Supplemental material for the article: "Learning-to-Rank *vs* Ranking-to-Learn: Strategies for Regression Testing in Continuous Integration"

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A ONLINE SUPPLEMENTAL MATERIAL

This appendix is available online for reviewers' use at the following anonymized GitHub repository:
https://github.com/icse20/RT-CI.
Material for verifiability and replicability of the experiments is at the same repository.

The appendix contains: the settings of the prioritization algorithms; results for RQ1, RQ2 and RQ3 not presented in the main article for the sake of space.

A.1 Algorithm parameters

Table 1 reports the parameters setting of the experimented algorithms. In all the cases except two, the default parameters are adopted: for RankNet and LambdaMART, due to overfitting causing NaN occurrences in the ranking, we needed to lower the number of epochs and trees, respectively, until obtaining a valid result.

A.2 RQ1

Figures 1a-1f and 2a-2f report the *RPA* and *ranking time* boxplots for each subject.
Figures 3a-3f report the total training times (ms) per subject, in logarithmic scale.

Table 1: Algorithms parameters settings

Algorithm	Parameters	
KNN	k=4	
RF	Tree=100	SplitCriterion = Information Gain Ratio
RF	Tree=100	
L-MART	Tree=30	Leaf=10
MART	Tree=1000	Leaf=10
RankBoost	round = 300	
RankNet	Epoch=50	Layer=2
CA	randomRestarts=5	iterations=25
RL	Layer=1	Neurons=12
RL-MLP	Layer=4	Neurons=12
RL-RF	Tree=100	SplitCriterion = Information Gain Ratio
RL-RF	Tree=100	

A.3 RQ2

Figures 4a-4f reports the T^2 Hotelling's statistic used to summarize the trend of the code metrics, computed on a set of principal components able to explain at least the 95% of the original metrics variance.

A.4 RQ3

Table 2f reports, for each subject, the difference between the tests execution times taken from the 25%, 50% or 75% of the list of tests sorted according to the *optimal* ranking and those taken from the 25%, 50% or 75% of the list of tests sorted according to the *predicted* ranking. Similarly, the difference between the total number of failing tests considering the 25%, 50% or 75% of optimal and predicted ranking.

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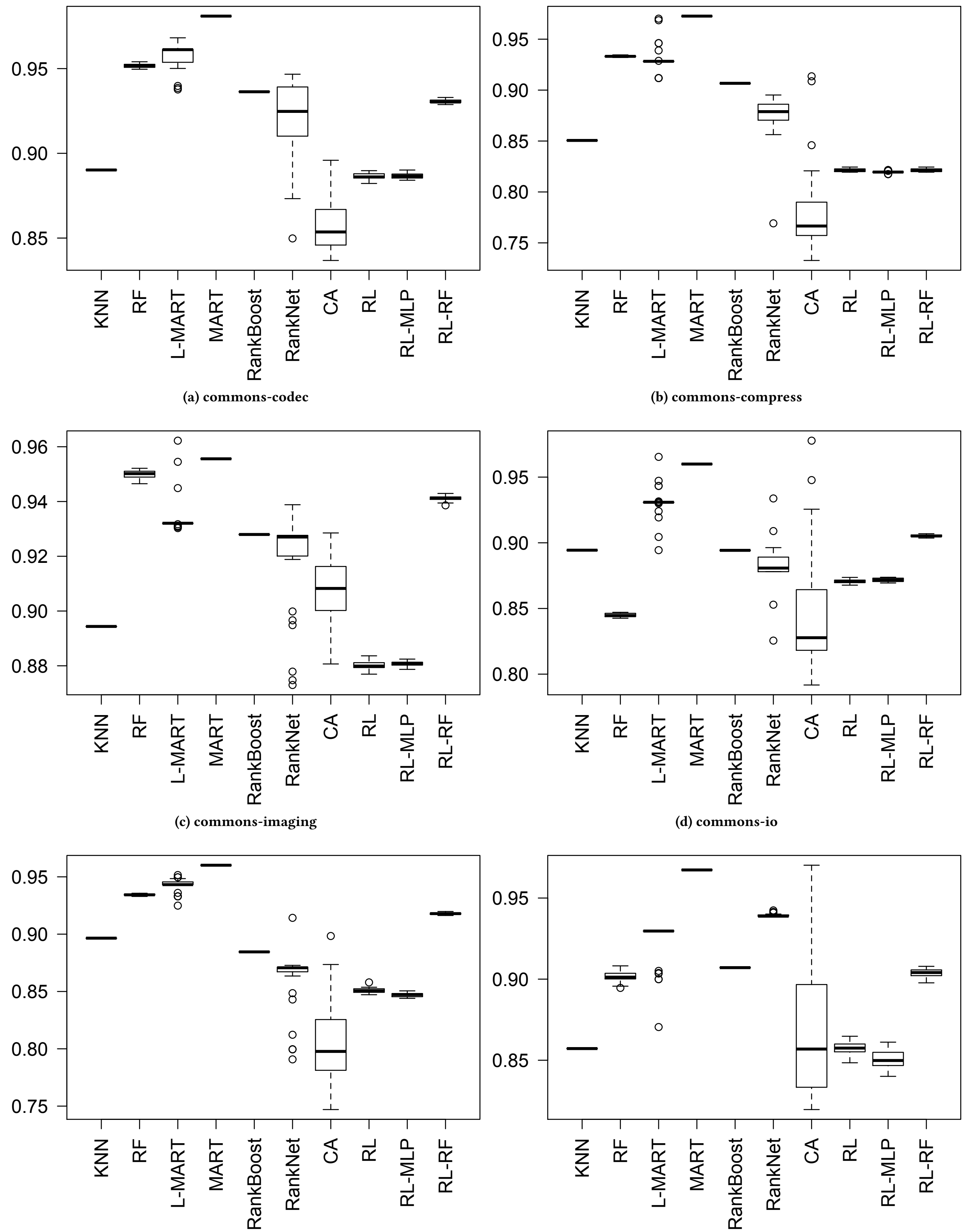


(a) commons-codec

(b) commons-compress

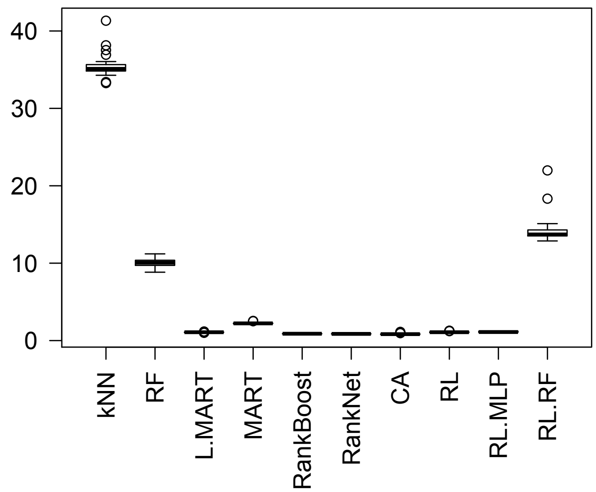
(c) commons-imaging

(d) commons-io

(e) commons-lang

(f) commons-math

Figure 1: RPA



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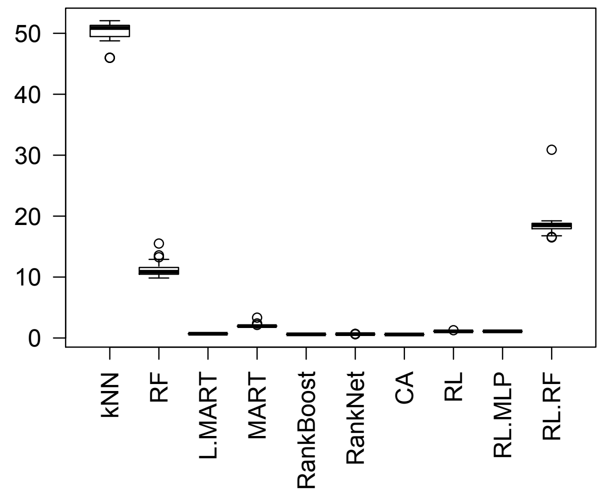

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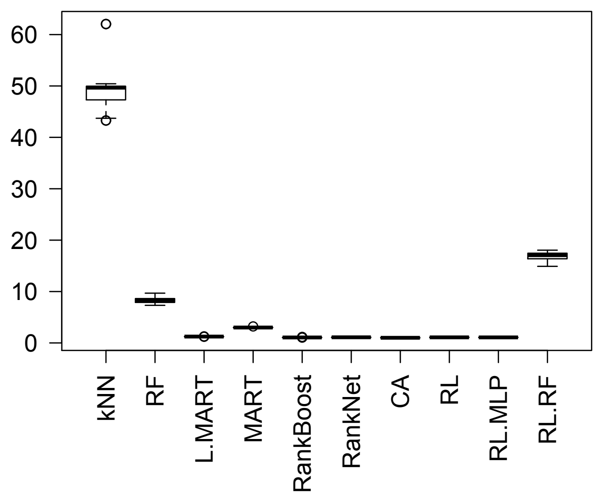

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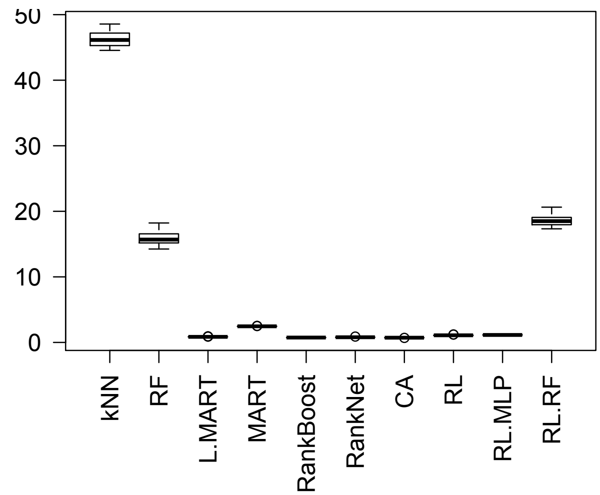

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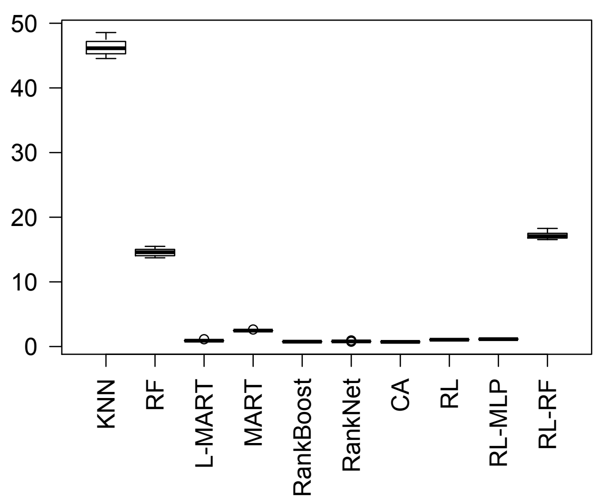

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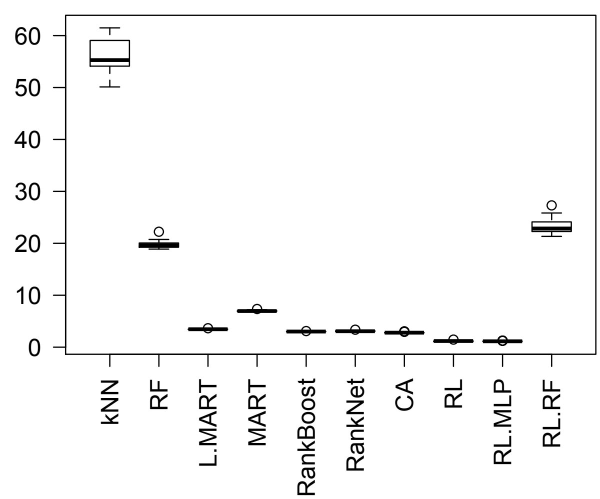
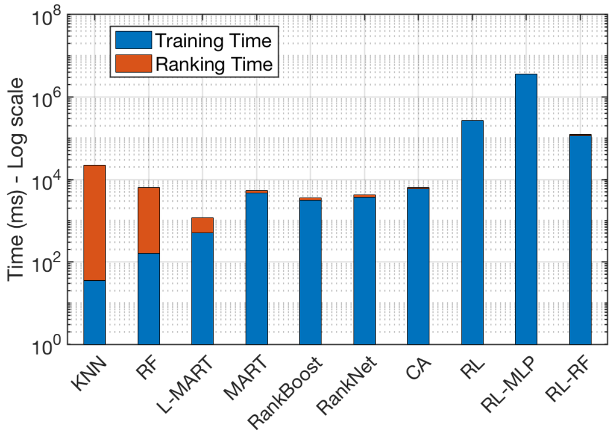


(f) commons-math

Figure 2: Ranking time



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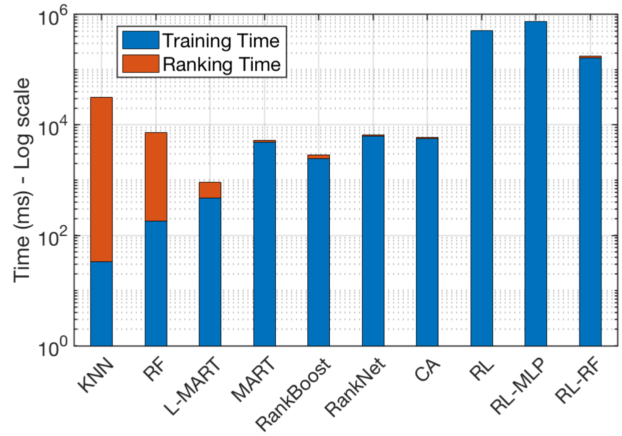

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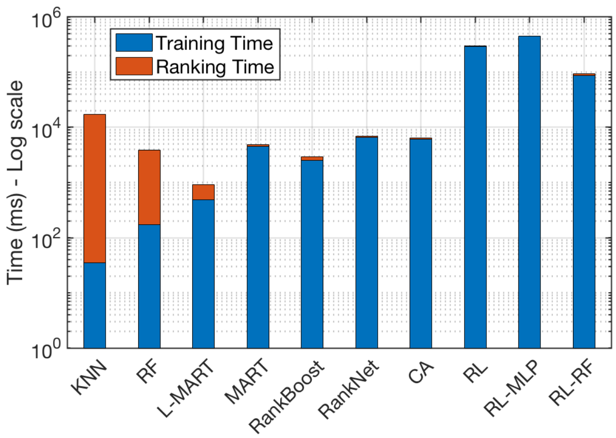

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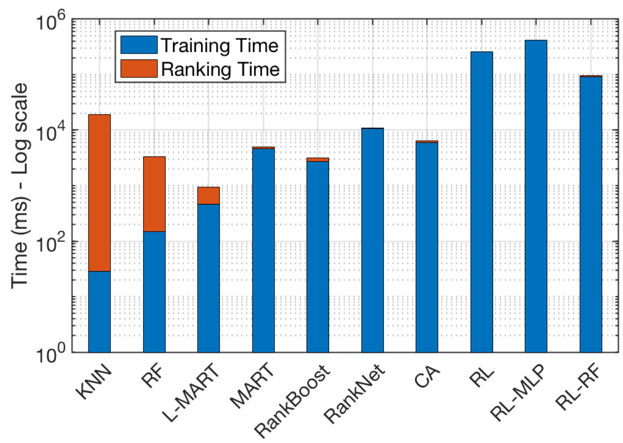

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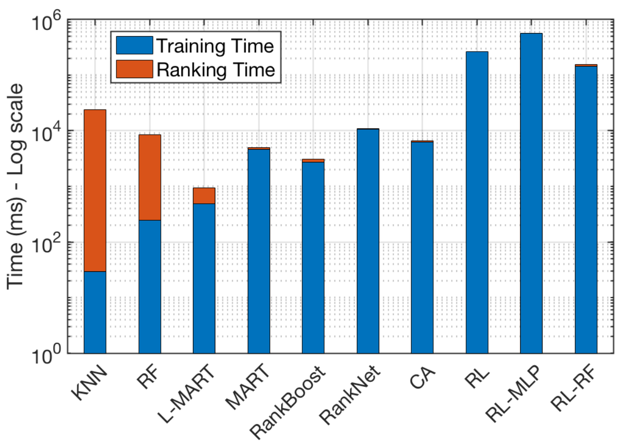

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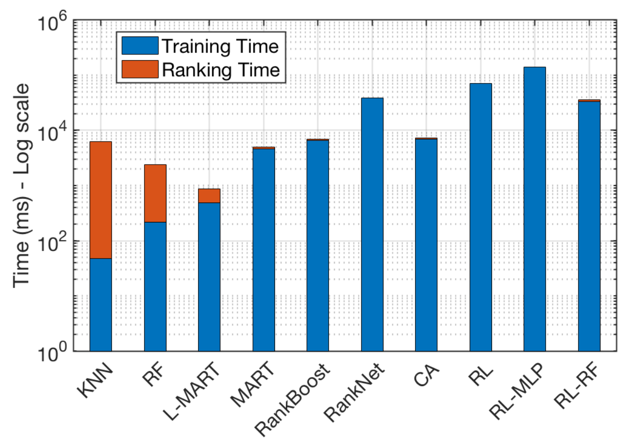
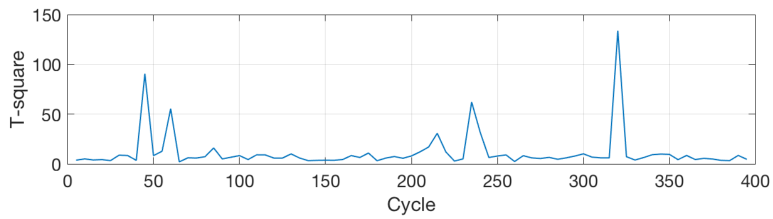
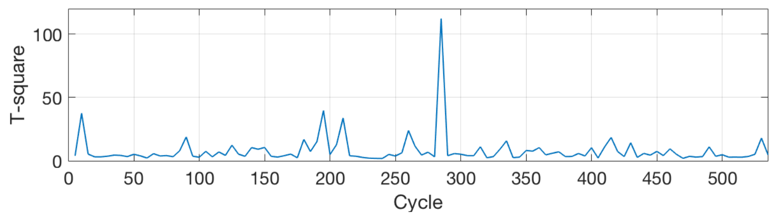


(f) commons-math

Figure 3: Training time



(a) commons-codec



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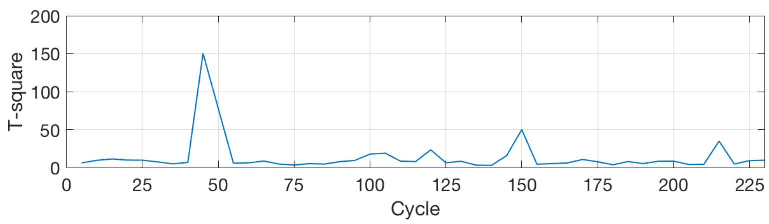

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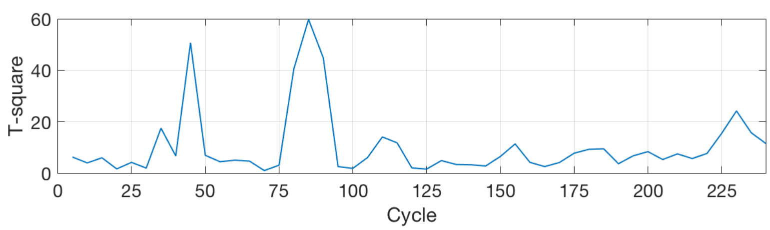

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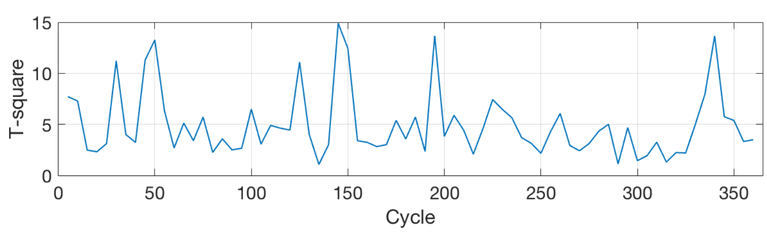
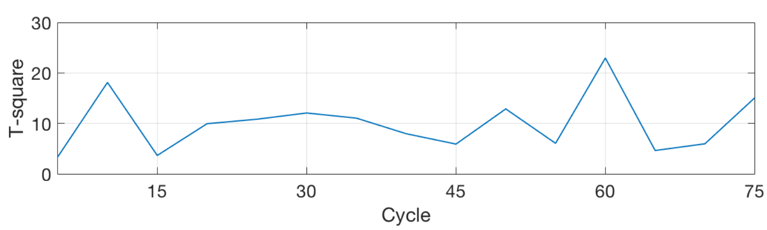


(e) commons-lang



(f) commons-math

Table 2: Optimal-predicted difference of tests execution times (ms), averaged over all the commits and subjects, and of total number of failing tests, averaged over subjects

(a) commons-codec

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	0.2846	0.0000	0.5775	0.0000	0.9354	0.0000
RF	0.0196	0.0000	0.1166	0.0000	0.3651	0.0000
L-MART	0.0298	0.0000	0.3240	0.0000	0.6993	0.0000
MART	0.0103	0.0000	0.0680	0.0000	0.0205	0.0000
RankBoost	0.2944	0.0000	0.5288	0.0000	0.5511	0.0000
RankNet	0.2633	0.0000	0.4158	0.0000	0.5592	0.0000
CA	0.6300	-5.4000	0.8352	0.0000	0.8903	0.0000
RL	0.2967	-1.0000	0.5357	0.0000	0.6005	0.0000
RL-MLP	0.2707	-1.0000	0.5257	0.0000	0.5641	0.0000
RL-RF	0.0510	-1.0000	0.2363	-1.0000	0.5359	-1.0000

(b) commons-compress

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	0.2951	0.0000	0.7672	0.0000	1.7559	0.0000
RF	0.0386	-5.2000	0.4788	-1.2000	1.3699	0.0000
L-MART	0.0366	-6.8000	0.2798	-4.8000	0.7783	-0.8000
MART	0.0120	0.0000	0.0136	0.0000	0.0819	0.0000
RankBoost	0.2848	0.0000	0.9204	0.0000	1.1516	0.0000
RankNet	0.3164	-4.0000	0.8582	-1.6000	1.2750	-0.4000
CA	0.8784	0.0000	1.4143	-4.2000	1.7709	-3.0000
RL	0.6250	-15.5000	1.1784	-12.2000	1.6203	-8.4000
RL-MLP	0.6521	-17.4000	1.2036	-13.3000	1.6207	-6.2000
RL-RF	0.0311	-22.0000	0.6720	-10.8000	1.8496	-5.8000

(c) commons-imaging

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	0.9200	0.0000	0.9884	0.0000	4.0614	0.0000
RF	0.0814	0.0000	0.6912	0.0000	3.8510	0.0000
L-MART	0.4546	0.0000	1.3764	0.0000	1.9815	0.0000
MART	0.0664	-2.0000	0.0188	0.0000	0.1173	0.0000
RankBoost	1.0048	0.0000	1.5274	0.0000	2.1156	0.0000
RankNet	1.2028	0.0000	2.1866	0.0000	3.3407	0.0000
CA	1.0650	-1.2000	2.6108	0.0000	3.6653	0.0000
RL	1.7687	-1.4000	3.3307	-0.6000	4.6458	-0.1000
RL-MLP	1.7952	-1.5000	3.4279	-1.0000	4.7758	-0.7000
RL-RF	0.0529	-1.2000	1.7756	0.0000	5.0547	0.0000

(d) commons-io

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	1.5958	-2.0000	4.9703	-2.0000	15.9193	-2.0000
RF	5.3489	-1.0000	12.7569	-0.8000	16.5187	-0.3000
L-MART	0.6970	-2.0000	2.4218	-2.0000	8.9455	-1.9000
MART	0.0170	-4.0000	0.2378	-2.0000	0.1483	-2.0000
RankBoost	8.0699	-2.0000	9.7164	-1.0000	10.3045	-1.0000
RankNet	4.2097	-0.4000	8.0319	-0.4000	9.1499	-0.3000
CA	10.3991	-2.2000	13.5966	-0.7000	14.8289	-0.5000
RL	5.4701	-3.0000	9.6149	-2.8000	13.5486	-1.3000
RL-MLP	5.0147	-3.2000	9.6170	-3.0000	13.4622	-0.6000
RL-RF	3.1774	-6.0000	9.3008	-6.0000	16.6132	-3.0000

(e) commons-lang

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	0.0564	-4.0000	0.5346	-4.0000	2.1290	0.0000
RF	0.0109	-3.6000	0.2227	-3.6000	1.4451	0.0000
L-MART	0.1703	-4.0000	1.1242	-4.0000	1.7714	-2.0000
MART	0.0115	-6.0000	0.0244	-2.0000	0.0605	-2.0000
RankBoost	0.4790	0.0000	1.6340	0.0000	2.0571	0.0000
RankNet	0.1823	0.0000	0.8609	0.0000	0.9708	0.0000
CA	0.9939	-6.0000	1.5273	-1.4000	1.6984	-1.0000
RL	0.5868	-3.0000	1.1955	-1.5000	1.6581	-0.7000
RL-MLP	0.6391	-2.8000	1.1720	-2.0000	1.6530	-0.9000
RL-RF	0.0281	-4.0000	0.3530	-4.0000	1.8433	0.0000

(f) commons-math

Algorithms	Time-constrained scenarios					
	25%		*50%*		*75%*	
	Time	Failures	Time	Failures	Time	Failures
KNN	0.1643	-6.0000	2.1354	-6.0000	4.4231	-6.0000
RF	0.1120	-6.0000	1.3305	-6.0000	2.9984	-6.0000
L-MART	0.0826	-6.0000	0.4000	-6.0000	0.5274	-6.0000
MART	0.0150		0.0177	-6.0000	0.0250	-6.0000
RankBoost	0.3496	-6.0000	0.8658	-6.0000	3.2967	-6.0000
RankNet	0.1544	-6.0000	2.5655	-6.0000	2.4697	-6.0000
CA	1.0478		1.4488	-6.0000	2.0388	-6.0000
RL	2.5887	-7.4000	5.1019	-4.5000	6.9543	-2.8000
RL-MLP	2.2968	-6.8000	5.0432	-4.6000	6.9328	-3.4000
RL-RF	0.1372	-9.0000	1.4215	-5.4000	4.8902	-4.3000