b>
0.5	clust	<b>0.807 (0.015)</b>	0.802 (0.018)	0.798 (0.020)	<b>0.722 (0.017)</b>	0.709 (0.020)	0.582 (0.021)	<b>0.678 (0.014)</b>	0.673 (0.014)	0.617 (0.016)
0.5	strict-lassclust	0.814 (0.007)	0.809 (0.024)	<b>0.818 (0.014)</b>	<b>0.699 (0.032)</b>	0.677 (0.021)	0.626 (0.058)	<b>0.658 (0.016)</b>	0.654 (0.008)	0.633 (0.033)
0.5	non-strict-lassclust	0.801 (0.042)	<b>0.817 (0.017)</b>	0.772 (0.046)	0.691 (0.056)	<b>0.715 (0.066)</b>	0.466 (0.088)	<b>0.663 (0.031)</b>	0.661 (0.037)	0.566 (0.034)
0.5	lassojoint	0.874 (0.014)	<b>0.878 (0.018)</b>	0.877 (0.013)	0.723 (0.181)	<b>0.832 (0.020)</b>	<b>0.832 (0.013)</b>	0.702 (0.097)	0.751 (0.031)	<b>0.753 (0.025)</b>
0.8	naive	<b>0.904 (0.000)</b>	<b>0.904 (0.000)</b>	<b>0.904 (0.000)</b>	<b>0.807 (0.000)</b>	<b>0.807 (0.000)</b>	<b>0.807 (0.000)</b>	<b>0.775 (0.000)</b>	<b>0.775 (0.000)</b>	<b>0.775 (0.000)</b>
0.8	clust	<b>0.827 (0.000)</b>	0.811 (0.000)	0.807 (0.000)	<b>0.728 (0.000)</b>	0.684 (0.000)	0.522 (0.000)	<b>0.695 (0.000)</b>	0.677 (0.000)	0.612 (0.000)
0.8	strict-lassclust	0.802 (0.000)	<b>0.813 (0.000)</b>	0.806 (0.000)	0.633 (0.000)	<b>0.649 (0.000)</b>	0.443 (0.000)	0.659 (0.000)	<b>0.661 (0.000)</b>	0.577 (0.000)
0.8	non-strict-lassclust	<b>0.835 (0.000)</b>	0.813 (0.000)	0.806 (0.000)	<b>0.769 (0.000)</b>	0.658 (0.000)	0.440 (0.000)	<b>0.700 (0.000)</b>	0.667 (0.000)	0.576 (0.000)
0.8	lassojoint	<b>0.917 (0.000)</b>	<b>0.917 (0.000)</b>	0.916 (0.000)	<b>0.851 (0.000)</b>	<b>0.851 (0.000)</b>	<b>0.851 (0.000)</b>	<b>0.798 (0.000)</b>	<b>0.798 (0.000)</b>	0.795 (0.000)

**Table 42.** Summary Statistics for df = spambase; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.936 (0.010)</b>	<b>0.936 (0.010)</b>	<b>0.936 (0.010)</b>	<b>0.397 (0.011)</b>	<b>0.397 (0.011)</b>	<b>0.397 (0.011)</b>	<b>0.565 (0.011)</b>	<b>0.565 (0.011)</b>	<b>0.565 (0.011)</b>
	clust	0.888 (0.053)	0.891 (0.041)	<b>0.896 (0.068)</b>	0.789 (0.136)	<b>0.814 (0.110)</b>	0.803 (0.148)	0.757 (0.078)	0.776 (0.059)	<b>0.787 (0.085)</b>
	strict-lassclust	0.889 (0.043)	0.898 (0.032)	<b>0.906 (0.028)</b>	0.778 (0.136)	<b>0.803 (0.106)</b>	0.792 (0.158)	0.713 (0.162)	0.724 (0.158)	<b>0.783 (0.089)</b>
	non-strict-lassclust	0.911 (0.012)	<b>0.913 (0.010)</b>	0.912 (0.020)	0.790 (0.133)	<b>0.816 (0.103)</b>	0.794 (0.156)	0.762 (0.071)	0.776 (0.056)	<b>0.783 (0.088)</b>
	lassojoint	<b>0.946 (0.011)</b>	<b>0.946 (0.011)</b>	<b>0.946 (0.012)</b>	<b>0.872 (0.100)</b>	0.864 (0.119)	0.863 (0.119)	<b>0.852 (0.063)</b>	0.848 (0.073)	0.846 (0.074)
0.5	naive	<b>0.956 (0.004)</b>	<b>0.956 (0.004)</b>	<b>0.956 (0.004)</b>	<b>0.530 (0.025)</b>	<b>0.530 (0.025)</b>	<b>0.530 (0.025)</b>	<b>0.631 (0.012)</b>	<b>0.631 (0.012)</b>	<b>0.631 (0.012)</b>
	clust	0.894 (0.062)	0.903 (0.046)	<b>0.918 (0.036)</b>	0.831 (0.022)	0.840 (0.012)	<b>0.864 (0.021)</b>	0.757 (0.046)	0.778 (0.024)	<b>0.828 (0.036)</b>
	strict-lassclust	0.907 (0.006)	0.903 (0.018)	<b>0.916 (0.005)</b>	0.834 (0.012)	0.800 (0.085)	<b>0.855 (0.027)</b>	0.766 (0.021)	0.658 (0.260)	<b>0.827 (0.022)</b>
	non-strict-lassclust	0.908 (0.006)	0.911 (0.005)	<b>0.916 (0.006)</b>	0.833 (0.012)	0.835 (0.011)	<b>0.856 (0.028)</b>	0.764 (0.022)	0.773 (0.022)	<b>0.827 (0.022)</b>
	lassojoint	0.967 (0.004)	0.967 (0.004)	<b>0.968 (0.004)</b>	<b>0.919 (0.006)</b>	0.917 (0.006)	0.918 (0.006)	<b>0.898 (0.008)</b>	0.897 (0.008)	0.897 (0.008)
0.8	naive	<b>0.963 (0.001)</b>	<b>0.963 (0.001)</b>	<b>0.963 (0.001)</b>	<b>0.913 (0.003)</b>	<b>0.913 (0.003)</b>	<b>0.913 (0.003)</b>	<b>0.894 (0.003)</b>	<b>0.894 (0.003)</b>	<b>0.894 (0.003)</b>
	clust	<b>0.886 (0.045)</b>	0.854 (0.055)	0.851 (0.053)	0.703 (0.062)	<b>0.834 (0.063)</b>	0.724 (0.088)	0.713 (0.027)	<b>0.790 (0.032)</b>	0.737 (0.049)
	strict-lassclust	0.817 (0.038)	0.877 (0.045)	<b>0.907 (0.018)</b>	0.751 (0.055)	<b>0.801 (0.080)</b>	0.619 (0.047)	0.689 (0.027)	<b>0.709 (0.129)</b>	0.671 (0.021)
	non-strict-lassclust	0.894 (0.040)	0.897 (0.042)	<b>0.910 (0.004)</b>	0.703 (0.061)	<b>0.834 (0.063)</b>	0.620 (0.048)	0.715 (0.026)	<b>0.790 (0.033)</b>	0.672 (0.022)
	lassojoint	<b>0.942 (0.004)</b>	<b>0.942 (0.004)</b>	0.942 (0.004)	<b>0.402 (0.004)</b>	0.402 (0.003)	<b>0.402 (0.003)</b>	<b>0.572 (0.003)</b>	<b>0.572 (0.003)</b>	<b>0.572 (0.003)</b>

**Table 43.** Summary Statistics for df = wdbc; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.959 (0.022)</b>	<b>0.959 (0.022)</b>	<b>0.959 (0.022)</b>	<b>0.435 (0.037)</b>	<b>0.435 (0.037)</b>	<b>0.435 (0.037)</b>	<b>0.566 (0.029)</b>	<b>0.566 (0.029)</b>	<b>0.566 (0.029)</b>
	clust	0.900 (0.024)	<b>0.901 (0.024)</b>	0.899 (0.028)	0.891 (0.024)	<b>0.892 (0.024)</b>	0.886 (0.028)	0.842 (0.036)	<b>0.844 (0.036)</b>	0.840 (0.039)
	strict-lassclust	0.960 (0.017)	0.959 (0.014)	<b>0.964 (0.011)</b>	0.865 (0.055)	0.860 (0.054)	<b>0.903 (0.026)</b>	0.775 (0.141)	0.767 (0.131)	<b>0.861 (0.046)</b>
	non-strict-lassclust	0.963 (0.013)	0.964 (0.013)	<b>0.965 (0.012)</b>	0.904 (0.021)	0.907 (0.020)	<b>0.908 (0.018)</b>	0.867 (0.030)	0.871 (0.028)	<b>0.872 (0.025)</b>
	lassojoint	0.973 (0.020)	0.973 (0.020)	<b>0.974 (0.021)</b>	<b>0.883 (0.111)</b>	0.880 (0.121)	0.879 (0.127)	<b>0.867 (0.082)</b>	0.866 (0.088)	<b>0.867 (0.092)</b>
0.5	naive	<b>0.970 (0.006)</b>	<b>0.970 (0.006)</b>	<b>0.970 (0.006)</b>	<b>0.684 (0.049)</b>	<b>0.684 (0.049)</b>	<b>0.684 (0.049)</b>	<b>0.731 (0.044)</b>	<b>0.731 (0.044)</b>	<b>0.731 (0.044)</b>
	clust	0.899 (0.008)	0.901 (0.008)	<b>0.911 (0.004)</b>	<b>0.890 (0.016)</b>	<b>0.890 (0.009)</b>	0.889 (0.007)	0.864 (0.025)	0.866 (0.014)	<b>0.874 (0.016)</b>
	strict-lassclust	0.950 (0.009)	0.950 (0.004)	<b>0.957 (0.004)</b>	0.856 (0.042)	0.860 (0.027)	<b>0.900 (0.020)</b>	0.806 (0.080)	0.817 (0.045)	<b>0.885 (0.028)</b>
	non-strict-lassclust	0.952 (0.003)	0.947 (0.006)	<b>0.957 (0.004)</b>	0.875 (0.006)	0.885 (0.005)	<b>0.902 (0.020)</b>	0.845 (0.008)	0.861 (0.007)	<b>0.890 (0.022)</b>
	lassojoint	<b>0.981 (0.006)</b>	0.980 (0.004)	0.977 (0.003)	0.846 (0.201)	<b>0.927 (0.015)</b>	0.926 (0.015)	0.865 (0.137)	<b>0.917 (0.021)</b>	0.915 (0.021)
0.8	naive	<b>0.983 (0.000)</b>	<b>0.983 (0.000)</b>	<b>0.983 (0.000)</b>	<b>0.912 (0.000)</b>	<b>0.912 (0.000)</b>	<b>0.912 (0.000)</b>	<b>0.887 (0.000)</b>	<b>0.887 (0.000)</b>	<b>0.887 (0.000)</b>
	clust	0.911 (0.000)	0.927 (0.000)	<b>0.949 (0.000)</b>	0.906 (0.000)	0.906 (0.000)	<b>0.912 (0.000)</b>	0.857 (0.000)	0.862 (0.000)	<b>0.885 (0.000)</b>
	strict-lassclust	0.974 (0.000)	0.948 (0.000)	<b>0.980 (0.000)</b>	0.888 (0.000)	0.694 (0.000)	<b>0.912 (0.000)</b>	0.826 (0.000)	0.297 (0.000)	<b>0.891 (0.000)</b>
	non-strict-lassclust	0.980 (0.000)	<b>0.985 (0.000)</b>	0.980 (0.000)	<b>0.929 (0.000)</b>	0.718 (0.000)	0.906 (0.000)	<b>0.898 (0.000)</b>	0.721 (0.000)	0.884 (0.000)
	lassojoint	<b>0.987 (0.000)</b>	0.981 (0.000)	0.981 (0.000)	0.524 (0.000)	<b>0.959 (0.000)</b>	<b>0.959 (0.000)</b>	0.609 (0.000)	<b>0.945 (0.000)</b>	<b>0.945 (0.000)</b>

**Table 44.** Summary Statistics for df = wine-quality; SCAR scheme

calc-c	method	AUC			ACC			F1		
		q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1	q=0.25	q=0.5	q=1
0.3	naive	<b>0.814 (0.046)</b>	<b>0.814 (0.046)</b>	<b>0.814 (0.046)</b>	<b>0.137 (0.013)</b>	<b>0.137 (0.013)</b>	<b>0.137 (0.013)</b>	<b>0.238 (0.019)</b>	<b>0.238 (0.019)</b>	<b>0.238 (0.019)</b>
	clust	0.689 (0.043)	0.693 (0.037)	<b>0.694 (0.034)</b>	0.620 (0.080)	<b>0.621 (0.088)</b>	0.445 (0.084)	0.342 (0.062)	<b>0.343 (0.071)</b>	0.280 (0.050)
	strict-lassclust	<b>0.703 (0.044)</b>	0.702 (0.038)	0.695 (0.035)	0.604 (0.162)	<b>0.606 (0.129)</b>	0.460 (0.086)	<b>0.342 (0.093)</b>	0.339 (0.075)	0.283 (0.054)
	non-strict-lassclust	0.686 (0.046)	0.690 (0.042)	<b>0.696 (0.033)</b>	0.627 (0.112)	<b>0.636 (0.092)</b>	0.458 (0.082)	0.334 (0.073)	<b>0.337 (0.079)</b>	0.283 (0.052)
	lassojoint	0.804 (0.090)	0.805 (0.086)	<b>0.807 (0.081)</b>	0.685 (0.293)	<b>0.724 (0.266)</b>	0.710 (0.275)	0.381 (0.155)	<b>0.385 (0.155)</b>	0.376 (0.147)
0.5	naive	<b>0.829 (0.013)</b>	<b>0.829 (0.013)</b>	<b>0.829 (0.013)</b>	<b>0.448 (0.034)</b>	<b>0.448 (0.034)</b>	<b>0.448 (0.034)</b>	<b>0.320 (0.019)</b>	<b>0.320 (0.019)</b>	<b>0.320 (0.019)</b>
	clust	<b>0.705 (0.027)</b>	0.703 (0.023)	0.701 (0.024)	<b>0.622 (0.044)</b>	0.620 (0.045)	0.279 (0.073)	<b>0.346 (0.024)</b>	<b>0.346 (0.027)</b>	0.257 (0.017)
	strict-lassclust	<b>0.711 (0.021)</b>	0.706 (0.018)	0.707 (0.017)	0.635 (0.042)	<b>0.641 (0.027)</b>	0.290 (0.070)	<b>0.358 (0.024)</b>	0.352 (0.022)	0.264 (0.013)
	non-strict-lassclust	<b>0.704 (0.026)</b>	<b>0.704 (0.021)</b>	0.701 (0.023)	<b>0.636 (0.039)</b>	0.627 (0.048)	0.295 (0.067)	<b>0.348 (0.026)</b>	0.344 (0.027)	0.260 (0.016)
	lassojoint	<b>0.827 (0.013)</b>	0.821 (0.019)	0.824 (0.015)	<b>0.839 (0.028)</b>	0.836 (0.041)	0.818 (0.080)	<b>0.404 (0.062)</b>	0.393 (0.050)	0.398 (0.057)
0.8	naive	<b>0.825 (0.003)</b>	<b>0.825 (0.003)</b>	<b>0.825 (0.003)</b>	<b>0.833 (0.000)</b>	<b>0.833 (0.000)</b>	<b>0.833 (0.000)</b>	<b>0.414 (0.007)</b>	<b>0.414 (0.007)</b>	<b>0.414 (0.007)</b>
	clust	<b>0.704 (0.012)</b>	0.689 (0.010)	0.674 (0.007)	0.589 (0.013)	<b>0.608 (0.020)</b>	0.161 (0.001)	0.333 (0.002)	<b>0.344 (0.006)</b>	0.254 (0.004)
	strict-lassclust	<b>0.729 (0.019)</b>	0.686 (0.005)	0.674 (0.004)	<b>0.697 (0.028)</b>	0.658 (0.012)	0.149 (0.003)	<b>0.387 (0.008)</b>	0.354 (0.005)	0.251 (0.004)
	non-strict-lassclust	<b>0.696 (0.010)</b>	0.679 (0.006)	0.673 (0.006)	<b>0.533 (0.019)</b>	0.515 (0.008)	0.148 (0.001)	<b>0.323 (0.003)</b>	0.306 (0.000)	0.251 (0.004)
	lassojoint	0.819 (0.005)	0.819 (0.005)	<b>0.830 (0.002)</b>	0.847 (0.003)	0.847 (0.003)	<b>0.852 (0.005)</b>	0.362 (0.011)	0.362 (0.011)	<b>0.381 (0.017)</b>

## 2.2 SCAR scheme - with SMOTE algorithm; pecking\_part = 1

**Table 45.** Summary Statistics for df = adult; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.797 (0.003)</b>	<b>0.797 (0.003)</b>	0.241 (0.005)	<b>0.527 (0.014)</b>	0.388 (0.006)	<b>0.490 (0.010)</b>
	clust	0.763 (0.005)	<b>0.770 (0.004)</b>	0.406 (0.011)	<b>0.746 (0.003)</b>	0.442 (0.008)	<b>0.507 (0.010)</b>
	strict-lassclust	0.763 (0.005)	<b>0.770 (0.004)</b>	0.405 (0.011)	<b>0.746 (0.003)</b>	0.442 (0.008)	<b>0.507 (0.010)</b>
	non-strict-lassclust	0.763 (0.005)	<b>0.770 (0.004)</b>	0.405 (0.011)	<b>0.746 (0.003)</b>	0.442 (0.008)	<b>0.507 (0.010)</b>
	lassojoint	<b>0.795 (0.003)</b>	0.794 (0.003)	<b>0.792 (0.003)</b>	0.785 (0.004)	<b>0.480 (0.033)</b>	0.306 (0.031)
	spy		0.744 (0.006)		0.759 (0.005)		0.491 (0.011)
0.5	naive	<b>0.804 (0.001)</b>	<b>0.804 (0.001)</b>	<b>0.335 (0.006)</b>	<b>0.335 (0.006)</b>	<b>0.419 (0.006)</b>	<b>0.419 (0.006)</b>
	clust	0.761 (0.004)	<b>0.780 (0.003)</b>	0.304 (0.002)	<b>0.730 (0.003)</b>	0.407 (0.004)	<b>0.534 (0.006)</b>
	strict-lassclust	0.761 (0.004)	<b>0.781 (0.003)</b>	0.302 (0.002)	<b>0.730 (0.003)</b>	0.407 (0.005)	<b>0.533 (0.006)</b>
	non-strict-lassclust	0.761 (0.004)	<b>0.781 (0.003)</b>	0.302 (0.002)	<b>0.730 (0.003)</b>	0.407 (0.005)	<b>0.533 (0.006)</b>
	lassojoint	<b>0.804 (0.002)</b>	<b>0.804 (0.002)</b>	<b>0.794 (0.005)</b>	<b>0.794 (0.005)</b>	<b>0.504 (0.016)</b>	<b>0.504 (0.016)</b>
	spy		0.728 (0.015)		0.762 (0.005)		0.414 (0.136)
0.8	naive	<b>0.802 (0.001)</b>	<b>0.802 (0.001)</b>	<b>0.783 (0.001)</b>	<b>0.783 (0.001)</b>	<b>0.544 (0.001)</b>	<b>0.544 (0.001)</b>
	clust	0.755 (0.001)	<b>0.789 (0.000)</b>	0.241 (0.003)	<b>0.785 (0.003)</b>	0.383 (0.003)	<b>0.493 (0.000)</b>
	strict-lassclust	0.755 (0.001)	<b>0.789 (0.000)</b>	0.241 (0.002)	<b>0.786 (0.003)</b>	0.383 (0.003)	<b>0.493 (0.000)</b>
	non-strict-lassclust	0.755 (0.001)	<b>0.789 (0.000)</b>	0.241 (0.002)	<b>0.786 (0.003)</b>	0.383 (0.003)	<b>0.493 (0.000)</b>
	lassojoint	<b>0.801 (0.002)</b>	<b>0.801 (0.002)</b>	<b>0.796 (0.002)</b>	<b>0.796 (0.002)</b>	<b>0.470 (0.003)</b>	<b>0.470 (0.003)</b>
	spy		0.723 (0.030)		0.761 (0.009)		0.316 (0.152)

**Table 46.** Summary Statistics for df = artif; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.968 (0.010)	<b>0.975 (0.008)</b>	0.520 (0.019)	<b>0.821 (0.020)</b>	0.670 (0.016)	<b>0.844 (0.017)</b>
	clust	0.599 (0.063)	<b>0.822 (0.060)</b>	0.543 (0.037)	<b>0.687 (0.037)</b>	<b>0.631 (0.035)</b>	0.579 (0.069)
	strict-lassclust	0.597 (0.065)	<b>0.823 (0.060)</b>	0.537 (0.043)	<b>0.685 (0.055)</b>	<b>0.617 (0.057)</b>	0.576 (0.139)
	non-strict-lassclust	0.602 (0.063)	<b>0.821 (0.058)</b>	0.548 (0.039)	<b>0.682 (0.041)</b>	<b>0.630 (0.036)</b>	0.565 (0.087)
	lassojoint	<b>0.988 (0.011)</b>	0.984 (0.011)	<b>0.943 (0.016)</b>	0.920 (0.078)	<b>0.941 (0.019)</b>	0.925 (0.050)
	spy		0.829 (0.016)		0.712 (0.059)		0.666 (0.147)
0.5	naive	0.983 (0.005)	<b>0.985 (0.004)</b>	0.627 (0.007)	<b>0.808 (0.010)</b>	0.729 (0.006)	<b>0.839 (0.006)</b>
	clust	0.555 (0.017)	<b>0.785 (0.024)</b>	0.531 (0.002)	<b>0.683 (0.032)</b>	<b>0.653 (0.003)</b>	0.601 (0.045)
	strict-lassclust	0.561 (0.016)	<b>0.787 (0.025)</b>	0.534 (0.007)	<b>0.681 (0.040)</b>	0.577 (0.057)	<b>0.589 (0.099)</b>
	non-strict-lassclust	0.550 (0.018)	<b>0.786 (0.022)</b>	0.527 (0.004)	<b>0.686 (0.031)</b>	<b>0.655 (0.012)</b>	0.605 (0.045)
	lassojoint	<b>0.993 (0.001)</b>	0.992 (0.001)	0.943 (0.003)	<b>0.946 (0.002)</b>	0.943 (0.003)	<b>0.947 (0.002)</b>
	spy		0.831 (0.012)		0.738 (0.016)		0.722 (0.034)
0.8	naive	<b>0.988 (0.000)</b>	<b>0.988 (0.000)</b>	<b>0.883 (0.005)</b>	<b>0.883 (0.005)</b>	<b>0.890 (0.005)</b>	<b>0.890 (0.005)</b>
	clust	0.602 (0.012)	<b>0.950 (0.025)</b>	0.477 (0.003)	<b>0.759 (0.008)</b>	0.642 (0.002)	<b>0.667 (0.007)</b>
	strict-lassclust	0.605 (0.010)	<b>0.949 (0.025)</b>	0.479 (0.004)	<b>0.758 (0.024)</b>	0.645 (0.001)	<b>0.663 (0.047)</b>
	non-strict-lassclust	0.603 (0.013)	<b>0.949 (0.024)</b>	0.478 (0.002)	<b>0.761 (0.008)</b>	0.643 (0.002)	<b>0.671 (0.002)</b>
	lassojoint	0.974 (0.000)	<b>0.992 (0.005)</b>	0.576 (0.005)	<b>0.950 (0.070)</b>	0.693 (0.004)	<b>0.952 (0.046)</b>
	spy		0.831 (0.012)		0.742 (0.014)		0.724 (0.020)

**Table 47.** Summary Statistics for df = bank-marketing; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.890 (0.023)	<b>0.891 (0.021)</b>	0.111 (0.006)	<b>0.259 (0.109)</b>	0.200 (0.010)	<b>0.233 (0.035)</b>
	clust	0.718 (0.049)	<b>0.835 (0.016)</b>	0.623 (0.043)	<b>0.753 (0.031)</b>	0.305 (0.021)	<b>0.380 (0.031)</b>
	strict-lassclust	0.718 (0.050)	<b>0.838 (0.016)</b>	0.629 (0.028)	<b>0.753 (0.036)</b>	0.307 (0.019)	<b>0.381 (0.036)</b>
	non-strict-lassclust	0.717 (0.050)	<b>0.838 (0.016)</b>	0.628 (0.034)	<b>0.750 (0.032)</b>	0.307 (0.020)	<b>0.378 (0.032)</b>
	lassojoint	<b>0.896 (0.028)</b>	0.891 (0.035)	0.798 (0.243)	<b>0.861 (0.168)</b>	0.436 (0.110)	<b>0.448 (0.084)</b>
	spy		0.743 (0.024)		0.705 (0.013)		0.348 (0.021)
0.5	naive		<b>0.910 (0.003)</b>	<b>0.910 (0.003)</b>	<b>0.407 (0.077)</b>	<b>0.407 (0.077)</b>	<b>0.265 (0.028)</b>
	clust		0.739 (0.038)	<b>0.841 (0.005)</b>	0.585 (0.104)	<b>0.745 (0.015)</b>	0.283 (0.026)
	strict-lassclust		0.740 (0.038)	<b>0.843 (0.006)</b>	0.586 (0.099)	<b>0.745 (0.014)</b>	0.282 (0.026)
	non-strict-lassclust		0.739 (0.038)	<b>0.843 (0.006)</b>	0.586 (0.099)	<b>0.745 (0.014)</b>	0.282 (0.026)
	lassojoint		<b>0.906 (0.006)</b>	<b>0.906 (0.006)</b>	<b>0.902 (0.004)</b>	<b>0.902 (0.004)</b>	0.509 (0.028)
	spy		0.745 (0.023)		0.707 (0.013)		0.345 (0.023)
0.8	naive	0.920 (0.004)	<b>0.921 (0.004)</b>	<b>0.909 (0.006)</b>	0.831 (0.010)	<b>0.547 (0.027)</b>	0.531 (0.019)
	clust	0.680 (0.022)	<b>0.862 (0.006)</b>	0.124 (0.033)	<b>0.868 (0.003)</b>	0.195 (0.010)	<b>0.514 (0.007)</b>
	strict-lassclust	0.674 (0.033)	<b>0.864 (0.006)</b>	0.133 (0.039)	<b>0.868 (0.003)</b>	0.196 (0.011)	<b>0.514 (0.012)</b>
	non-strict-lassclust	0.669 (0.023)	<b>0.864 (0.006)</b>	0.116 (0.021)	<b>0.868 (0.003)</b>	0.194 (0.007)	<b>0.514 (0.012)</b>
	lassojoint	0.921 (0.004)	<b>0.922 (0.003)</b>	<b>0.915 (0.004)</b>	0.904 (0.003)	0.511 (0.032)	<b>0.578 (0.031)</b>
	spy		0.746 (0.021)		0.710 (0.013)		0.345 (0.023)

**Table 48.** Summary Statistics for df = banknote; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.997 (0.002)	<b>0.998 (0.002)</b>	0.462 (0.019)	<b>0.905 (0.019)</b>	0.624 (0.018)	<b>0.904 (0.018)</b>
	clust	0.680 (0.040)	<b>0.786 (0.052)</b>	0.586 (0.059)	<b>0.750 (0.039)</b>	0.578 (0.033)	<b>0.683 (0.056)</b>
	strict-lassclust	0.677 (0.038)	<b>0.785 (0.052)</b>	0.580 (0.050)	<b>0.749 (0.039)</b>	0.575 (0.030)	<b>0.681 (0.059)</b>
	non-strict-lassclust	0.677 (0.038)	<b>0.786 (0.052)</b>	0.580 (0.050)	<b>0.749 (0.039)</b>	0.574 (0.030)	<b>0.682 (0.055)</b>
	lassojoint	<b>0.999 (0.001)</b>	<b>0.999 (0.002)</b>	<b>0.985 (0.007)</b>	0.984 (0.008)	<b>0.983 (0.008)</b>	0.982 (0.009)
	spy		0.783 (0.096)		0.678 (0.062)		0.555 (0.108)
0.5	naive	0.997 (0.001)	<b>0.998 (0.001)</b>	0.723 (0.013)	<b>0.921 (0.011)</b>	0.757 (0.009)	<b>0.916 (0.010)</b>
	clust	0.663 (0.028)	<b>0.794 (0.014)</b>	0.565 (0.023)	<b>0.770 (0.013)</b>	0.575 (0.018)	<b>0.690 (0.017)</b>
	strict-lassclust	0.660 (0.028)	<b>0.794 (0.014)</b>	0.561 (0.021)	<b>0.769 (0.013)</b>	0.575 (0.018)	<b>0.689 (0.019)</b>
	non-strict-lassclust	0.660 (0.028)	<b>0.794 (0.014)</b>	0.561 (0.021)	<b>0.769 (0.013)</b>	0.575 (0.018)	<b>0.689 (0.019)</b>
	lassojoint	<b>0.999 (0.000)</b>	<b>0.999 (0.000)</b>	<b>0.982 (0.006)</b>	0.981 (0.005)	<b>0.980 (0.007)</b>	0.979 (0.005)
	spy		0.787 (0.086)		0.673 (0.055)		0.529 (0.099)
0.8	naive	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	<b>0.949 (0.000)</b>	<b>0.949 (0.000)</b>	<b>0.945 (0.000)</b>	<b>0.945 (0.000)</b>
	clust	0.687 (0.018)	<b>0.863 (0.004)</b>	0.522 (0.024)	<b>0.815 (0.001)</b>	0.611 (0.005)	<b>0.753 (0.001)</b>
	strict-lassclust	0.681 (0.014)	<b>0.862 (0.004)</b>	0.529 (0.015)	<b>0.815 (0.001)</b>	0.618 (0.001)	<b>0.753 (0.001)</b>
	non-strict-lassclust	0.681 (0.014)	<b>0.862 (0.004)</b>	0.529 (0.015)	<b>0.815 (0.001)</b>	0.618 (0.001)	<b>0.753 (0.001)</b>
	lassojoint	<b>1.000 (0.000)</b>	<b>1.000 (0.000)</b>	0.981 (0.002)	<b>0.988 (0.000)</b>	0.978 (0.002)	<b>0.986 (0.001)</b>
	spy		0.767 (0.093)		0.659 (0.051)		0.502 (0.094)

**Table 49.** Summary Statistics for df = breastc; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.984 (0.011)	<b>0.985 (0.011)</b>	0.348 (0.031)	<b>0.881 (0.037)</b>	0.514 (0.034)	<b>0.854 (0.040)</b>
0.3	clust	0.979 (0.020)	<b>0.983 (0.021)</b>	<b>0.964 (0.013)</b>	0.956 (0.014)	<b>0.947 (0.020)</b>	0.934 (0.021)
0.3	strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.966 (0.016)</b>	0.958 (0.013)	<b>0.951 (0.023)</b>	0.937 (0.021)
0.3	non-strict-lassclust	<b>0.994 (0.003)</b>	<b>0.994 (0.003)</b>	<b>0.966 (0.016)</b>	0.958 (0.013)	<b>0.951 (0.023)</b>	0.937 (0.020)
0.3	lassojoint	<b>0.983 (0.016)</b>	<b>0.983 (0.013)</b>	<b>0.868 (0.191)</b>	0.857 (0.204)	<b>0.867 (0.134)</b>	0.860 (0.139)
0.3	spy	0.989 (0.006)		0.919 (0.023)		0.895 (0.029)	
0.5	naive	0.993 (0.003)	<b>0.994 (0.002)</b>	0.706 (0.032)	<b>0.913 (0.041)</b>	0.691 (0.024)	<b>0.886 (0.037)</b>
0.5	clust	0.988 (0.009)	<b>0.997 (0.003)</b>	0.963 (0.006)	<b>0.968 (0.006)</b>	0.946 (0.008)	<b>0.951 (0.010)</b>
0.5	strict-lassclust	0.995 (0.001)	<b>0.997 (0.001)</b>	0.965 (0.006)	<b>0.970 (0.007)</b>	0.949 (0.009)	<b>0.954 (0.011)</b>
0.5	non-strict-lassclust	0.995 (0.001)	<b>0.997 (0.001)</b>	0.965 (0.006)	<b>0.970 (0.007)</b>	0.949 (0.009)	<b>0.954 (0.011)</b>
0.5	lassojoint	<b>0.996 (0.001)</b>	<b>0.996 (0.001)</b>	0.958 (0.010)	<b>0.961 (0.009)</b>	0.940 (0.014)	<b>0.943 (0.012)</b>
0.5	spy	0.989 (0.006)		0.921 (0.026)		0.898 (0.031)	
0.8	naive	<b>0.992 (0.003)</b>	<b>0.992 (0.003)</b>	<b>0.941 (0.015)</b>	<b>0.941 (0.015)</b>	<b>0.921 (0.016)</b>	<b>0.921 (0.016)</b>
0.8	clust	0.962 (0.016)	<b>0.992 (0.003)</b>	0.940 (0.038)	<b>0.960 (0.007)</b>	0.919 (0.047)	<b>0.944 (0.008)</b>
0.8	strict-lassclust	0.988 (0.004)	<b>0.991 (0.003)</b>	0.867 (0.083)	<b>0.962 (0.010)</b>	0.841 (0.078)	<b>0.947 (0.012)</b>
0.8	non-strict-lassclust	0.988 (0.004)	<b>0.991 (0.003)</b>	0.867 (0.083)	<b>0.962 (0.010)</b>	0.841 (0.078)	<b>0.947 (0.012)</b>
0.8	lassojoint	<b>0.993 (0.002)</b>	<b>0.993 (0.002)</b>	<b>0.934 (0.134)</b>	<b>0.934 (0.134)</b>	<b>0.929 (0.094)</b>	<b>0.929 (0.094)</b>
0.8	spy	0.988 (0.006)		0.916 (0.022)		0.892 (0.029)	

**Table 50.** Summary Statistics for df = credit-a; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.813 (0.030)	<b>0.818 (0.028)</b>	0.457 (0.029)	<b>0.740 (0.026)</b>	0.626 (0.027)	<b>0.730 (0.031)</b>
0.3	clust	0.752 (0.048)	<b>0.787 (0.037)</b>	0.659 (0.029)	<b>0.663 (0.034)</b>	<b>0.477 (0.064)</b>	0.455 (0.066)
0.3	strict-lassclust	0.762 (0.033)	<b>0.791 (0.030)</b>	0.652 (0.031)	<b>0.660 (0.034)</b>	<b>0.451 (0.065)</b>	0.447 (0.065)
0.3	non-strict-lassclust	0.762 (0.033)	<b>0.791 (0.030)</b>	0.652 (0.031)	<b>0.660 (0.034)</b>	<b>0.451 (0.065)</b>	0.447 (0.065)
0.3	lassojoint	<b>0.808 (0.032)</b>	0.795 (0.040)	0.575 (0.139)	<b>0.700 (0.096)</b>	0.643 (0.048)	<b>0.654 (0.051)</b>
0.3	spy	0.769 (0.038)		0.703 (0.037)		0.607 (0.077)	
0.5	naive	0.800 (0.017)	<b>0.801 (0.017)</b>	0.450 (0.007)	<b>0.707 (0.018)</b>	0.618 (0.007)	<b>0.697 (0.017)</b>
0.5	clust	0.750 (0.006)	<b>0.779 (0.013)</b>	<b>0.648 (0.012)</b>	0.643 (0.006)	<b>0.425 (0.057)</b>	0.380 (0.037)
0.5	strict-lassclust	0.756 (0.007)	<b>0.778 (0.013)</b>	0.634 (0.009)	<b>0.642 (0.007)</b>	0.356 (0.047)	<b>0.378 (0.042)</b>
0.5	non-strict-lassclust	0.756 (0.007)	<b>0.778 (0.013)</b>	0.634 (0.009)	<b>0.642 (0.007)</b>	0.356 (0.047)	<b>0.378 (0.042)</b>
0.5	lassojoint	<b>0.804 (0.015)</b>	0.798 (0.016)	0.480 (0.092)	<b>0.695 (0.038)</b>	0.620 (0.008)	<b>0.670 (0.016)</b>
0.5	spy	0.774 (0.036)		0.709 (0.040)		0.603 (0.083)	
0.8	naive	<b>0.837 (0.000)</b>	<b>0.837 (0.000)</b>	<b>0.764 (0.000)</b>	<b>0.764 (0.000)</b>	<b>0.744 (0.000)</b>	<b>0.744 (0.000)</b>
0.8	clust	0.804 (0.000)	<b>0.823 (0.000)</b>	<b>0.744 (0.000)</b>	0.651 (0.000)	<b>0.719 (0.000)</b>	0.424 (0.000)
0.8	strict-lassclust	0.807 (0.000)	<b>0.822 (0.000)</b>	<b>0.733 (0.000)</b>	0.651 (0.000)	<b>0.683 (0.000)</b>	0.424 (0.000)
0.8	non-strict-lassclust	0.807 (0.000)	<b>0.822 (0.000)</b>	<b>0.733 (0.000)</b>	0.651 (0.000)	<b>0.683 (0.000)</b>	0.424 (0.000)
0.8	lassojoint	<b>0.835 (0.000)</b>	<b>0.835 (0.000)</b>	<b>0.713 (0.000)</b>	<b>0.713 (0.000)</b>	<b>0.743 (0.000)</b>	<b>0.743 (0.000)</b>
0.8	spy	0.774 (0.040)		0.713 (0.041)		0.615 (0.079)	

**Table 51.** Summary Statistics for df = credit-g; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.679 (0.042)</b>	<b>0.679 (0.041)</b>	0.299 (0.023)	<b>0.511 (0.057)</b>	0.460 (0.027)	<b>0.500 (0.034)</b>
0.3	clust	0.619 (0.034)	<b>0.642 (0.037)</b>	0.631 (0.096)	<b>0.708 (0.031)</b>	<b>0.414 (0.040)</b>	0.307 (0.062)
0.3	strict-lassclust	0.617 (0.034)	<b>0.633 (0.037)</b>	0.637 (0.100)	<b>0.707 (0.031)</b>	<b>0.409 (0.056)</b>	0.291 (0.073)
0.3	non-strict-lassclust	0.619 (0.034)	<b>0.639 (0.043)</b>	0.636 (0.103)	<b>0.707 (0.031)</b>	<b>0.403 (0.053)</b>	0.291 (0.085)
0.3	lassojoint	0.652 (0.074)	<b>0.656 (0.066)</b>	0.596 (0.179)	<b>0.696 (0.075)</b>	<b>0.436 (0.147)</b>	0.298 (0.099)
0.3	spy		0.608 (0.038)		0.648 (0.044)		0.409 (0.047)
0.5	naive	<b>0.748 (0.011)</b>	<b>0.748 (0.011)</b>	<b>0.387 (0.029)</b>	<b>0.387 (0.029)</b>	<b>0.476 (0.017)</b>	<b>0.476 (0.017)</b>
0.5	clust	0.639 (0.012)	<b>0.663 (0.008)</b>	0.636 (0.021)	<b>0.741 (0.017)</b>	<b>0.457 (0.020)</b>	0.407 (0.040)
0.5	strict-lassclust	0.643 (0.013)	<b>0.662 (0.005)</b>	0.653 (0.026)	<b>0.743 (0.016)</b>	<b>0.451 (0.021)</b>	0.410 (0.037)
0.5	non-strict-lassclust	0.644 (0.010)	<b>0.661 (0.005)</b>	0.656 (0.021)	<b>0.743 (0.016)</b>	<b>0.452 (0.023)</b>	0.410 (0.037)
0.5	lassojoint	<b>0.741 (0.018)</b>	<b>0.741 (0.018)</b>	<b>0.349 (0.148)</b>	<b>0.349 (0.148)</b>	<b>0.424 (0.068)</b>	<b>0.424 (0.068)</b>
0.5	spy		0.614 (0.034)		0.655 (0.034)		0.411 (0.039)
0.8	naive	<b>0.751 (0.022)</b>	<b>0.751 (0.022)</b>	<b>0.754 (0.017)</b>	<b>0.754 (0.017)</b>	<b>0.584 (0.002)</b>	<b>0.584 (0.002)</b>
0.8	clust	0.592 (0.022)	<b>0.656 (0.028)</b>	0.366 (0.028)	<b>0.722 (0.005)</b>	<b>0.454 (0.011)</b>	0.290 (0.016)
0.8	strict-lassclust	0.623 (0.037)	<b>0.651 (0.025)</b>	0.454 (0.075)	<b>0.715 (0.002)</b>	<b>0.469 (0.021)</b>	0.247 (0.001)
0.8	non-strict-lassclust	0.611 (0.026)	<b>0.647 (0.029)</b>	0.418 (0.040)	<b>0.718 (0.002)</b>	<b>0.464 (0.016)</b>	0.262 (0.014)
0.8	lassojoint	<b>0.735 (0.010)</b>	<b>0.735 (0.010)</b>	<b>0.727 (0.004)</b>	<b>0.727 (0.004)</b>	<b>0.220 (0.010)</b>	<b>0.220 (0.010)</b>
0.8	spy		0.609 (0.032)		0.657 (0.025)		0.404 (0.037)

**Table 52.** Summary Statistics for df = dhfr; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.592 (0.074)	<b>0.604 (0.057)</b>	0.534 (0.083)	<b>0.547 (0.062)</b>	0.559 (0.068)	<b>0.561 (0.054)</b>
0.3	clust	0.521 (0.117)	<b>0.571 (0.064)</b>	0.504 (0.164)	<b>0.575 (0.071)</b>	0.475 (0.036)	<b>0.478 (0.071)</b>
0.3	strict-lassclust	0.622 (0.072)	<b>0.652 (0.108)</b>	0.566 (0.092)	<b>0.674 (0.059)</b>	0.525 (0.122)	<b>0.576 (0.101)</b>
0.3	non-strict-lassclust	0.614 (0.077)	<b>0.652 (0.098)</b>	0.534 (0.094)	<b>0.618 (0.131)</b>	0.486 (0.081)	<b>0.501 (0.099)</b>
0.3	lassojoint	0.837 (0.095)	<b>0.876 (0.050)</b>	<b>0.643 (0.175)</b>	0.549 (0.119)	<b>0.646 (0.122)</b>	0.608 (0.056)
0.3	spy		0.664 (0.049)		0.628 (0.067)		0.498 (0.064)
0.5	naive	<b>0.647 (0.012)</b>	0.624 (0.032)	<b>0.596 (0.014)</b>	0.585 (0.034)	<b>0.631 (0.003)</b>	0.602 (0.018)
0.5	clust	0.476 (0.009)	<b>0.647 (0.004)</b>	0.443 (0.023)	<b>0.654 (0.019)</b>	0.465 (0.038)	<b>0.567 (0.007)</b>
0.5	strict-lassclust	0.685 (0.022)	<b>0.750 (0.014)</b>	0.460 (0.013)	<b>0.767 (0.010)</b>	0.546 (0.028)	<b>0.655 (0.020)</b>
0.5	non-strict-lassclust	0.685 (0.032)	<b>0.733 (0.031)</b>	0.527 (0.056)	<b>0.725 (0.034)</b>	0.516 (0.004)	<b>0.618 (0.034)</b>
0.5	lassojoint	<b>0.954 (0.027)</b>	0.942 (0.006)	<b>0.783 (0.048)</b>	0.750 (0.060)	<b>0.776 (0.027)</b>	0.749 (0.051)
0.5	spy		0.679 (0.075)		0.645 (0.098)		0.545 (0.089)
0.8	naive	0.652 (0.000)	<b>0.684 (0.000)</b>	0.619 (0.000)	<b>0.660 (0.000)</b>	0.584 (0.000)	<b>0.612 (0.000)</b>
0.8	clust	0.481 (0.000)	<b>0.600 (0.000)</b>	0.443 (0.000)	<b>0.649 (0.000)</b>	0.426 (0.000)	<b>0.514 (0.000)</b>
0.8	strict-lassclust	0.658 (0.000)	<b>0.746 (0.000)</b>	0.412 (0.000)	<b>0.784 (0.000)</b>	0.513 (0.000)	<b>0.644 (0.000)</b>
0.8	non-strict-lassclust	0.658 (0.000)	<b>0.748 (0.000)</b>	0.423 (0.000)	<b>0.784 (0.000)</b>	0.517 (0.000)	<b>0.644 (0.000)</b>
0.8	lassojoint	0.929 (0.000)	<b>0.943 (0.000)</b>	0.567 (0.000)	<b>0.887 (0.000)</b>	0.611 (0.000)	<b>0.836 (0.000)</b>
0.8	spy		0.720 (0.039)		0.642 (0.049)		0.600 (0.045)

**Table 53.** Summary Statistics for df = diabetes; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.794 (0.032)	<b>0.800 (0.031)</b>	0.352 (0.030)	<b>0.642 (0.042)</b>	0.516 (0.032)	<b>0.629 (0.038)</b>
0.3	clust	0.727 (0.049)	<b>0.769 (0.032)</b>	0.626 (0.055)	<b>0.714 (0.028)</b>	<b>0.595 (0.049)</b>	0.504 (0.069)
0.3	strict-lassclust	0.725 (0.050)	<b>0.770 (0.034)</b>	0.634 (0.058)	<b>0.709 (0.033)</b>	<b>0.588 (0.055)</b>	0.470 (0.127)
0.3	non-strict-lassclust	0.731 (0.049)	<b>0.768 (0.033)</b>	0.610 (0.070)	<b>0.711 (0.030)</b>	<b>0.591 (0.047)</b>	0.505 (0.071)
0.3	lassojoint	<b>0.800 (0.033)</b>	0.789 (0.043)	0.684 (0.129)	<b>0.743 (0.049)</b>	<b>0.595 (0.062)</b>	0.570 (0.071)
0.3	spy		0.677 (0.062)		0.648 (0.051)		0.534 (0.089)
0.5	naive	<b>0.791 (0.014)</b>	<b>0.791 (0.014)</b>	0.533 (0.037)	<b>0.546 (0.050)</b>	0.588 (0.025)	<b>0.591 (0.027)</b>
0.5	clust	0.723 (0.022)	<b>0.757 (0.020)</b>	0.551 (0.067)	<b>0.687 (0.013)</b>	<b>0.594 (0.033)</b>	0.495 (0.047)
0.5	strict-lassclust	0.723 (0.021)	<b>0.755 (0.020)</b>	0.539 (0.066)	<b>0.688 (0.016)</b>	<b>0.590 (0.033)</b>	0.487 (0.053)
0.5	non-strict-lassclust	0.725 (0.020)	<b>0.756 (0.020)</b>	0.535 (0.068)	<b>0.694 (0.015)</b>	<b>0.588 (0.033)</b>	0.512 (0.054)
0.5	lassojoint	0.791 (0.015)	<b>0.793 (0.013)</b>	<b>0.707 (0.041)</b>	<b>0.707 (0.040)</b>	<b>0.639 (0.012)</b>	0.638 (0.016)
0.5	spy		0.690 (0.054)		0.662 (0.049)		0.546 (0.080)
0.8	naive	<b>0.797 (0.019)</b>	<b>0.797 (0.019)</b>	<b>0.724 (0.016)</b>	<b>0.724 (0.016)</b>	<b>0.653 (0.016)</b>	<b>0.653 (0.016)</b>
0.8	clust	0.712 (0.037)	<b>0.767 (0.024)</b>	0.346 (0.008)	<b>0.678 (0.030)</b>	<b>0.507 (0.014)</b>	0.390 (0.055)
0.8	strict-lassclust	0.703 (0.042)	<b>0.766 (0.025)</b>	0.348 (0.005)	<b>0.671 (0.034)</b>	<b>0.510 (0.015)</b>	0.366 (0.073)
0.8	non-strict-lassclust	0.707 (0.047)	<b>0.766 (0.025)</b>	0.344 (0.011)	<b>0.671 (0.033)</b>	<b>0.509 (0.016)</b>	0.366 (0.072)
0.8	lassojoint	<b>0.798 (0.015)</b>	<b>0.798 (0.015)</b>	0.352 (0.016)	<b>0.353 (0.016)</b>	<b>0.512 (0.016)</b>	<b>0.512 (0.016)</b>
0.8	spy		0.678 (0.049)		0.661 (0.038)		0.527 (0.065)

**Table 54.** Summary Statistics for df = heart-c; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	0.708 (0.065)	<b>0.709 (0.060)</b>	0.466 (0.040)	<b>0.631 (0.053)</b>	0.633 (0.038)	<b>0.655 (0.051)</b>
0.3	clust	0.710 (0.055)	<b>0.722 (0.056)</b>	0.603 (0.062)	<b>0.647 (0.056)</b>	<b>0.674 (0.058)</b>	0.547 (0.107)
0.3	strict-lassclust	0.708 (0.055)	<b>0.722 (0.056)</b>	0.600 (0.060)	<b>0.646 (0.056)</b>	<b>0.673 (0.058)</b>	0.543 (0.106)
0.3	non-strict-lassclust	0.708 (0.055)	<b>0.722 (0.056)</b>	0.600 (0.060)	<b>0.646 (0.056)</b>	<b>0.673 (0.058)</b>	0.543 (0.106)
0.3	lassojoint	0.677 (0.102)	<b>0.685 (0.071)</b>	0.563 (0.096)	<b>0.611 (0.071)</b>	<b>0.608 (0.112)</b>	0.491 (0.136)
0.3	spy		0.694 (0.075)		0.606 (0.065)		0.427 (0.199)
0.5	naive	<b>0.739 (0.003)</b>	0.733 (0.001)	0.433 (0.003)	<b>0.578 (0.003)</b>	0.605 (0.003)	<b>0.655 (0.003)</b>
0.5	clust	0.731 (0.005)	<b>0.749 (0.005)</b>	0.456 (0.000)	<b>0.700 (0.002)</b>	0.608 (0.002)	<b>0.629 (0.010)</b>
0.5	strict-lassclust	0.731 (0.005)	<b>0.749 (0.005)</b>	0.444 (0.000)	<b>0.700 (0.002)</b>	0.603 (0.002)	<b>0.629 (0.010)</b>
0.5	non-strict-lassclust	0.731 (0.005)	<b>0.749 (0.005)</b>	0.444 (0.000)	<b>0.700 (0.002)</b>	0.603 (0.002)	<b>0.629 (0.010)</b>
0.5	lassojoint	0.727 (0.006)	<b>0.730 (0.006)</b>	0.686 (0.029)	<b>0.690 (0.007)</b>	<b>0.631 (0.006)</b>	0.549 (0.014)
0.5	spy		0.695 (0.055)		0.600 (0.051)		0.409 (0.168)
0.8	naive	<b>0.746 (0.000)</b>	<b>0.746 (0.000)</b>	<b>0.611 (0.002)</b>	<b>0.611 (0.002)</b>	<b>0.599 (0.007)</b>	<b>0.599 (0.007)</b>
0.8	clust	0.792 (0.005)	<b>0.794 (0.004)</b>	0.400 (0.003)	<b>0.778 (0.005)</b>	0.571 (0.003)	<b>0.677 (0.001)</b>
0.8	strict-lassclust	<b>0.793 (0.005)</b>	<b>0.793 (0.004)</b>	0.400 (0.003)	<b>0.767 (0.003)</b>	0.571 (0.003)	<b>0.656 (0.004)</b>
0.8	non-strict-lassclust	<b>0.793 (0.005)</b>	<b>0.793 (0.004)</b>	0.400 (0.003)	<b>0.767 (0.003)</b>	0.571 (0.003)	<b>0.656 (0.004)</b>
0.8	lassojoint	<b>0.777 (0.003)</b>	<b>0.777 (0.003)</b>	<b>0.777 (0.011)</b>	<b>0.777 (0.011)</b>	<b>0.696 (0.014)</b>	<b>0.696 (0.014)</b>
0.8	spy		0.705 (0.055)		0.602 (0.044)		0.372 (0.142)

**Table 55.** Summary Statistics for df = qsar-biodeg; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.815 (0.031)</b>	0.805 (0.035)	0.372 (0.025)	<b>0.637 (0.042)</b>	0.516 (0.024)	<b>0.627 (0.031)</b>
0.3	clust	0.778 (0.028)	<b>0.836 (0.029)</b>	0.546 (0.044)	<b>0.767 (0.030)</b>	0.583 (0.030)	<b>0.678 (0.039)</b>
0.3	strict-lassclust	0.781 (0.030)	<b>0.841 (0.028)</b>	0.543 (0.090)	<b>0.748 (0.055)</b>	0.551 (0.109)	<b>0.602 (0.184)</b>
0.3	non-strict-lassclust	0.773 (0.039)	<b>0.838 (0.032)</b>	0.506 (0.076)	<b>0.733 (0.092)</b>	0.568 (0.038)	<b>0.663 (0.051)</b>
0.3	lassojoint	<b>0.841 (0.052)</b>	0.820 (0.038)	0.746 (0.104)	<b>0.773 (0.033)</b>	<b>0.674 (0.058)</b>	0.661 (0.051)
0.3	spy		0.767 (0.076)		0.668 (0.098)		0.572 (0.161)
0.5	naive	<b>0.866 (0.008)</b>	0.863 (0.011)	0.512 (0.026)	<b>0.643 (0.098)</b>	0.583 (0.015)	<b>0.654 (0.054)</b>
0.5	clust	0.798 (0.020)	<b>0.863 (0.009)</b>	0.582 (0.021)	<b>0.790 (0.014)</b>	0.617 (0.016)	<b>0.707 (0.005)</b>
0.5	strict-lassclust	0.818 (0.014)	<b>0.873 (0.011)</b>	0.626 (0.058)	<b>0.720 (0.073)</b>	<b>0.633 (0.033)</b>	0.476 (0.354)
0.5	non-strict-lassclust	0.772 (0.046)	<b>0.859 (0.010)</b>	0.466 (0.088)	<b>0.672 (0.127)</b>	0.566 (0.034)	<b>0.669 (0.068)</b>
0.5	lassojoint	<b>0.877 (0.013)</b>	0.856 (0.025)	<b>0.832 (0.013)</b>	0.811 (0.020)	<b>0.753 (0.025)</b>	0.693 (0.037)
0.5	spy		0.789 (0.058)		0.701 (0.053)		0.628 (0.075)
0.8	naive	<b>0.904 (0.000)</b>	<b>0.904 (0.000)</b>	<b>0.807 (0.000)</b>	<b>0.807 (0.000)</b>	<b>0.775 (0.000)</b>	<b>0.775 (0.000)</b>
0.8	clust	0.807 (0.000)	<b>0.916 (0.000)</b>	0.522 (0.000)	<b>0.839 (0.000)</b>	0.612 (0.000)	<b>0.783 (0.000)</b>
0.8	strict-lassclust	0.806 (0.000)	<b>0.911 (0.000)</b>	0.443 (0.000)	<b>0.816 (0.000)</b>	0.577 (0.000)	<b>0.743 (0.000)</b>
0.8	non-strict-lassclust	0.806 (0.000)	<b>0.911 (0.000)</b>	0.440 (0.000)	<b>0.816 (0.000)</b>	0.576 (0.000)	<b>0.743 (0.000)</b>
0.8	lassojoint	<b>0.916 (0.000)</b>	<b>0.916 (0.000)</b>	<b>0.851 (0.000)</b>	<b>0.851 (0.000)</b>	<b>0.795 (0.000)</b>	<b>0.795 (0.000)</b>
0.8	spy		0.812 (0.047)		0.718 (0.035)		0.656 (0.038)

**Table 56.** Summary Statistics for df = spambase; SCAR scheme

calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.936 (0.010)</b>	0.933 (0.010)	0.397 (0.011)	<b>0.832 (0.020)</b>	0.565 (0.011)	<b>0.812 (0.019)</b>
0.3	clust	0.896 (0.068)	<b>0.921 (0.049)</b>	0.803 (0.148)	<b>0.857 (0.026)</b>	0.787 (0.085)	<b>0.797 (0.048)</b>
0.3	strict-lassclust	0.906 (0.028)	<b>0.937 (0.009)</b>	0.792 (0.158)	<b>0.857 (0.024)</b>	0.783 (0.089)	<b>0.798 (0.044)</b>
0.3	non-strict-lassclust	0.912 (0.020)	<b>0.937 (0.009)</b>	0.794 (0.156)	<b>0.859 (0.026)</b>	0.783 (0.088)	<b>0.803 (0.046)</b>
0.3	lassojoint	<b>0.946 (0.012)</b>	0.943 (0.013)	0.863 (0.119)	<b>0.892 (0.018)</b>	0.846 (0.074)	<b>0.862 (0.022)</b>
0.3	spy		0.841 (0.029)		0.748 (0.067)		0.732 (0.045)
0.5	naive	<b>0.956 (0.004)</b>	0.953 (0.005)	0.530 (0.025)	<b>0.859 (0.010)</b>	0.631 (0.012)	<b>0.844 (0.010)</b>
0.5	clust	<b>0.918 (0.036)</b>	0.855 (0.078)	<b>0.864 (0.021)</b>	0.825 (0.014)	<b>0.828 (0.036)</b>	0.737 (0.025)
0.5	strict-lassclust	0.916 (0.005)	<b>0.941 (0.005)</b>	<b>0.855 (0.027)</b>	0.824 (0.014)	<b>0.827 (0.022)</b>	0.734 (0.025)
0.5	non-strict-lassclust	0.916 (0.006)	<b>0.941 (0.005)</b>	<b>0.856 (0.028)</b>	0.824 (0.013)	<b>0.827 (0.022)</b>	0.733 (0.023)
0.5	lassojoint	<b>0.968 (0.004)</b>	0.958 (0.011)	<b>0.918 (0.006)</b>	0.855 (0.137)	<b>0.897 (0.008)</b>	0.847 (0.090)
0.5	spy		0.834 (0.025)		0.746 (0.065)		0.732 (0.042)
0.8	naive	<b>0.963 (0.001)</b>	<b>0.963 (0.001)</b>	<b>0.913 (0.003)</b>	<b>0.913 (0.003)</b>	<b>0.894 (0.003)</b>	<b>0.894 (0.003)</b>
0.8	clust	0.851 (0.053)	<b>0.942 (0.005)</b>	0.724 (0.088)	<b>0.842 (0.016)</b>	0.737 (0.049)	<b>0.769 (0.028)</b>
0.8	strict-lassclust	0.907 (0.018)	<b>0.941 (0.004)</b>	0.619 (0.047)	<b>0.838 (0.017)</b>	0.671 (0.021)	<b>0.760 (0.031)</b>
0.8	non-strict-lassclust	0.910 (0.004)	<b>0.941 (0.004)</b>	0.620 (0.048)	<b>0.838 (0.017)</b>	0.672 (0.022)	<b>0.761 (0.031)</b>
0.8	lassojoint	<b>0.942 (0.004)</b>	<b>0.942 (0.004)</b>	<b>0.402 (0.003)</b>	<b>0.402 (0.003)</b>	<b>0.572 (0.003)</b>	<b>0.572 (0.003)</b>
0.8	spy		0.829 (0.020)		0.769 (0.037)		0.743 (0.026)

**Table 57.** Summary Statistics for df = wdbc; SCAR scheme

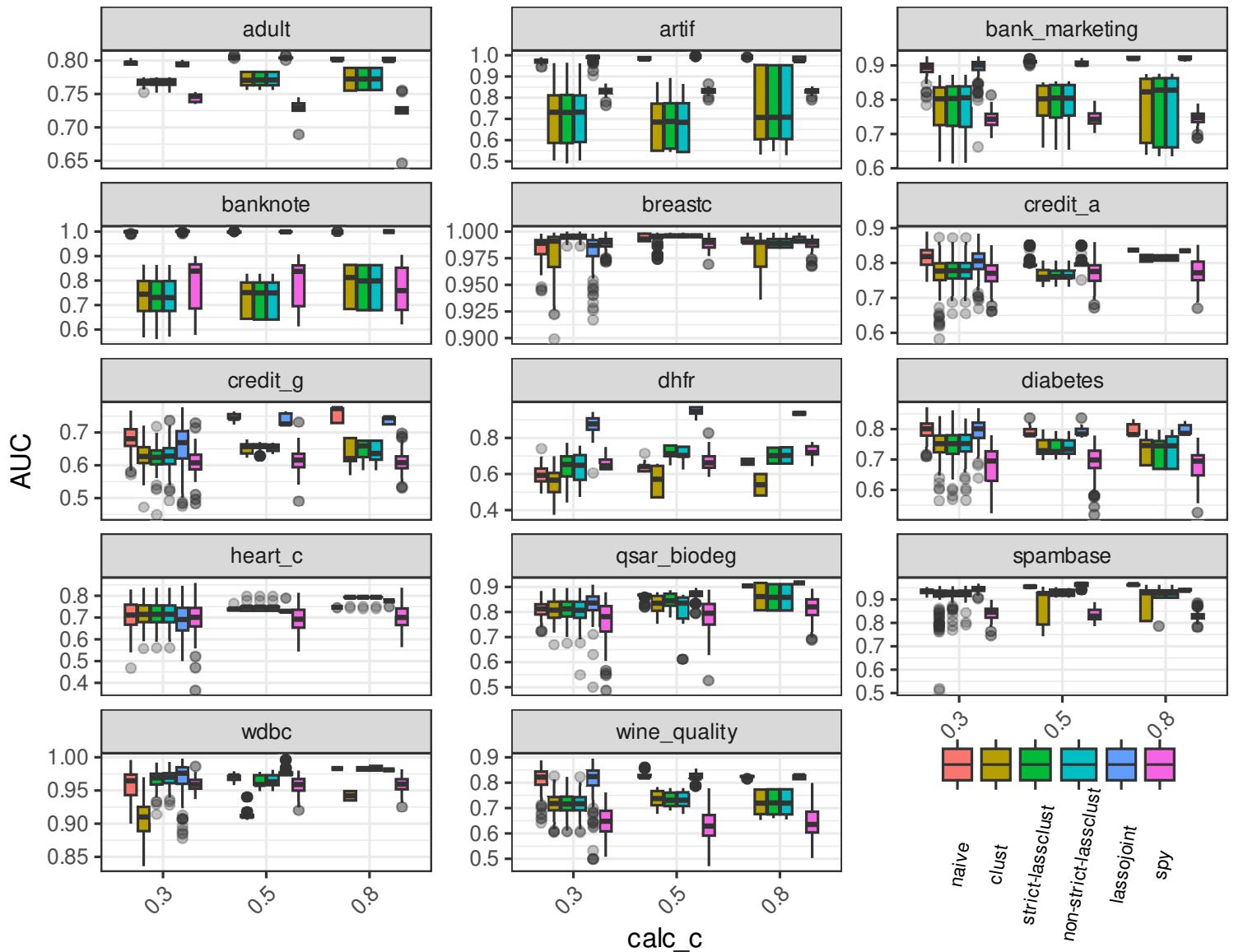
calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.959 (0.022)</b>	0.958 (0.021)	0.435 (0.037)	<b>0.748 (0.046)</b>	0.566 (0.029)	<b>0.742 (0.044)</b>
	clust	0.899 (0.028)	<b>0.914 (0.021)</b>	0.886 (0.028)	<b>0.903 (0.021)</b>	0.840 (0.039)	<b>0.861 (0.033)</b>
	strict-lassclust	0.964 (0.011)	<b>0.970 (0.013)</b>	0.903 (0.026)	<b>0.904 (0.028)</b>	<b>0.861 (0.046)</b>	0.858 (0.051)
	non-strict-lassclust	0.965 (0.012)	<b>0.972 (0.011)</b>	0.908 (0.018)	<b>0.911 (0.020)</b>	<b>0.872 (0.025)</b>	<b>0.872 (0.031)</b>
	lassojoint	<b>0.974 (0.021)</b>	0.964 (0.025)	<b>0.879 (0.127)</b>	0.621 (0.239)	<b>0.867 (0.092)</b>	0.687 (0.149)
	spy		0.959 (0.010)		0.900 (0.018)		0.869 (0.023)
0.5	naive	<b>0.970 (0.006)</b>	0.967 (0.006)	0.684 (0.049)	<b>0.839 (0.048)</b>	0.731 (0.044)	<b>0.838 (0.048)</b>
	clust	0.911 (0.004)	<b>0.917 (0.010)</b>	0.889 (0.007)	<b>0.919 (0.005)</b>	0.874 (0.016)	<b>0.903 (0.007)</b>
	strict-lassclust	0.957 (0.004)	<b>0.971 (0.007)</b>	<b>0.900 (0.020)</b>	0.895 (0.017)	<b>0.885 (0.028)</b>	0.868 (0.029)
	non-strict-lassclust	0.957 (0.004)	<b>0.973 (0.005)</b>	0.902 (0.020)	<b>0.906 (0.016)</b>	<b>0.890 (0.022)</b>	0.887 (0.016)
	lassojoint	0.977 (0.003)	<b>0.979 (0.009)</b>	<b>0.926 (0.015)</b>	0.505 (0.099)	<b>0.915 (0.021)</b>	0.638 (0.044)
	spy		0.958 (0.012)		0.899 (0.019)		0.866 (0.026)
0.8	naive	<b>0.983 (0.000)</b>	<b>0.983 (0.000)</b>	<b>0.912 (0.000)</b>	<b>0.912 (0.000)</b>	<b>0.887 (0.000)</b>	<b>0.887 (0.000)</b>
	clust	<b>0.949 (0.000)</b>	0.935 (0.000)	<b>0.912 (0.000)</b>	0.906 (0.000)	<b>0.885 (0.000)</b>	0.864 (0.000)
	strict-lassclust	0.980 (0.000)	<b>0.985 (0.000)</b>	0.912 (0.000)	<b>0.924 (0.000)</b>	<b>0.891 (0.000)</b>	<b>0.891 (0.000)</b>
	non-strict-lassclust	0.980 (0.000)	<b>0.987 (0.000)</b>	0.906 (0.000)	<b>0.929 (0.000)</b>	0.884 (0.000)	<b>0.898 (0.000)</b>
	lassojoint	<b>0.981 (0.000)</b>	<b>0.981 (0.000)</b>	<b>0.959 (0.000)</b>	<b>0.959 (0.000)</b>	<b>0.945 (0.000)</b>	<b>0.945 (0.000)</b>
	spy		0.959 (0.012)		0.902 (0.020)		0.872 (0.027)

**Table 58.** Summary Statistics for df = wine-quality; SCAR scheme

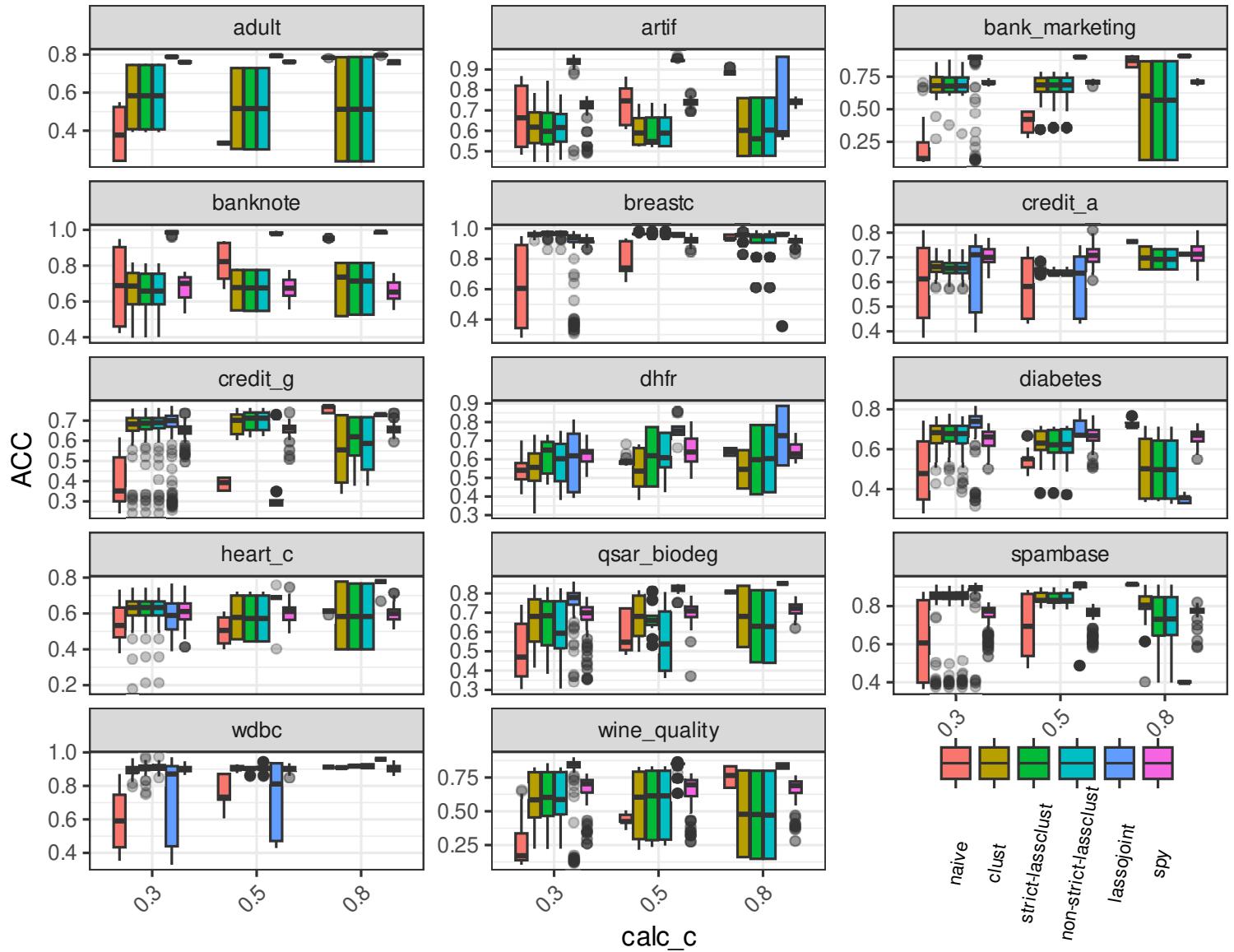
calc-c	method	AUC		ACC		F1	
		nonSMOTE	SMOTE	nonSMOTE	SMOTE	nonSMOTE	SMOTE
0.3	naive	<b>0.814 (0.046)</b>	<b>0.814 (0.042)</b>	0.137 (0.013)	<b>0.370 (0.125)</b>	0.238 (0.019)	<b>0.298 (0.044)</b>
	clust	0.694 (0.034)	<b>0.737 (0.035)</b>	0.445 (0.084)	<b>0.777 (0.053)</b>	0.280 (0.050)	<b>0.369 (0.085)</b>
	strict-lassclust	0.695 (0.035)	<b>0.736 (0.035)</b>	0.460 (0.086)	<b>0.781 (0.052)</b>	0.283 (0.054)	<b>0.363 (0.079)</b>
	non-strict-lassclust	0.696 (0.033)	<b>0.735 (0.035)</b>	0.458 (0.082)	<b>0.777 (0.055)</b>	0.283 (0.052)	<b>0.361 (0.084)</b>
	lassojoint	<b>0.807 (0.081)</b>	0.801 (0.063)	0.710 (0.275)	<b>0.818 (0.143)</b>	<b>0.376 (0.147)</b>	0.345 (0.113)
	spy		0.645 (0.059)		0.659 (0.122)		0.282 (0.070)
0.5	naive	<b>0.829 (0.013)</b>	<b>0.829 (0.013)</b>	<b>0.448 (0.034)</b>	<b>0.448 (0.034)</b>	<b>0.320 (0.019)</b>	<b>0.320 (0.019)</b>
	clust	0.701 (0.024)	<b>0.759 (0.016)</b>	0.279 (0.073)	<b>0.801 (0.011)</b>	0.257 (0.017)	<b>0.403 (0.019)</b>
	strict-lassclust	0.707 (0.017)	<b>0.752 (0.020)</b>	0.290 (0.070)	<b>0.803 (0.010)</b>	0.264 (0.013)	<b>0.393 (0.025)</b>
	non-strict-lassclust	0.701 (0.023)	<b>0.752 (0.020)</b>	0.295 (0.067)	<b>0.804 (0.011)</b>	0.260 (0.016)	<b>0.394 (0.027)</b>
	lassojoint	<b>0.824 (0.015)</b>	0.820 (0.019)	0.818 (0.080)	<b>0.834 (0.040)</b>	<b>0.398 (0.057)</b>	0.392 (0.048)
	spy		0.633 (0.062)		0.645 (0.129)		0.274 (0.066)
0.8	naive	<b>0.825 (0.003)</b>	0.822 (0.001)	<b>0.833 (0.000)</b>	0.676 (0.007)	0.414 (0.007)	<b>0.416 (0.007)</b>
	clust	0.674 (0.007)	<b>0.772 (0.003)</b>	0.161 (0.001)	<b>0.801 (0.002)</b>	0.254 (0.004)	<b>0.444 (0.001)</b>
	strict-lassclust	0.674 (0.004)	<b>0.773 (0.002)</b>	0.149 (0.003)	<b>0.800 (0.001)</b>	0.251 (0.004)	<b>0.435 (0.001)</b>
	non-strict-lassclust	0.673 (0.006)	<b>0.773 (0.003)</b>	0.148 (0.001)	<b>0.799 (0.003)</b>	0.251 (0.004)	<b>0.436 (0.005)</b>
	lassojoint	<b>0.830 (0.002)</b>	0.815 (0.003)	<b>0.852 (0.005)</b>	0.818 (0.007)	0.381 (0.017)	<b>0.435 (0.020)</b>
	spy		0.643 (0.058)		0.657 (0.099)		0.299 (0.066)

### 2.3 Graphs

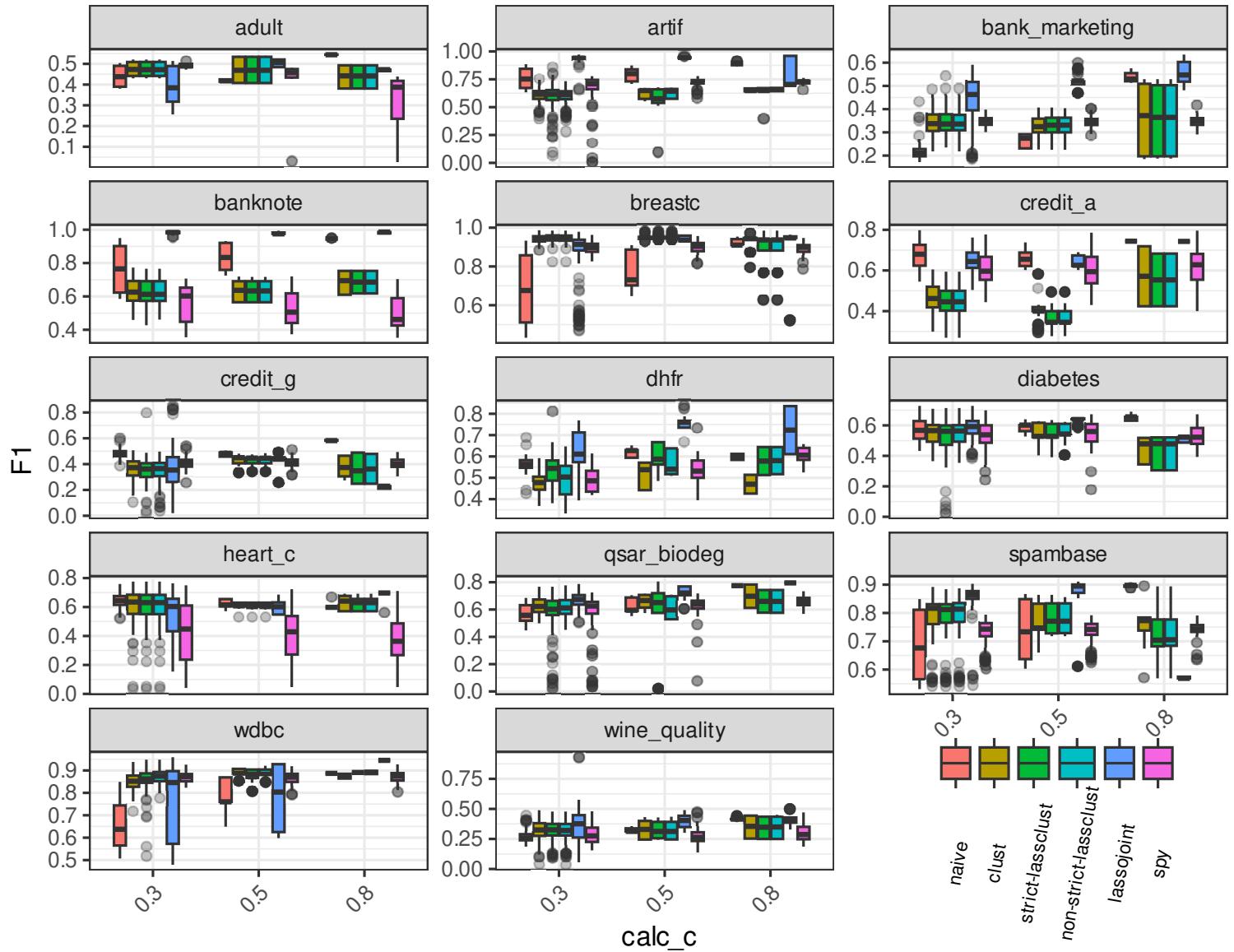
In this section we present all barplots for classification metrics for our methods. In addition, we present boxplots of the execution times of the algorithms used.



**Fig. 4.** AUC; SMOTE scheme; SCAR

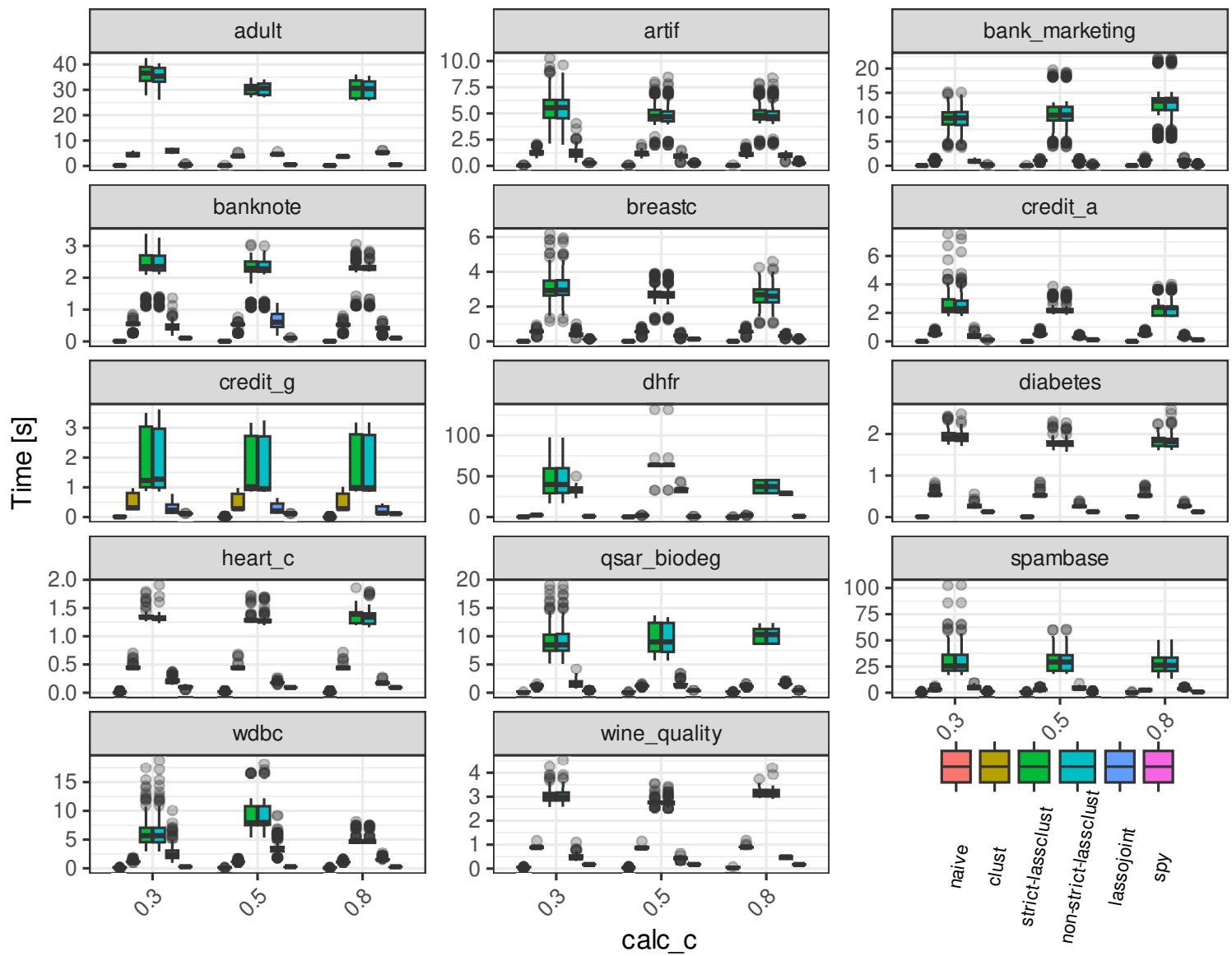


**Fig. 5.** Accuracy; SMOTE scheme; SCAR

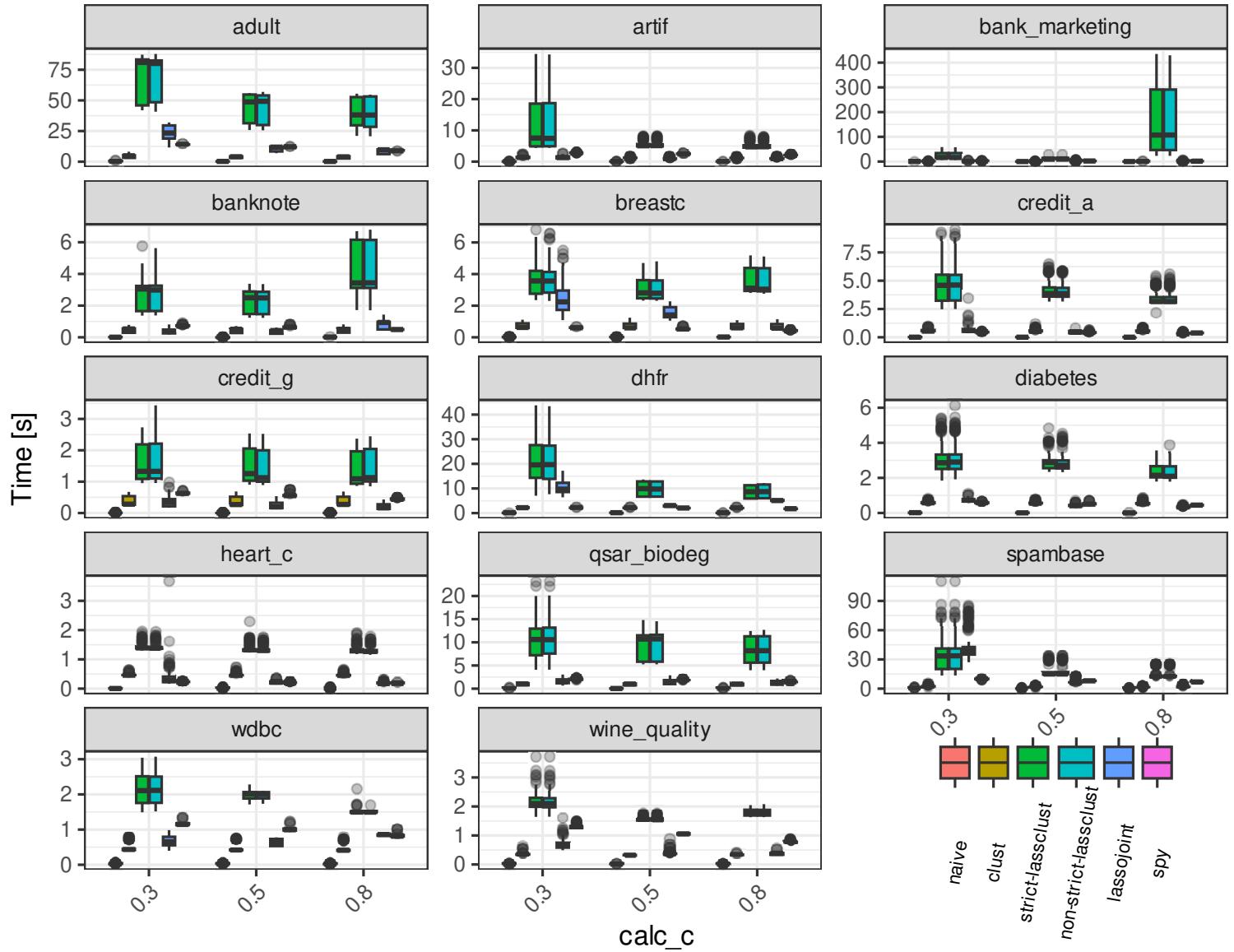


**Fig. 6.** F1 score; SMOTE scheme; SCAR

### 3 Calculation times



**Fig. 7.** Time[s]; SMOTE scheme; SCAR



**Fig. 8.** Time[s]; SMOTE scheme; nonSCAR

## 4 Description of the Function `non_scar_labelling.mvc`

Given a dataset  $\mathbf{D}$  with columns representing features and a target variable  $Y$ , the function `non_scar_labelling.mvc` performs the following steps:

1. Filter out columns  $Y$ :

$$\mathbf{D}_{\text{filtered}} = \mathbf{D} \setminus \{Y\}$$

2. Calculate variance for each column:

$$\text{var}_i = \text{Var}(X_i) \quad \text{for each feature } X_i \in \mathbf{D}_{\text{filtered}}$$

3. Sort columns by decreasing variance:

$$\text{sorted\_variances} = \text{sort}(\{\text{var}_i\}, \text{decreasing} = \text{TRUE})$$

4. Select top  $n_{\text{vars}}$  columns with highest variance:

$$\mathbf{T} = \{X_i \mid \text{var}_i \in \text{sorted\_variances}[1 : n_{\text{vars}}]\}$$

5. Create temporary dataframe with new column defined as rank of sums of selected column, where rank  $\text{rn}=1$  for the smallest value and rank  $\text{rn}=n$  for the largest value and  $n$  is the number of rows in our dataset :

$$\mathbf{D}_{\text{temp}} = \mathbf{D} \cup \left\{ \text{rn} = \text{row\_number} \left( \sum_{X_i \in \mathbf{T}} X_i \right) \right\}$$

6. Define binary variables  $S_{02}$ ,  $S_{05}$ , and  $S_{08}$ :

$$S_{02} = \begin{cases} 1 & \text{if } \frac{\text{rn}}{n} < 0.2 \text{ and } Y = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$S_{04} = \begin{cases} 1 & \text{if } \frac{\text{rn}}{n} < 0.4 \text{ and } Y = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$S_{06} = \begin{cases} 1 & \text{if } \frac{\text{rn}}{n} < 0.6 \text{ and } Y = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$S_{08} = \begin{cases} 1 & \text{if } \frac{\text{rn}}{n} < 0.8 \text{ and } Y = 1 \\ 0 & \text{otherwise} \end{cases}$$

7. Calculate  $c_{\text{calc}}$  values:

$$c_{\text{calc}02} = \frac{\sum S_{02}}{\sum Y}, \quad c_{\text{calc}04} = \frac{\sum S_{04}}{\sum Y}, \quad c_{\text{calc}06} = \frac{\sum S_{06}}{\sum Y}, \quad c_{\text{calc}08} = \frac{\sum S_{08}}{\sum Y}$$

$$\mathbf{c}_{\text{calc}} = \{c_{\text{calc}02}, c_{\text{calc}04}, c_{\text{calc}06}, c_{\text{calc}08}\}$$

8. Fit a linear model to estimate target  $c_{\text{calc}}$ :

$$c_{\text{calc}} \sim \alpha + \beta \times x, \quad \text{where } x \in \{0.2, 0.4, 0.6, 0.8\}$$

$$\text{rn\_frac} = \frac{\text{target\_c\_calc} - \alpha}{\beta}$$

9. Create the final dataframe with the new column  $S$ :

$$S = \begin{cases} 1 & \text{if } \frac{\text{rn}}{n} < \text{rn\_frac} \text{ and } Y = 1 \\ 0 & \text{otherwise} \end{cases}$$

The final dataframe  $\mathbf{D1} = \mathbf{D} \cup S$  is returned with the new column  $S$  representing the target variable's adjusted binary label.