

Appendix: Detailed Results for LSH-ART

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This appendix contains the detailed experimental data and corresponding statistical analyses for the paper “Toward Cost-effective Adaptive Random Testing: An Approximate Nearest Neighbor Approach”. The data are intended to supplement the discussion and conclusions in the main text, providing a deeper understanding and validation. The data are presented in tables, which were not shown in the main text, due to space limitations.

A DETAILED EXPERIMENT RESULTS FOR NUMERICAL INPUT DOMAINS

This section contains the following experimental results for numerical input domains: F-measure results, P-measure results, test case generation time results, and F-time results.

A. F-measure Results

Tables A.1, A.2, and A.3 present the FSCS F-measure simulation results for block, strip, and point patterns, respectively. Tables A.4, A.5, and A.6 show the corresponding RRT F-measure simulation results. Tables A.7 and A.8 summarize the F-measure results for the empirical studies using the 23 subject programs. In these figures, when comparing two methods \mathcal{M}_1 and \mathcal{M}_2 , we used the \bigcirc symbol to indicate that there was no statistical difference between them (their p -value was greater than 0.01); the \checkmark symbol to indicate that \mathcal{M}_1 was significantly better (p -value was less than 0.01, and the effect size was greater than 0.50); and the \times symbol to indicate that \mathcal{M}_2 was significantly better (p -value was less than 0.01, and the effect size was less than 0.50). Each effect size value — $\hat{A}_{12}(\mathcal{M}_1, \mathcal{M}_2)$ — is listed in the parenthesis immediately following the comparison symbol.

TABLE A.1
FSCS VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR BLOCK PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.9866	0.5669	0.7012	0.6439	0.5706	0.5682	0.5564	✓ (0.61)	○ (0.51)	✓ (0.53)	○ (0.52)	○ (0.51)	○ (0.51)
	5.0×10^{-3}	0.9875	0.5712	0.8729	0.8312	0.5552	0.5586	0.5605	✓ (0.61)	○ (0.51)	✓ (0.57)	✓ (0.57)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	0.9574	0.5651	0.9718	0.9310	0.5687	0.5659	0.5533	✓ (0.61)	○ (0.51)	✓ (0.61)	✓ (0.60)	○ (0.51)	○ (0.51)
	1.0×10^{-3}	1.0053	0.5605	0.9830	0.9956	0.5694	0.5570	0.5643	✓ (0.62)	○ (0.50)	✓ (0.60)	✓ (0.61)	○ (0.50)	○ (0.49)
	5.0×10^{-4}	1.0160	0.5679	0.9913	0.9957	0.5532	0.5557	0.5546	✓ (0.62)	○ (0.51)	✓ (0.62)	✓ (0.61)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	0.9955	0.5527	0.9820	0.9775	0.5702	0.5530	0.5697	✓ (0.60)	○ (0.49)	✓ (0.60)	✓ (0.60)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	0.9899	0.5570	1.0025	1.0504	0.5629	0.5524	0.5671	✓ (0.60)	○ (0.49)	✓ (0.61)	✓ (0.62)	○ (0.50)	○ (0.49)
$d = 2$	1.0×10^{-2}	1.0152	0.6760	0.9123	0.9090	0.6719	0.6814	0.6828	✓ (0.57)	○ (0.50)	✓ (0.54)	✓ (0.54)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0030	0.6716	0.9863	1.0185	0.6538	0.6532	0.6787	✓ (0.57)	○ (0.50)	✓ (0.56)	✓ (0.58)	○ (0.49)	○ (0.49)
	2.0×10^{-3}	1.0227	0.6523	1.0651	1.0916	0.6390	0.6504	0.6596	✓ (0.58)	○ (0.50)	✓ (0.59)	✓ (0.60)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	1.0215	0.6456	1.0263	1.0642	0.6302	0.6359	0.6549	✓ (0.59)	○ (0.50)	✓ (0.58)	✓ (0.59)	○ (0.49)	○ (0.50)
	5.0×10^{-4}	0.9954	0.6362	1.0706	1.0848	0.6300	0.6432	0.6706	✓ (0.57)	○ (0.49)	✓ (0.58)	✓ (0.59)	○ (0.48)	○ (0.49)
	2.0×10^{-4}	0.9893	0.6289	1.0783	1.0780	0.6141	0.6354	0.6662	✓ (0.57)	○ (0.48)	✓ (0.59)	✓ (0.59)	✖ (0.48)	○ (0.49)
	1.0×10^{-4}	1.0004	0.6333	1.0506	1.0429	0.6363	0.6254	0.6666	✓ (0.58)	○ (0.50)	✓ (0.59)	✓ (0.59)	○ (0.50)	○ (0.49)
$d = 3$	1.0×10^{-2}	1.0325	0.8510	1.1764	1.1428	0.8461	0.8402	0.8659	○ (0.52)	○ (0.50)	✓ (0.56)	✓ (0.55)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9728	0.7827	1.2262	1.2463	0.8004	0.8069	0.8517	○ (0.51)	○ (0.48)	✓ (0.57)	✓ (0.57)	○ (0.49)	○ (0.49)
	2.0×10^{-3}	0.9796	0.7769	1.2688	1.2501	0.7563	0.7751	0.8337	✓ (0.52)	○ (0.49)	✓ (0.59)	✓ (0.58)	✖ (0.48)	○ (0.49)
	1.0×10^{-3}	1.0114	0.7567	1.2919	1.2824	0.7539	0.7298	0.8277	✓ (0.53)	✖ (0.48)	✓ (0.59)	✓ (0.59)	✖ (0.48)	✖ (0.47)
	5.0×10^{-4}	0.9982	0.7455	1.2486	1.2898	0.7388	0.7391	0.8310	✓ (0.53)	✖ (0.48)	✓ (0.58)	✓ (0.58)	✖ (0.47)	✖ (0.47)
	2.0×10^{-4}	1.0387	0.7215	1.2484	1.2674	0.7222	0.7233	0.8198	✓ (0.54)	✖ (0.47)	✓ (0.58)	✓ (0.58)	✖ (0.47)	✖ (0.47)
	1.0×10^{-4}	1.0088	0.6928	1.2068	1.2439	0.7138	0.7094	0.8023	✓ (0.54)	✖ (0.47)	✓ (0.58)	✓ (0.58)	✖ (0.47)	✖ (0.47)
$d = 4$	1.0×10^{-2}	0.9774	1.0656	1.4415	1.4818	1.0279	1.0623	1.1108	✖ (0.44)	○ (0.49)	✓ (0.55)	✓ (0.55)	✖ (0.48)	○ (0.50)
	5.0×10^{-3}	0.9814	0.9743	1.5576	1.5498	0.9896	0.9670	1.0458	✖ (0.46)	○ (0.49)	✓ (0.58)	✓ (0.58)	○ (0.49)	○ (0.48)
	2.0×10^{-3}	0.9999	0.9543	1.5852	1.6398	0.9268	0.9444	0.9929	○ (0.48)	○ (0.50)	✓ (0.60)	✓ (0.60)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	0.9963	0.9239	1.5569	1.6138	0.8929	0.8920	0.9588	○ (0.49)	○ (0.50)	✓ (0.60)	✓ (0.61)	○ (0.49)	○ (0.49)
	5.0×10^{-4}	1.0128	0.8679	1.5486	1.5814	0.8831	0.8643	0.9724	○ (0.49)	✖ (0.48)	✓ (0.59)	✓ (0.60)	✖ (0.48)	✖ (0.47)
	2.0×10^{-4}	0.9831	0.8373	1.4802	1.5168	0.8540	0.8654	0.9637	○ (0.49)	✖ (0.48)	✓ (0.59)	✓ (0.59)	○ (0.48)	○ (0.49)
	1.0×10^{-4}	0.9981	0.8469	1.4976	1.5264	0.8222	0.8318	0.9643	○ (0.50)	✖ (0.48)	✓ (0.59)	✓ (0.59)	✖ (0.48)	✖ (0.47)
$d = 5$	1.0×10^{-2}	0.9850	1.3207	1.8729	1.9630	1.2984	1.3159	1.3484	✖ (0.40)	○ (0.50)	✓ (0.56)	✓ (0.57)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	0.9878	1.2490	1.9845	2.0510	1.2192	1.2001	1.2623	✖ (0.41)	○ (0.50)	✓ (0.60)	✓ (0.60)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	1.0600	1.1550	1.9957	2.0779	1.1506	1.1411	1.2049	✖ (0.43)	○ (0.49)	✓ (0.59)	✓ (0.61)	○ (0.49)	○ (0.49)
	1.0×10^{-3}	0.9852	1.1074	2.0159	2.0654	1.1045	1.0399	1.1642	✖ (0.44)	○ (0.50)	✓ (0.62)	✓ (0.62)	○ (0.49)	✖ (0.48)
	5.0×10^{-4}	0.9949	1.0492	1.8778	2.0207	1.0523	1.0391	1.1114	✖ (0.45)	○ (0.49)	✓ (0.61)	✓ (0.63)	○ (0.49)	○ (0.49)
	2.0×10^{-4}	1.0331	0.9593	2.0164	1.9705	1.0146	1.0069	1.0977	✖ (0.47)	✖ (0.48)	✓ (0.63)	✓ (0.62)	○ (0.49)	○ (0.49)
	1.0×10^{-4}	1.0146	0.9715	1.8741	1.8804	0.9739	0.9503	1.0856	✖ (0.48)	○ (0.48)	✓ (0.61)	✓ (0.61)	○ (0.48)	✖ (0.48)
$d = 10$	1.0×10^{-2}	0.9950	3.9269	6.8133	7.2000	3.5567	3.8815	3.6978	✖ (0.17)	✓ (0.52)	✓ (0.63)	✓ (0.63)	✖ (0.47)	○ (0.52)
	5.0×10^{-3}	0.9962	3.5159	7.9884	7.8587	3.4175	3.2698	3.3243	✖ (0.18)	○ (0.51)	✓ (0.67)	✓ (0.67)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	1.0482	3.1408	8.8285	8.4213	3.1135	2.9067	2.8955	✖ (0.22)	✓ (0.52)	✓ (0.72)	✓ (0.72)	○ (0.52)	○ (0.51)
	1.0×10^{-3}	0.9941	2.9168	9.1635	9.2257	2.7990	2.4650	2.5916	✖ (0.23)	✓ (0.53)	✓ (0.76)	✓ (0.75)	○ (0.52)	○ (0.48)
	5.0×10^{-4}	0.9913	2.6234	10.0563	9.8977	2.6057	2.3924	2.2903	✖ (0.26)	✓ (0.54)	✓ (0.77)	✓ (0.77)	✓ (0.53)	○ (0.51)
	2.0×10^{-4}	0.9799	2.3712	9.7029	9.7759	2.4603	2.0818	2.1074	✖ (0.30)	✓ (0.53)	✓ (0.78)	✓ (0.79)	✓ (0.55)	○ (0.51)
	1.0×10^{-4}	1.0215	2.2270	9.9951	9.7526	2.2100	1.9173	1.8729	✖ (0.33)	✓ (0.55)	✓ (0.80)	✓ (0.80)	✓ (0.55)	○ (0.51)

TABLE A.2

FSCS VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR STRIP PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.9866	0.5669	0.7012	0.6439	0.5706	0.5682	0.5564	✓ (0.61)	○ (0.51)	✓ (0.53)	○ (0.52)	○ (0.51)	○ (0.51)
	5.0×10^{-3}	0.9875	0.5712	0.8729	0.8312	0.5552	0.5586	0.5605	✓ (0.61)	○ (0.51)	✓ (0.57)	✓ (0.57)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	0.9574	0.5651	0.9718	0.9310	0.5687	0.5659	0.5533	✓ (0.61)	○ (0.51)	✓ (0.61)	✓ (0.60)	○ (0.51)	○ (0.51)
	1.0×10^{-3}	1.0053	0.5605	0.9830	0.9956	0.5694	0.5570	0.5643	✓ (0.62)	○ (0.50)	✓ (0.60)	✓ (0.61)	○ (0.50)	○ (0.49)
	5.0×10^{-4}	1.0160	0.5679	0.9913	0.9957	0.5532	0.5557	0.5546	✓ (0.62)	○ (0.51)	✓ (0.62)	✓ (0.61)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	0.9955	0.5527	0.9820	0.9775	0.5702	0.5530	0.5697	✓ (0.60)	○ (0.49)	✓ (0.60)	✓ (0.60)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	0.9899	0.5570	1.0025	1.0504	0.5629	0.5524	0.5671	✓ (0.60)	○ (0.49)	✓ (0.61)	✓ (0.62)	○ (0.50)	○ (0.49)
$d = 2$	1.0×10^{-2}	0.9725	0.9168	0.9766	0.9572	0.9098	0.9234	0.9495	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	0.9979	0.9705	1.0244	0.9715	0.9361	0.9350	0.9248	○ (0.51)	✓ (0.52)	✓ (0.52)	○ (0.51)	○ (0.50)	○ (0.51)
	2.0×10^{-3}	0.9752	0.9676	0.9810	1.0029	0.9623	0.9654	0.9931	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
	1.0×10^{-3}	0.9782	0.9793	1.0154	0.9815	0.9570	0.9580	0.9749	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.49)	○ (0.50)
	5.0×10^{-4}	1.0191	0.9717	1.0092	0.9900	0.9739	0.9418	0.9764	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.49)
	2.0×10^{-4}	1.0081	0.9281	0.9716	0.9982	0.9852	1.0017	0.9642	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
	1.0×10^{-4}	0.9997	0.9470	0.9923	1.0197	0.9836	0.9990	1.0098	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
$d = 3$	1.0×10^{-2}	0.9971	0.9708	0.9912	1.0072	0.9794	0.9809	0.9811	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0056	0.9797	0.9817	0.9843	0.9701	0.9908	0.9648	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
	2.0×10^{-3}	0.9676	0.9745	0.9876	0.9660	1.0026	0.9780	0.9956	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
	1.0×10^{-3}	1.0144	0.9898	0.9772	1.0029	1.0247	1.0006	1.0172	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.51)	○ (0.50)
	5.0×10^{-4}	0.9956	0.9716	1.0279	0.9975	0.9912	1.0264	0.9938	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
	2.0×10^{-4}	0.9978	0.9962	1.0091	0.9973	1.0058	0.9914	1.0039	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
	1.0×10^{-4}	1.0174	0.9596	1.0408	0.9903	0.9869	0.9882	0.9862	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
$d = 4$	1.0×10^{-2}	0.9988	1.0162	1.0208	0.9697	0.9757	0.9903	1.0010	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.48)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	1.0124	1.0008	1.0043	1.0321	0.9817	1.0180	1.0205	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
	2.0×10^{-3}	0.9726	0.9923	1.0148	0.9884	0.9891	1.0218	0.9917	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	0.9894	0.9890	1.0207	0.9800	0.9846	1.0116	1.0092	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0308	0.9687	0.9886	1.0097	1.0145	0.9970	1.0157	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
	2.0×10^{-4}	0.9825	1.0148	0.9985	1.0044	0.9643	1.0402	1.0153	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.48)	○ (0.51)
	1.0×10^{-4}	1.0068	0.9952	1.0348	1.0287	0.9936	0.9775	0.9921	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
$d = 5$	1.0×10^{-2}	0.9887	0.9786	1.0227	1.0102	0.9744	0.9994	1.0040	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	1.0094	0.9968	1.0336	1.0250	0.9856	0.9752	1.0187	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.49)
	2.0×10^{-3}	1.0006	0.9949	0.9738	1.0227	0.9877	1.0202	1.0024	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	1.0341	0.9883	0.9986	1.0181	1.0171	1.0176	0.9711	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
	5.0×10^{-4}	0.9774	0.9555	1.0036	0.9783	0.9675	1.0098	0.9890	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.51)
	2.0×10^{-4}	1.0011	1.0053	1.0263	1.0087	1.0155	1.0029	1.0103	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
	1.0×10^{-4}	0.9943	0.9948	1.0262	1.0071	1.0197	1.0249	0.9946	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
$d = 10$	1.0×10^{-2}	0.9932	0.9707	0.9977	1.0079	1.0042	0.9787	1.0190	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
	5.0×10^{-3}	1.0100	0.9984	1.0350	1.0022	1.0010	1.0160	0.9844	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)
	2.0×10^{-3}	1.0275	1.0261	0.9959	1.0212	0.9956	0.9895	0.9949	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	1.0426	0.9743	0.9963	0.9930	1.0111	0.9690	0.9742	✓ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
	5.0×10^{-4}	0.9836	1.0060	1.0262	0.9920	1.0117	1.0246	0.9932	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
	2.0×10^{-4}	0.9981	0.9584	1.0152	1.0521	0.9684	0.9861	0.9881	○ (0.50)	✗ (0.48)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.49)
	1.0×10^{-4}	0.9779	1.0006	0.9798	1.0152	1.0007	0.9833	1.0020	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)

TABLE A.3

FSCS VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR POINT PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	1.0273	0.9467	1.0015	1.0352	0.9655	0.9861	0.9540	○ (0.52)	○ (0.49)	○ (0.51)	○ (0.52)	○ (0.50)	○ (0.51)
	5.0×10^{-3}	1.0057	0.9719	0.9949	0.9899	0.9797	0.9435	0.9583	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	0.9869	0.9658	1.0017	0.9985	0.9690	0.9322	0.9510	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.49)
	1.0×10^{-3}	0.9626	0.9598	0.9640	0.9839	0.9643	0.9548	0.9664	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0055	0.9628	0.9950	0.9913	0.9793	0.9728	0.9511	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
	2.0×10^{-4}	1.0111	0.9589	0.9974	0.9961	1.0095	0.9822	0.9637	○ (0.51)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
	1.0×10^{-4}	0.9984	0.9646	0.9920	1.0228	0.9803	0.9914	0.9570	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
$d = 2$	1.0×10^{-2}	1.0086	0.9883	1.0406	1.0322	0.9834	1.0103	0.9840	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0010	0.9961	1.0319	1.0702	0.9850	0.9760	0.9680	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)
	2.0×10^{-3}	0.9962	0.9690	1.0361	1.0120	0.9676	0.9503	0.9723	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	0.9819	0.9597	1.0181	1.0534	0.9895	0.9788	0.9838	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.52)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0150	0.9717	1.0103	1.0538	0.9509	0.9625	0.9691	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.52)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	1.0014	0.9281	1.0000	0.9966	0.9830	0.9628	0.9529	○ (0.51)	○ (0.49)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)
	1.0×10^{-4}	0.9906	0.9470	1.0122	1.0116	0.9661	0.9545	0.9594	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.49)
$d = 3$	1.0×10^{-2}	1.0367	1.1159	1.2016	1.1375	1.1287	1.1076	1.1265	✖ (0.48)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0138	1.0775	1.1561	1.1510	1.0471	1.0533	1.0681	✖ (0.48)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.49)
	2.0×10^{-3}	1.0213	1.0194	1.1472	1.1205	1.0245	1.0334	1.0328	○ (0.50)	○ (0.50)	✓ (0.53)	✓ (0.52)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	0.9892	1.0350	1.1095	1.0946	1.0296	1.0196	1.0223	○ (0.48)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0238	1.0248	1.0757	1.0796	1.0368	1.0196	1.0142	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
	2.0×10^{-4}	1.0141	0.9972	1.0700	1.0921	1.0151	0.9875	1.0366	○ (0.49)	○ (0.49)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	0.9890	0.9895	1.0464	1.0286	1.0035	0.9812	1.0238	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
$d = 4$	1.0×10^{-2}	0.9967	1.2852	1.4359	1.4677	1.2890	1.2843	1.3177	✖ (0.42)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	0.9748	1.2191	1.4129	1.4161	1.2087	1.2212	1.2178	✖ (0.44)	○ (0.50)	✓ (0.53)	✓ (0.53)	○ (0.50)	○ (0.50)
	2.0×10^{-3}	0.9663	1.1811	1.3234	1.3089	1.1894	1.1706	1.1393	✖ (0.45)	○ (0.51)	✓ (0.53)	✓ (0.53)	○ (0.52)	○ (0.51)
	1.0×10^{-3}	1.0181	1.1663	1.2912	1.2729	1.1578	1.1051	1.1385	✖ (0.47)	○ (0.51)	✓ (0.53)	✓ (0.52)	○ (0.51)	○ (0.50)
	5.0×10^{-4}	1.0080	1.1139	1.2345	1.2336	1.1194	1.0910	1.0911	✖ (0.47)	○ (0.51)	✓ (0.52)	✓ (0.53)	○ (0.52)	○ (0.50)
	2.0×10^{-4}	1.0178	1.1116	1.2083	1.2055	1.1003	1.0427	1.0602	○ (0.49)	○ (0.52)	✓ (0.53)	✓ (0.53)	○ (0.51)	○ (0.50)
	1.0×10^{-4}	1.0249	1.0555	1.2146	1.1905	1.0317	1.0585	1.0792	○ (0.48)	○ (0.50)	✓ (0.52)	○ (0.51)	○ (0.49)	○ (0.50)
$d = 5$	1.0×10^{-2}	1.0409	1.5487	1.7544	1.7187	1.4937	1.4976	1.5172	✖ (0.39)	○ (0.50)	✓ (0.52)	○ (0.51)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	1.0082	1.4722	1.7652	1.7730	1.4504	1.3867	1.4570	✖ (0.39)	○ (0.50)	✓ (0.53)	✓ (0.54)	○ (0.50)	○ (0.49)
	2.0×10^{-3}	1.0009	1.3422	1.6058	1.6745	1.3519	1.2768	1.3252	✖ (0.42)	○ (0.50)	✓ (0.54)	✓ (0.55)	○ (0.50)	○ (0.49)
	1.0×10^{-3}	0.9944	1.2794	1.5522	1.5515	1.2854	1.2498	1.2532	✖ (0.43)	○ (0.51)	✓ (0.54)	✓ (0.54)	○ (0.51)	○ (0.50)
	5.0×10^{-4}	0.9944	1.2439	1.4886	1.5262	1.2654	1.2318	1.2185	✖ (0.44)	○ (0.51)	✓ (0.54)	✓ (0.55)	○ (0.51)	○ (0.51)
	2.0×10^{-4}	1.0149	1.2212	1.3994	1.4946	1.1679	1.1322	1.1783	✖ (0.45)	○ (0.51)	✓ (0.54)	✓ (0.55)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	1.0057	1.1281	1.3467	1.3691	1.1531	1.1334	1.1422	✖ (0.46)	○ (0.50)	✓ (0.54)	✓ (0.54)	○ (0.51)	○ (0.50)
$d = 10$	1.0×10^{-2}	1.0293	2.5080	3.0027	3.1504	2.1913	2.4785	2.4305	✖ (0.27)	○ (0.50)	✓ (0.54)	✓ (0.55)	✖ (0.45)	○ (0.50)
	5.0×10^{-3}	0.9749	2.7548	3.7525	3.6545	2.5803	2.7069	2.6010	✖ (0.23)	○ (0.51)	✓ (0.57)	✓ (0.56)	✖ (0.48)	○ (0.51)
	2.0×10^{-3}	1.0136	2.9162	4.4359	4.4004	2.7063	2.7202	2.5061	✖ (0.25)	✓ (0.54)	✓ (0.62)	✓ (0.62)	○ (0.50)	✓ (0.53)
	1.0×10^{-3}	1.0355	2.8933	4.9950	4.8092	2.8142	2.5995	2.2507	✖ (0.28)	✓ (0.56)	✓ (0.68)	✓ (0.67)	✓ (0.55)	✓ (0.53)
	5.0×10^{-4}	1.0043	2.6884	5.2132	5.2301	2.6988	2.4270	2.0949	✖ (0.29)	✓ (0.57)	✓ (0.70)	✓ (0.70)	✓ (0.56)	✓ (0.54)
	2.0×10^{-4}	1.0045	2.5644	5.1711	5.1401	2.5497	2.2553	2.0251	✖ (0.30)	✓ (0.56)	✓ (0.71)	✓ (0.70)	✓ (0.56)	✓ (0.53)
	1.0×10^{-4}	1.0094	2.2833	4.9316	5.0699	2.3494	2.1527	1.8466	✖ (0.33)	✓ (0.56)	✓ (0.72)	✓ (0.73)	✓ (0.57)	✓ (0.55)

TABLE A.4

RRT VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR BLOCK PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.9866	0.5980	0.6166	0.6004	0.7816	0.5945	0.6039	✓ (0.59)	○ (0.50)	○ (0.51)	○ (0.50)	✓ (0.53)	○ (0.49)
	5.0×10^{-3}	0.9875	0.5883	0.6048	0.5987	0.8748	0.6025	0.5975	✓ (0.60)	○ (0.49)	○ (0.51)	○ (0.50)	✓ (0.56)	○ (0.51)
	2.0×10^{-3}	0.9574	0.6074	0.5949	0.5949	0.9450	0.5887	0.6056	✓ (0.59)	○ (0.50)	○ (0.50)	○ (0.50)	✓ (0.58)	○ (0.50)
	1.0×10^{-3}	1.0053	0.5899	0.5938	0.5910	0.9820	0.5954	0.6020	✓ (0.60)	○ (0.49)	○ (0.50)	○ (0.49)	✓ (0.59)	○ (0.50)
	5.0×10^{-4}	1.0160	0.5851	0.6122	0.6097	0.9904	0.6028	0.6067	✓ (0.60)	○ (0.49)	○ (0.50)	○ (0.50)	✓ (0.59)	○ (0.50)
	2.0×10^{-4}	0.9955	0.5929	0.5821	0.6055	1.0392	0.5923	0.5991	✓ (0.59)	○ (0.49)	○ (0.49)	○ (0.50)	✓ (0.61)	○ (0.49)
	1.0×10^{-4}	0.9899	0.5955	0.5931	0.5975	0.9653	0.5947	0.6021	✓ (0.59)	○ (0.50)	○ (0.49)	○ (0.50)	✓ (0.59)	○ (0.49)
$d = 2$	1.0×10^{-2}	1.0152	0.7202	0.8642	0.8270	0.7235	0.7159	0.7149	✓ (0.56)	○ (0.50)	✓ (0.53)	○ (0.52)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0030	0.7179	0.9279	0.8988	0.6940	0.7042	0.7212	✓ (0.56)	○ (0.50)	✓ (0.54)	✓ (0.54)	○ (0.49)	○ (0.50)
	2.0×10^{-3}	1.0227	0.6840	0.9725	0.9590	0.6888	0.7129	0.7101	✓ (0.57)	○ (0.49)	✓ (0.56)	✓ (0.56)	○ (0.50)	○ (0.51)
	1.0×10^{-3}	1.0215	0.6841	1.0039	1.0164	0.6755	0.6884	0.7237	✓ (0.57)	○ (0.49)	✓ (0.57)	✓ (0.57)	○ (0.49)	○ (0.49)
	5.0×10^{-4}	0.9954	0.6907	1.0066	1.0156	0.6720	0.6901	0.7088	✓ (0.57)	○ (0.49)	✓ (0.57)	✓ (0.57)	○ (0.49)	○ (0.50)
	2.0×10^{-4}	0.9893	0.6662	1.0295	0.9827	0.6896	0.6875	0.7147	✓ (0.56)	✗ (0.48)	✓ (0.57)	✓ (0.55)	○ (0.49)	○ (0.49)
	1.0×10^{-4}	1.0004	0.6813	1.0314	1.0009	0.6874	0.6823	0.7062	✓ (0.56)	○ (0.50)	✓ (0.57)	✓ (0.57)	○ (0.49)	○ (0.49)
$d = 3$	1.0×10^{-2}	1.0325	0.8283	0.9456	0.9156	0.8381	0.8242	0.8357	✓ (0.54)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9728	0.7979	1.0052	0.9994	0.7917	0.7954	0.8254	✓ (0.53)	○ (0.49)	✓ (0.54)	✓ (0.54)	○ (0.49)	○ (0.49)
	2.0×10^{-3}	0.9796	0.7746	1.0700	1.0638	0.8109	0.7788	0.8078	✓ (0.54)	○ (0.50)	✓ (0.55)	✓ (0.56)	○ (0.51)	○ (0.49)
	1.0×10^{-3}	1.0114	0.7685	1.0826	1.0476	0.8052	0.7859	0.8207	✓ (0.54)	○ (0.49)	✓ (0.56)	✓ (0.55)	○ (0.51)	○ (0.49)
	5.0×10^{-4}	0.9982	0.7583	1.0524	1.0589	0.7961	0.7811	0.8285	✓ (0.54)	○ (0.49)	✓ (0.55)	✓ (0.55)	○ (0.50)	○ (0.49)
	2.0×10^{-4}	1.0387	0.7824	1.0300	1.0771	0.7759	0.7531	0.8273	✓ (0.55)	○ (0.49)	✓ (0.54)	✓ (0.55)	○ (0.49)	○ (0.48)
	1.0×10^{-4}	1.0088	0.7988	1.0563	1.0318	0.7519	0.7617	0.8354	✓ (0.54)	○ (0.49)	✓ (0.55)	✓ (0.54)	✗ (0.48)	○ (0.48)
$d = 4$	1.0×10^{-2}	0.9774	0.9447	1.0448	1.0315	0.9196	0.9338	0.9253	○ (0.50)	○ (0.51)	✓ (0.52)	○ (0.52)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9814	0.9331	1.0313	1.0660	0.9437	0.9475	0.9215	○ (0.51)	○ (0.51)	○ (0.52)	✓ (0.53)	○ (0.51)	○ (0.52)
	2.0×10^{-3}	0.9999	0.9026	1.1028	1.1364	0.8775	0.9064	0.8918	○ (0.52)	○ (0.51)	✓ (0.54)	✓ (0.55)	○ (0.50)	○ (0.51)
	1.0×10^{-3}	0.9963	0.8943	1.0935	1.1080	0.8876	0.8593	0.8991	○ (0.52)	○ (0.51)	✓ (0.55)	✓ (0.55)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0128	0.8713	1.1273	1.1265	0.8646	0.8730	0.9031	✓ (0.52)	○ (0.50)	✓ (0.55)	✓ (0.55)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	0.9831	0.8463	1.1189	1.0788	0.8514	0.8820	0.9045	○ (0.51)	○ (0.49)	✓ (0.55)	✓ (0.54)	○ (0.49)	○ (0.50)
	1.0×10^{-4}	0.9981	0.8315	1.1006	1.1278	0.8513	0.8776	0.9139	○ (0.51)	○ (0.49)	✓ (0.54)	✓ (0.54)	○ (0.50)	○ (0.49)
$d = 5$	1.0×10^{-2}	0.9850	1.0252	1.1210	1.1198	1.0217	0.9899	0.9785	○ (0.50)	○ (0.51)	✓ (0.52)	✓ (0.53)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9878	0.9886	1.1123	1.1503	0.9918	1.0187	0.9831	○ (0.49)	○ (0.50)	✓ (0.52)	✓ (0.53)	○ (0.50)	○ (0.51)
	2.0×10^{-3}	1.0600	0.9914	1.1498	1.1779	1.0059	0.9910	0.9937	○ (0.50)	○ (0.51)	✓ (0.53)	✓ (0.54)	○ (0.51)	○ (0.50)
	1.0×10^{-3}	0.9852	0.9596	1.1743	1.1692	0.9665	0.9431	0.9777	○ (0.50)	○ (0.50)	✓ (0.54)	✓ (0.54)	○ (0.50)	○ (0.49)
	5.0×10^{-4}	0.9949	0.9791	1.1815	1.1504	0.9486	0.9517	0.9647	○ (0.50)	○ (0.51)	✓ (0.54)	✓ (0.54)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	1.0331	0.9447	1.1383	1.1173	0.9263	0.9421	0.9825	○ (0.50)	○ (0.49)	✓ (0.52)	✓ (0.53)	○ (0.49)	○ (0.49)
	1.0×10^{-4}	1.0146	0.9325	1.1405	1.1221	0.9078	0.9349	0.9340	○ (0.52)	○ (0.51)	✓ (0.55)	✓ (0.54)	○ (0.49)	○ (0.51)
$d = 10$	1.0×10^{-2}	0.9950	1.1288	1.1990	1.1422	1.1462	1.2120	1.1202	✗ (0.47)	○ (0.50)	○ (0.52)	○ (0.50)	○ (0.50)	○ (0.52)
	5.0×10^{-3}	0.9962	1.2317	1.1873	1.1969	1.1818	1.1590	1.1456	✗ (0.47)	○ (0.52)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.50)
	2.0×10^{-3}	1.0482	1.2133	1.1866	1.1957	1.2123	1.2319	1.0632	○ (0.49)	✓ (0.53)	✓ (0.53)	✓ (0.52)	✓ (0.53)	✓ (0.53)
	1.0×10^{-3}	0.9941	1.2202	1.1741	1.2183	1.2018	1.1629	1.0581	✗ (0.48)	✓ (0.53)	○ (0.51)	✓ (0.53)	✓ (0.53)	✓ (0.52)
	5.0×10^{-4}	0.9913	1.2265	1.1848	1.1951	1.0084	1.1418	1.0301	○ (0.48)	✓ (0.54)	✓ (0.53)	✓ (0.52)	○ (0.49)	✓ (0.53)
	2.0×10^{-4}	0.9799	1.1894	1.2283	1.2278	1.1738	1.0970	1.0254	○ (0.49)	✓ (0.54)	✓ (0.54)	✓ (0.54)	✓ (0.54)	○ (0.51)
	1.0×10^{-4}	1.0215	1.2076	1.2538	1.2383	1.2245	1.1028	0.9794	○ (0.51)	✓ (0.55)	✓ (0.56)	✓ (0.56)	✓ (0.56)	✓ (0.54)

TABLE A.5
RRT VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR STRIP PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.9866	0.5980	0.6166	0.6004	0.7816	0.5945	0.6039	✓ (0.59)	○ (0.50)	○ (0.51)	○ (0.50)	✓ (0.53)	○ (0.49)
	5.0×10^{-3}	0.9875	0.5883	0.6048	0.5987	0.8748	0.6025	0.5975	✓ (0.60)	○ (0.49)	○ (0.51)	○ (0.50)	✓ (0.56)	○ (0.51)
	2.0×10^{-3}	0.9574	0.6074	0.5949	0.5949	0.9450	0.5887	0.6056	✓ (0.59)	○ (0.50)	○ (0.50)	○ (0.50)	✓ (0.58)	○ (0.50)
	1.0×10^{-3}	1.0053	0.5899	0.5938	0.5910	0.9820	0.5954	0.6020	✓ (0.60)	○ (0.49)	○ (0.50)	○ (0.49)	✓ (0.59)	○ (0.50)
	5.0×10^{-4}	1.0160	0.5851	0.6122	0.6097	0.9904	0.6028	0.6067	✓ (0.60)	○ (0.49)	○ (0.50)	○ (0.50)	✓ (0.59)	○ (0.50)
	2.0×10^{-4}	0.9955	0.5929	0.5821	0.6055	1.0392	0.5923	0.5991	✓ (0.59)	○ (0.49)	○ (0.49)	○ (0.50)	✓ (0.61)	○ (0.49)
	1.0×10^{-4}	0.9899	0.5955	0.5931	0.5975	0.9653	0.5947	0.6021	✓ (0.59)	○ (0.50)	○ (0.49)	○ (0.50)	✓ (0.59)	○ (0.49)
$d = 2$	1.0×10^{-2}	0.9725	0.9090	0.9900	0.9470	0.9216	0.9171	0.9405	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9979	0.9319	0.9905	0.9899	0.9503	0.9491	0.9214	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)
	2.0×10^{-3}	0.9752	0.9534	1.0046	1.0268	0.9548	0.9643	0.9846	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	0.9782	0.9773	1.0061	1.0004	0.9870	0.9814	0.9769	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
	5.0×10^{-4}	1.0191	0.9732	1.0066	1.0133	0.9733	0.9974	0.9976	○ (0.51)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
	2.0×10^{-4}	1.0081	1.0110	0.9745	1.0100	1.0157	0.9727	0.9982	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
	1.0×10^{-4}	0.9997	0.9945	0.9934	1.0075	1.0185	1.0189	0.9868	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
$d = 3$	1.0×10^{-2}	0.9971	0.9808	0.9588	0.9997	0.9508	0.9656	0.9492	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
	5.0×10^{-3}	1.0056	0.9770	0.9882	0.9742	0.9914	0.9683	1.0198	○ (0.49)	○ (0.49)	○ (0.49)	✖ (0.48)	○ (0.49)	○ (0.48)
	2.0×10^{-3}	0.9676	0.9941	0.9621	0.9971	0.9869	0.9615	0.9950	○ (0.49)	○ (0.49)	○ (0.48)	○ (0.50)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	1.0144	0.9990	0.9921	1.0066	0.9977	1.0153	0.9719	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
	5.0×10^{-4}	0.9956	1.0040	0.9747	0.9777	1.0051	1.0044	0.9754	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	0.9978	0.9709	1.0180	1.0441	0.9521	1.0030	0.9823	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.51)	○ (0.49)	○ (0.50)
	1.0×10^{-4}	1.0174	0.9931	1.0236	1.0117	1.0172	1.0076	0.9644	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
$d = 4$	1.0×10^{-2}	0.9988	0.9750	1.0018	0.9913	0.9697	0.9652	0.9816	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	1.0124	0.9576	0.9656	0.9866	0.9710	1.0171	1.0004	○ (0.51)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
	2.0×10^{-3}	0.9726	0.9510	0.9742	0.9999	0.9851	1.0263	1.0048	○ (0.49)	○ (0.48)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.51)
	1.0×10^{-3}	0.9894	1.0437	1.0246	1.0071	0.9650	0.9939	0.9899	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
	5.0×10^{-4}	1.0308	1.0271	0.9724	0.9728	1.0037	0.9880	1.0030	○ (0.51)	○ (0.51)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
	2.0×10^{-4}	0.9825	0.9962	0.9818	1.0191	0.9862	1.0016	0.9819	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
	1.0×10^{-4}	1.0068	1.0208	1.0009	0.9767	1.0035	0.9997	1.0149	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)
$d = 5$	1.0×10^{-2}	0.9887	0.9986	0.9879	0.9932	0.9920	0.9716	0.9660	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
	5.0×10^{-3}	1.0094	1.0068	0.9915	0.9994	1.0121	0.9817	1.0091	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
	2.0×10^{-3}	1.0006	0.9735	0.9782	1.0120	0.9847	1.0022	0.9906	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
	1.0×10^{-3}	1.0341	0.9885	0.9844	0.9746	0.9961	1.0285	1.0118	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	0.9774	1.0077	1.0049	0.9923	0.9668	1.0090	0.9955	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.51)
	2.0×10^{-4}	1.0011	0.9904	1.0334	1.0207	0.9840	0.9994	0.9925	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
	1.0×10^{-4}	0.9943	0.9962	0.9977	0.9795	1.0120	0.9992	1.0457	○ (0.49)	○ (0.49)	○ (0.48)	✖ (0.48)	○ (0.49)	○ (0.49)
$d = 10$	1.0×10^{-2}	0.9932	1.0299	0.9983	1.0008	0.9948	0.9652	0.9964	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
	5.0×10^{-3}	1.0100	0.9628	1.0121	0.9767	0.9922	0.9922	1.0259	○ (0.49)	○ (0.48)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)
	2.0×10^{-3}	1.0275	1.0006	0.9734	1.0049	0.9936	0.9950	1.0047	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
	1.0×10^{-3}	1.0426	1.0084	0.9520	1.0020	1.0122	1.0169	0.9936	○ (0.51)	○ (0.50)	○ (0.48)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	0.9836	1.0089	1.0002	0.9587	0.9772	0.9978	1.0186	○ (0.49)	○ (0.50)	○ (0.49)	✖ (0.48)	○ (0.49)	○ (0.49)
	2.0×10^{-4}	0.9981	1.0016	0.9911	1.0199	1.0041	0.9652	1.0094	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	0.9779	0.9926	0.9985	1.0207	0.9734	1.0122	0.9813	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)

TABLE A.6
RRT VERSION: MEAN F-RATIO RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR POINT PATTERN SIMULATIONS

Dimension (<i>d</i>)	Failure Rate (θ)	Methods							LSH					
		<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
<i>d</i> = 1	1.0×10^{-2}	1.0273	0.9752	0.9478	0.9431	0.9779	0.9551	0.9780	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)
	5.0×10^{-3}	1.0057	0.9291	0.9541	0.9514	0.9966	0.9353	0.9646	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
	2.0×10^{-3}	0.9869	0.9325	0.9359	0.9655	0.9724	0.9699	0.9639	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	0.9626	0.9805	0.9443	0.9666	0.9616	0.9611	0.9388	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)
	5.0×10^{-4}	1.0055	0.9608	0.9877	0.9583	1.0172	0.9623	0.9444	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.52)	○ (0.51)
	2.0×10^{-4}	1.0111	0.9541	0.9361	0.9716	1.0041	0.9504	0.9536	○ (0.51)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
	1.0×10^{-4}	0.9984	0.9466	0.9872	0.9873	0.9755	0.9900	0.9315	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)
<i>d</i> = 2	1.0×10^{-2}	1.0086	0.9658	0.9802	1.0145	0.9489	1.0008	0.9792	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.51)
	5.0×10^{-3}	1.0010	0.9719	0.9986	1.0036	0.9451	0.9853	0.9660	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.49)	○ (0.50)
	2.0×10^{-3}	0.9962	0.9742	0.9878	1.0396	0.9872	0.9772	0.9728	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
	1.0×10^{-3}	0.9819	0.9886	1.0040	1.0297	0.9824	0.9487	0.9663	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)
	5.0×10^{-4}	1.0150	0.9723	0.9923	1.0142	0.9612	0.9556	0.9539	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
	2.0×10^{-4}	1.0014	0.9731	1.0059	1.0057	0.9322	0.9594	0.9711	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
	1.0×10^{-4}	0.9906	0.9603	1.0060	1.0314	0.9872	0.9504	0.9412	○ (0.51)	○ (0.51)	○ (0.51)	✓ (0.52)	○ (0.52)	○ (0.50)
<i>d</i> = 3	1.0×10^{-2}	1.0367	1.0219	1.0412	1.0670	1.0134	1.0216	1.0176	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
	5.0×10^{-3}	1.0138	1.0440	1.0247	1.0487	1.0184	1.0263	0.9936	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)
	2.0×10^{-3}	1.0213	0.9850	1.0315	1.0176	0.9925	0.9689	0.9901	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
	1.0×10^{-3}	0.9892	1.0221	1.0221	1.0435	0.9682	0.9824	0.9838	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
	5.0×10^{-4}	1.0238	0.9991	1.0500	1.0154	0.9877	0.9652	1.0252	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	✖ (0.48)
	2.0×10^{-4}	1.0141	0.9607	1.0042	1.0264	0.9891	0.9705	1.0219	○ (0.49)	✖ (0.48)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.48)
	1.0×10^{-4}	0.9890	0.9762	0.9977	1.0409	0.9796	0.9970	1.0002	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.51)
<i>d</i> = 4	1.0×10^{-2}	0.9967	1.0678	1.0998	1.1509	1.0720	1.0746	1.0625	○ (0.48)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
	5.0×10^{-3}	0.9748	1.0599	1.1010	1.0935	1.0806	1.0347	1.0716	✖ (0.47)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
	2.0×10^{-3}	0.9663	1.0223	1.0958	1.0829	1.0151	1.0202	1.0326	✖ (0.48)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
	1.0×10^{-3}	1.0181	1.0113	1.0688	1.0993	0.9965	1.0234	0.9948	○ (0.50)	○ (0.50)	○ (0.51)	✓ (0.52)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	1.0080	1.0249	1.0582	1.0848	1.0252	1.0524	1.0052	○ (0.49)	○ (0.51)	○ (0.51)	✓ (0.52)	○ (0.51)	○ (0.51)
	2.0×10^{-4}	1.0178	1.0225	1.0799	1.0437	1.0120	0.9975	1.0079	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
	1.0×10^{-4}	1.0249	1.0304	1.0421	1.0400	0.9892	1.0054	0.9887	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
<i>d</i> = 5	1.0×10^{-2}	1.0409	1.1161	1.1479	1.1559	1.1543	1.0832	1.0783	○ (0.48)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)
	5.0×10^{-3}	1.0082	1.1136	1.1604	1.1697	1.1245	1.0956	1.0525	○ (0.48)	○ (0.51)	✓ (0.52)	✓ (0.52)	✓ (0.52)	○ (0.51)
	2.0×10^{-3}	1.0009	1.0492	1.1250	1.1274	1.0910	1.0676	1.0367	○ (0.49)	○ (0.50)	✓ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)
	1.0×10^{-3}	0.9944	1.0946	1.1241	1.0804	1.0825	1.0471	1.0564	✖ (0.48)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-4}	0.9944	1.0901	1.0727	1.0824	1.0747	1.0728	1.0252	○ (0.48)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
	2.0×10^{-4}	1.0149	1.0481	1.0734	1.0863	1.0444	1.0263	0.9942	○ (0.50)	○ (0.51)	✓ (0.52)	✓ (0.52)	○ (0.52)	○ (0.51)
	1.0×10^{-4}	1.0057	1.0294	1.0417	1.0647	1.0523	1.0231	0.9689	○ (0.51)	○ (0.52)	○ (0.52)	✓ (0.52)	✓ (0.53)	✓ (0.53)
<i>d</i> = 10	1.0×10^{-2}	1.0293	1.0932	1.0835	1.0728	1.0878	1.0927	1.0668	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
	5.0×10^{-3}	0.9749	1.1590	1.1157	1.1367	1.1079	1.1144	1.0490	✖ (0.48)	✓ (0.52)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)
	2.0×10^{-3}	1.0136	1.1648	1.1723	1.1066	1.1604	1.1462	1.0939	✖ (0.48)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.51)
	1.0×10^{-3}	1.0355	1.1798	1.1443	1.1399	1.2147	1.1587	1.0866	✖ (0.48)	○ (0.51)	○ (0.50)	○ (0.51)	✓ (0.53)	○ (0.51)
	5.0×10^{-4}	1.0043	1.2300	1.1545	1.1450	1.2094	1.1782	1.0437	○ (0.49)	✓ (0.53)	✓ (0.52)	○ (0.52)	✓ (0.53)	✓ (0.53)
	2.0×10^{-4}	1.0045	1.2342	1.1471	1.1696	1.2764	1.1269	1.0318	○ (0.48)	✓ (0.54)	✓ (0.53)	✓ (0.52)	✓ (0.55)	✓ (0.52)
	1.0×10^{-4}	1.0094	1.1967	1.1859	1.1300	1.2416	1.1405	0.9971	○ (0.50)	✓ (0.54)	✓ (0.55)	✓ (0.53)	✓ (0.55)	✓ (0.54)

TABLE A.7
FSCS VERSION: MEAN F-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR REAL-LIFE PROGRAMS

ID	Program	Methods							LSH					
		<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
P1	airy	1444.64	794.02	1400.15	1440.76	788.61	803.70	788.23	✓ (0.62)	○ (0.50)	✓ (0.61)	✓ (0.62)	○ (0.50)	○ (0.51)
P2	bessj0	760.24	437.02	750.17	712.10	443.36	445.48	443.03	✓ (0.61)	○ (0.50)	✓ (0.60)	✓ (0.59)	○ (0.50)	○ (0.50)
P3	erfcc	1867.60	1032.28	1897.29	1839.75	1033.04	1045.93	1018.20	✓ (0.62)	○ (0.51)	✓ (0.62)	✓ (0.62)	○ (0.51)	○ (0.51)
P4	probks	2590.02	1468.08	2527.86	2681.32	1428.13	1440.23	1473.70	✓ (0.60)	○ (0.50)	✓ (0.60)	✓ (0.62)	○ (0.49)	○ (0.49)
P5	tanh	556.28	303.59	551.62	528.89	303.43	308.54	313.58	✓ (0.61)	○ (0.49)	✓ (0.61)	✓ (0.60)	○ (0.49)	○ (0.49)
P6	bessj	778.47	433.47	516.64	498.96	544.76	457.08	462.24	✓ (0.62)	○ (0.49)	○ (0.52)	○ (0.51)	✓ (0.54)	○ (0.50)
P7	gammq	1246.62	1076.85	1067.20	1043.79	1064.96	1060.88	1128.44	✓ (0.52)	○ (0.49)	○ (0.48)	✖ (0.48)	✖ (0.48)	○ (0.49)
P8	snendn	622.61	613.62	629.84	625.18	611.38	616.85	621.60	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
P9	golden	1847.63	1792.73	1805.71	1715.81	1833.62	1786.20	1828.17	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.48)	○ (0.50)	○ (0.49)
P10	plgnr	2701.59	1620.91	1108.47	1112.56	1520.86	1573.64	1682.47	✓ (0.61)	○ (0.49)	✖ (0.40)	✖ (0.40)	✖ (0.46)	○ (0.49)
P11	cel	2998.85	1588.90	2103.34	2040.76	1977.56	1543.65	1606.12	✓ (0.65)	○ (0.50)	✓ (0.57)	✓ (0.56)	✓ (0.56)	○ (0.49)
P12	el2	1399.04	692.76	729.77	735.42	709.31	730.49	782.19	✓ (0.65)	✖ (0.47)	○ (0.49)	○ (0.49)	○ (0.48)	○ (0.49)
P13	calDay	1631.33	1241.15	1491.29	1514.96	1358.25	1272.54	1274.34	✓ (0.56)	○ (0.50)	✓ (0.55)	✓ (0.55)	✓ (0.52)	○ (0.51)
P14	complex	1185.39	1204.34	1243.80	1245.59	1209.19	1162.68	1220.67	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.49)
P15	pntLinePos	1361.16	1473.44	1574.85	1645.63	1501.06	1439.63	1446.11	✖ (0.47)	○ (0.50)	○ (0.52)	✓ (0.53)	○ (0.50)	○ (0.49)
P16	triangle	1411.06	1349.37	1405.37	1353.53	1358.71	1367.38	1362.67	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
P17	line	3175.25	3368.37	3607.22	3479.19	3413.45	3406.65	3553.09	✖ (0.48)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.49)
P18	pntTrianglePos	5631.50	5910.23	5700.59	5884.85	5780.71	5732.40	5581.19	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.50)
P19	twoLinesPos	6980.25	9397.73	10130.81	10203.24	9507.52	8590.03	8582.56	✖ (0.44)	○ (0.52)	✓ (0.53)	✓ (0.53)	✓ (0.52)	○ (0.50)
P20	calGCD	986.34	1000.10	1015.27	1029.68	988.74	1019.25	1004.32	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
P21	nearestDistance	1933.48	1131.15	1168.33	1174.18	1221.33	1124.78	1286.17	✓ (0.60)	✖ (0.47)	✖ (0.48)	✖ (0.48)	○ (0.50)	✖ (0.47)
P22	select	3130.59	2607.52	2758.34	2684.43	2725.50	2706.77	2785.58	✓ (0.54)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
P23	tcas	1944.33	2490.33	1994.09	2015.11	2623.27	2486.45	2335.84	✖ (0.47)	○ (0.51)	✖ (0.48)	✖ (0.47)	✓ (0.53)	○ (0.51)

TABLE A.8
RRT VERSION: MEAN F-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR REAL-LIFE PROGRAMS

ID	Program	Methods							LSH					
		<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
P1	airy	1444.64	853.28	1434.04	1397.80	1363.03	864.91	859.32	✓ (0.61)	○ (0.50)	✓ (0.59)	✓ (0.59)	✓ (0.58)	○ (0.50)
P2	bessj0	760.24	453.21	734.54	721.98	722.39	464.37	478.19	✓ (0.60)	✖ (0.48)	✓ (0.58)	✓ (0.57)	✓ (0.58)	○ (0.49)
P3	erfcc	1867.60	1087.85	1857.94	1869.51	1797.57	1092.82	1119.16	✓ (0.60)	○ (0.49)	✓ (0.60)	✓ (0.60)	✓ (0.59)	○ (0.49)
P4	probks	2590.02	1552.39	2597.79	2570.65	2572.19	1554.80	1533.70	✓ (0.60)	○ (0.51)	✓ (0.60)	✓ (0.60)	✓ (0.60)	○ (0.51)
P5	tanh	556.28	335.62	532.49	534.69	527.56	328.49	331.06	✓ (0.60)	○ (0.51)	✓ (0.59)	✓ (0.60)	✓ (0.58)	○ (0.50)
P6	bessj	778.47	540.29	630.89	626.24	669.32	534.82	532.36	✓ (0.58)	○ (0.51)	✓ (0.54)	✓ (0.53)	✓ (0.54)	○ (0.50)
P7	gammq	1246.62	1071.88	1155.25	1128.95	1166.34	1076.39	1092.73	✓ (0.53)	○ (0.50)	✓ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
P8	sncndn	622.61	636.50	617.44	619.83	635.43	621.96	633.97	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
P9	golden	1847.63	1839.33	1881.74	1807.27	1811.66	1863.63	1800.58	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.51)
P10	plgndr	2701.59	2060.61	2421.39	2427.02	2398.98	1994.55	2073.64	✓ (0.56)	○ (0.50)	✓ (0.53)	✓ (0.54)	✓ (0.53)	○ (0.50)
P11	cel	2998.85	2919.24	2963.60	2950.99	3108.99	2927.30	3035.65	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.51)	○ (0.49)
P12	el2	1399.04	1060.93	1114.77	1098.09	1071.01	1071.56	1178.11	✓ (0.55)	○ (0.48)	○ (0.50)	○ (0.49)	✖ (0.48)	○ (0.48)
P13	calDay	1631.33	1456.59	1560.68	1558.09	1496.28	1493.04	1522.13	○ (0.51)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
P14	complex	1185.39	1116.28	1138.40	1155.56	1158.38	1127.90	1149.99	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)
P15	pntLinePos	1361.16	1421.23	1446.08	1436.50	1404.05	1384.24	1363.48	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)
P16	triangle	1411.06	1397.08	1381.39	1417.02	1340.59	1367.88	1393.21	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)
P17	line	3175.25	3247.43	3331.89	3416.33	3286.10	3320.59	3255.89	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)
P18	pntTrianglePos	5631.50	6062.34	5952.07	6043.09	6247.93	5676.57	5848.06	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
P19	twoLinesPos	6980.25	7679.92	7796.03	7889.73	8088.04	7444.42	7248.92	○ (0.49)	○ (0.51)	✓ (0.52)	✓ (0.52)	✓ (0.52)	○ (0.51)
P20	calGCD	986.34	1008.03	981.94	1019.98	988.29	999.10	991.98	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
P21	nearestDistance	1933.48	1919.65	1895.69	1829.66	1885.29	1839.59	1906.73	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
P22	select	3130.59	3083.32	3105.71	3162.44	3208.90	3111.00	3172.89	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
P23	tcas	1944.62	1863.13	1948.84	1981.75	1947.58	1971.06	1997.28	○ (0.49)	✖ (0.48)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)

B. P-measure Results

Tables A.9, A.10, and A.11 present the FSCS P-measure simulation results for block, strip, and point patterns, respectively. Tables A.12, A.13, and A.14 show the corresponding RRT P-measure simulation results. Tables A.15 and A.16 summarize the P-measure results for the empirical study. In these figures, when comparing two methods \mathcal{M}_1 and \mathcal{M}_2 , we used the \bigcirc symbol to indicate that there was no statistical difference between them (their p -value was greater than 0.01); the \checkmark symbol to indicate that \mathcal{M}_1 was significantly better (p -value was less than 0.01, and the effect size was greater than 1.0); and the \times symbol to indicate that \mathcal{M}_2 was significantly better (p -value was less than 0.01, and the effect size was less than 1.0). Each effect size value — $\psi(\mathcal{M}_1, \mathcal{M}_2)$ — is listed in the parenthesis immediately following the comparison symbol.

TABLE A.9

FSCS VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR BLOCK PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.5016	0.6646	0.6546	0.6525	0.6672	0.6670	0.6653	\checkmark (1.9751)	\bigcirc (1.0033)	\checkmark (1.0489)	\checkmark (1.0587)	\bigcirc (0.9918)	\bigcirc (0.9924)
	5.0×10^{-3}	0.5022	0.6664	0.5513	0.5641	0.6683	0.6673	0.6672	\checkmark (1.9877)	\bigcirc (1.0038)	\checkmark (1.6316)	\checkmark (1.5492)	\bigcirc (0.9954)	\bigcirc (0.9995)
	2.0×10^{-3}	0.4991	0.6700	0.5095	0.5202	0.6700	0.6691	0.6677	\checkmark (2.0169)	\bigcirc (0.9898)	\checkmark (1.9347)	\checkmark (1.8533)	\bigcirc (0.9898)	\bigcirc (0.9936)
	1.0×10^{-3}	0.4997	0.6715	0.5036	0.5119	0.6704	0.6712	0.6678	\checkmark (2.0130)	\times (0.9836)	\checkmark (1.9819)	\checkmark (1.9169)	\bigcirc (0.9885)	\times (0.9850)
	5.0×10^{-4}	0.5001	0.6701	0.5002	0.5035	0.6710	0.6709	0.6679	\checkmark (2.0102)	\bigcirc (0.9901)	\checkmark (2.0093)	\checkmark (1.9828)	\bigcirc (0.9861)	\bigcirc (0.9864)
	2.0×10^{-4}	0.5000	0.6705	0.4994	0.5017	0.6724	0.6702	0.6680	\checkmark (2.0118)	\bigcirc (0.9889)	\checkmark (2.0169)	\checkmark (1.9979)	\times (0.9803)	\bigcirc (0.9898)
	1.0×10^{-4}	0.5009	0.6719	0.5006	0.5003	0.6717	0.6729	0.6688	\checkmark (2.0116)	\bigcirc (0.9860)	\checkmark (2.0146)	\checkmark (2.0166)	\bigcirc (0.9867)	\times (0.9817)
$d = 2$	1.0×10^{-2}	0.5000	0.5954	0.5913	0.5893	0.5982	0.5806	0.5960	\checkmark (1.4750)	\bigcirc (1.0022)	\checkmark (1.0194)	\checkmark (1.0281)	\bigcirc (0.9907)	\checkmark (1.0655)
	5.0×10^{-3}	0.4987	0.6086	0.5272	0.5330	0.6092	0.5951	0.5958	\checkmark (1.4813)	\times (0.9478)	\checkmark (1.3219)	\checkmark (1.2910)	\times (0.9453)	\bigcirc (1.0027)
	2.0×10^{-3}	0.4995	0.6173	0.4880	0.4967	0.6190	0.6082	0.6017	\checkmark (1.5138)	\times (0.9365)	\checkmark (1.5848)	\checkmark (1.5310)	\times (0.9297)	\times (0.9733)
	1.0×10^{-3}	0.4988	0.6255	0.4821	0.4895	0.6242	0.6134	0.6044	\checkmark (1.5350)	\times (0.9146)	\checkmark (1.6412)	\checkmark (1.5932)	\times (0.9195)	\times (0.9625)
	5.0×10^{-4}	0.5011	0.6283	0.4824	0.4877	0.6274	0.6190	0.6052	\checkmark (1.5258)	\times (0.9069)	\checkmark (1.6445)	\checkmark (1.6101)	\times (0.9104)	\times (0.9436)
	2.0×10^{-4}	0.4997	0.6315	0.4861	0.4893	0.6297	0.6242	0.6069	\checkmark (1.5455)	\times (0.9008)	\checkmark (1.6320)	\checkmark (1.6112)	\times (0.9078)	\times (0.9296)
	1.0×10^{-4}	0.4978	0.6323	0.4869	0.4883	0.6333	0.6269	0.6040	\checkmark (1.5386)	\times (0.8870)	\checkmark (1.6070)	\checkmark (1.5984)	\times (0.8831)	\times (0.9078)
$d = 3$	1.0×10^{-2}	0.4983	0.5096	0.5011	0.4978	0.5031	0.5099	0.5026	\checkmark (1.0174)	\times (0.9724)	\bigcirc (1.0061)	\checkmark (1.0195)	\bigcirc (0.9981)	\times (0.9713)
	5.0×10^{-3}	0.4947	0.5302	0.4724	0.4721	0.5252	0.5297	0.5093	\checkmark (1.0602)	\times (0.9198)	\checkmark (1.1591)	\checkmark (1.1603)	\times (0.9384)	\times (0.9215)
	2.0×10^{-3}	0.4979	0.5511	0.4409	0.4484	0.5501	0.5463	0.5254	\checkmark (1.1160)	\times (0.9015)	\checkmark (1.4034)	\checkmark (1.3615)	\times (0.9053)	\times (0.9191)
	1.0×10^{-3}	0.4995	0.5640	0.4377	0.4438	0.5633	0.5580	0.5328	\checkmark (1.1424)	\times (0.8814)	\checkmark (1.4651)	\checkmark (1.4291)	\times (0.8840)	\times (0.9033)
	5.0×10^{-4}	0.4994	0.5714	0.4415	0.4447	0.5732	0.5667	0.5378	\checkmark (1.1665)	\times (0.8729)	\checkmark (1.4721)	\checkmark (1.4533)	\times (0.8666)	\times (0.8898)
	2.0×10^{-4}	0.5017	0.5815	0.4499	0.4496	0.5811	0.5756	0.5422	\checkmark (1.1760)	\times (0.8521)	\checkmark (1.4479)	\checkmark (1.4497)	\times (0.8537)	\times (0.8731)
	1.0×10^{-4}	0.4994	0.5857	0.4548	0.4548	0.5866	0.5806	0.5457	\checkmark (1.2039)	\times (0.8496)	\checkmark (1.4398)	\checkmark (1.4400)	\times (0.8467)	\times (0.8678)
$d = 4$	1.0×10^{-2}	0.4931	0.4116	0.4163	0.4122	0.4197	0.4187	0.4125	\times (0.7217)	\bigcirc (1.0035)	\times (0.9843)	\bigcirc (1.0014)	\times (0.9708)	\times (0.9747)
	5.0×10^{-3}	0.4986	0.4414	0.3986	0.4004	0.4476	0.4473	0.4264	\times (0.7476)	\times (0.9407)	\checkmark (1.1214)	\checkmark (1.1131)	\times (0.9173)	\times (0.9186)
	2.0×10^{-3}	0.4966	0.4754	0.3836	0.3886	0.4786	0.4826	0.4535	\times (0.8409)	\times (0.9157)	\checkmark (1.3334)	\checkmark (1.3054)	\times (0.9037)	\times (0.8894)
	1.0×10^{-3}	0.4984	0.4918	0.3818	0.3839	0.4933	0.4985	0.4706	\times (0.8946)	\times (0.9183)	\checkmark (1.4391)	\checkmark (1.4264)	\times (0.9131)	\times (0.8943)
	5.0×10^{-4}	0.5002	0.5073	0.3851	0.3855	0.5072	0.5088	0.4815	\times (0.9277)	\times (0.9019)	\checkmark (1.4827)	\checkmark (1.4799)	\times (0.9021)	\times (0.8963)
	2.0×10^{-4}	0.4990	0.5239	0.3958	0.3962	0.5222	0.5228	0.4900	\times (0.9646)	\times (0.8731)	\checkmark (1.4662)	\checkmark (1.4639)	\times (0.8791)	\times (0.8770)
	1.0×10^{-4}	0.5010	0.5321	0.4030	0.4030	0.5325	0.5302	0.4980	\bigcirc (0.9881)	\times (0.8725)	\checkmark (1.4698)	\checkmark (1.4697)	\times (0.8709)	\times (0.8791)
$d = 5$	1.0×10^{-2}	0.5044	0.3401	0.3368	0.3400	0.3494	0.3447	0.3381	\times (0.5020)	\bigcirc (0.9914)	\bigcirc (1.0059)	\bigcirc (0.9918)	\times (0.9513)	\times (0.9712)
	5.0×10^{-3}	0.4971	0.3659	0.3335	0.3308	0.3741	0.3804	0.3574	\times (0.5628)	\times (0.9640)	\checkmark (1.1114)	\checkmark (1.1252)	\times (0.9307)	\times (0.9061)
	2.0×10^{-3}	0.4963	0.4005	0.3285	0.3274	0.4026	0.4181	0.3909	\times (0.6515)	\times (0.9609)	\checkmark (1.3121)	\checkmark (1.3187)	\times (0.9522)	\times (0.8934)
	1.0×10^{-3}	0.5005	0.4220	0.3230	0.3238	0.4260	0.4424	0.4106	\times (0.6953)	\times (0.9539)	\checkmark (1.4601)	\checkmark (1.4545)	\times (0.9384)	\times (0.8779)
	5.0×10^{-4}	0.5027	0.4411	0.3267	0.3285	0.4412	0.4572	0.4321	\times (0.7528)	\times (0.9638)	\checkmark (1.5679)	\checkmark (1.5556)	\times (0.9636)	\times (0.9033)
	2.0×10^{-4}	0.5011	0.4626	0.3342	0.3372	0.4619	0.4729	0.4487	\times (0.8104)	\times (0.9453)	\checkmark (1.6215)	\checkmark (1.5997)	\times (0.9481)	\times (0.9070)
	1.0×10^{-4}	0.5003	0.4757	0.3446	0.3462	0.4763	0.4823	0.4588	\times (0.8466)	\times (0.9343)	\checkmark (1.6122)	\checkmark (1.6011)	\times (0.9322)	\times (0.9100)
$d = 10$	1.0×10^{-2}	0.5033	0.1073	0.1016	0.1148	0.2197	0.1111	0.1127	\times (0.1254)	\checkmark (1.0570)	\checkmark (1.1230)	\bigcirc (0.9798)	\times (0.4511)	\bigcirc (1.0167)
	5.0×10^{-3}	0.5141	0.1103	0.1087	0.1026	0.1533	0.1052	0.1199	\times (0.1288)	\checkmark (1.0983)	\checkmark (1.1172)	\checkmark (1.1917)	\times (0.7523)	\checkmark (1.1583)
	2.0×10^{-3}	0.5021	0.1359	0.0992	0.1003	0.1413	0.1292	0.1384	\times (0.1594)	\checkmark (1.0220)	\checkmark (1.4592)	\checkmark (1.4416)	\times (0.9766)	\checkmark (1.0834)
	1.0×10^{-3}	0.5002	0.1653	0.1005	0.0998	0.1670	0.1691	0.1666	\times (0.1997)	\bigcirc (1.0095)	\checkmark (1.7892)	\checkmark (1.8040)	\bigcirc (0.9972)	\bigcirc (0.9825)
	5.0×10^{-4}	0.4973	0.1865	0.1032	0.1001	0.1898	0.2054	0.1994	\times (0.2518)	\checkmark (1.0867)	\checkmark (2.1651)	\checkmark (2.2396)	\checkmark (1.0632)	\times (0.9639)
	2.0×10^{-4}	0.4984	0.2050	0.1037	0.1038	0.2094	0.2352	0.2344	\times (0.3082)	\checkmark (1.1872)	\checkmark (2.6479)	\checkmark (2.6440)	\checkmark (1.1564)	\bigcirc (0.9958)
	1.0×10^{-4}	0.4999	0.2199	0.1076	0.1069	0.2233	0.2497	0.2773	\times (0.3838)	\checkmark (1.3608)	\checkmark (3.1830)	\checkmark (3.2054)	\checkmark (1.3341)	\checkmark (1.1527)

TABLE A.10

FSCS VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR STRIP PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
$d = 1$	1.0×10^{-2}	0.4999	0.6657	0.6536	0.6535	0.6674	0.6644	0.6643	✓ (1.9796)	○ (0.9935)	✓ (1.0486)	✓ (1.0492)	✗ (0.9859)	○ (0.9993)
	5.0×10^{-3}	0.5033	0.6676	0.5519	0.5652	0.6672	0.6685	0.6644	✓ (1.9538)	✗ (0.9857)	✓ (1.6075)	✓ (1.5230)	○ (0.9877)	✗ (0.9818)
	2.0×10^{-3}	0.4986	0.6703	0.5081	0.5209	0.6706	0.6700	0.6656	✓ (2.0014)	✗ (0.9789)	✓ (1.9265)	✓ (1.8307)	✗ (0.9775)	✗ (0.9801)
	1.0×10^{-3}	0.5001	0.6707	0.5038	0.5102	0.6702	0.6705	0.6680	✓ (2.0108)	○ (0.9879)	✓ (1.9816)	✓ (1.9314)	○ (0.9900)	○ (0.9888)
	5.0×10^{-4}	0.4994	0.6715	0.5016	0.5051	0.6691	0.6710	0.6698	✓ (2.0333)	○ (0.9925)	✓ (2.0157)	✓ (1.9878)	○ (1.0031)	○ (0.9946)
	2.0×10^{-4}	0.4977	0.6709	0.4995	0.5025	0.6701	0.6702	0.6685	✓ (2.0358)	○ (0.9891)	✓ (2.0209)	✓ (1.9967)	○ (0.9929)	○ (0.9925)
	1.0×10^{-4}	0.5003	0.6713	0.4995	0.5009	0.6716	0.6713	0.6677	✓ (2.0067)	✗ (0.9837)	✓ (2.0130)	✓ (2.0018)	✗ (0.9823)	✗ (0.9838)
$d = 2$	1.0×10^{-2}	0.5020	0.5172	0.5143	0.5186	0.5160	0.5175	0.5166	✓ (1.0599)	○ (0.9974)	○ (1.0090)	○ (0.9920)	○ (1.0022)	○ (0.9962)
	5.0×10^{-3}	0.4986	0.5132	0.5066	0.5080	0.5127	0.5122	0.5113	✓ (1.0523)	○ (0.9926)	✓ (1.0192)	○ (1.0133)	○ (0.9945)	○ (0.9964)
	2.0×10^{-3}	0.5006	0.5082	0.5035	0.5027	0.5086	0.5066	0.5088	✓ (1.0332)	○ (1.0021)	✓ (1.0212)	✓ (1.0245)	○ (1.0007)	○ (1.0087)
	1.0×10^{-3}	0.5020	0.5051	0.5002	0.5014	0.5055	0.5054	0.5047	○ (1.0109)	○ (0.9983)	✓ (1.0181)	○ (1.0133)	○ (0.9966)	○ (0.9971)
	5.0×10^{-4}	0.4985	0.5042	0.5019	0.5029	0.5049	0.5034	0.5033	✓ (1.0195)	○ (0.9968)	○ (1.0058)	○ (1.0020)	○ (0.9936)	○ (0.9997)
	2.0×10^{-4}	0.5010	0.5021	0.4985	0.5001	0.5044	0.5023	0.5031	○ (1.0088)	○ (1.0041)	✓ (1.0188)	○ (1.0123)	○ (0.9951)	○ (1.0034)
	1.0×10^{-4}	0.5005	0.5027	0.5003	0.5005	0.5018	0.5022	0.5024	○ (1.0073)	○ (0.9987)	○ (1.0082)	○ (1.0075)	○ (1.0023)	○ (1.0007)
$d = 3$	1.0×10^{-2}	0.5058	0.5071	0.5057	0.5088	0.5095	0.5088	0.5072	○ (1.0059)	○ (1.0005)	○ (1.0062)	○ (0.9938)	○ (0.9907)	○ (0.9937)
	5.0×10^{-3}	0.5006	0.5056	0.5029	0.5040	0.5057	0.5030	0.5015	○ (1.0038)	✗ (0.9837)	○ (0.9944)	○ (0.9904)	✗ (0.9834)	○ (0.9942)
	2.0×10^{-3}	0.4996	0.5021	0.4998	0.5030	0.5028	0.5026	0.5014	○ (1.0072)	○ (0.9972)	○ (1.0064)	○ (0.9936)	○ (0.9942)	○ (0.9950)
	1.0×10^{-3}	0.5010	0.5011	0.5012	0.5002	0.5002	0.5016	0.5038	○ (1.0114)	○ (1.0110)	○ (1.0104)	✓ (1.0147)	✓ (1.0148)	○ (1.0089)
	5.0×10^{-4}	0.5014	0.5021	0.5019	0.4987	0.5029	0.5011	0.5006	○ (0.9968)	○ (0.9940)	○ (0.9949)	○ (1.0077)	○ (0.9911)	○ (0.9979)
	2.0×10^{-4}	0.4999	0.5001	0.5019	0.4996	0.4998	0.4999	0.4998	○ (0.9998)	○ (0.9989)	○ (0.9917)	○ (1.0009)	○ (1.0001)	○ (0.9998)
	1.0×10^{-4}	0.4996	0.5002	0.5002	0.4999	0.5019	0.5018	0.4978	○ (0.9928)	○ (0.9906)	○ (0.9905)	○ (0.9918)	✗ (0.9837)	✗ (0.9840)
$d = 4$	1.0×10^{-2}	0.5037	0.5034	0.5037	0.5050	0.5094	0.5065	0.5068	○ (1.0126)	✓ (1.0137)	○ (1.0125)	○ (1.0074)	○ (0.9898)	○ (1.0014)
	5.0×10^{-3}	0.4978	0.5014	0.5038	0.5046	0.5060	0.5028	0.5062	✓ (1.0344)	✓ (1.0195)	○ (1.0096)	○ (1.0063)	○ (1.0008)	✓ (1.0137)
	2.0×10^{-3}	0.4990	0.5042	0.5021	0.5024	0.5018	0.5019	0.5015	○ (1.0098)	○ (0.9891)	○ (0.9976)	○ (0.9960)	○ (0.9987)	○ (0.9982)
	1.0×10^{-3}	0.5001	0.5012	0.5027	0.5038	0.5005	0.4996	0.4998	○ (0.9989)	○ (0.9947)	○ (0.9888)	✗ (0.9844)	○ (0.9975)	○ (1.0012)
	5.0×10^{-4}	0.5003	0.5015	0.5020	0.5030	0.5007	0.5007	0.4997	○ (0.9975)	○ (0.9929)	○ (0.9909)	○ (0.9869)	○ (0.9961)	○ (0.9959)
	2.0×10^{-4}	0.4986	0.5008	0.5023	0.5030	0.4995	0.4990	0.4979	○ (0.9973)	○ (0.9886)	✗ (0.9824)	✗ (0.9799)	○ (0.9936)	○ (0.9954)
	1.0×10^{-4}	0.4997	0.4999	0.5033	0.5026	0.5005	0.5013	0.4985	○ (0.9951)	○ (0.9944)	✗ (0.9810)	✗ (0.9837)	○ (0.9919)	○ (0.9890)
$d = 5$	1.0×10^{-2}	0.4969	0.5036	0.5092	0.5051	0.5042	0.5056	0.5038	✓ (1.0281)	○ (1.0011)	✗ (0.9789)	○ (0.9951)	○ (0.9984)	○ (0.9932)
	5.0×10^{-3}	0.4977	0.5022	0.5058	0.5034	0.5029	0.5021	0.5009	○ (1.0126)	○ (0.9946)	✗ (0.9806)	○ (0.9900)	○ (0.9920)	○ (0.9952)
	2.0×10^{-3}	0.4990	0.5038	0.5040	0.5057	0.5034	0.5010	0.5028	✓ (1.0153)	○ (0.9963)	○ (0.9952)	○ (0.9886)	○ (0.9979)	○ (1.0075)
	1.0×10^{-3}	0.4996	0.5045	0.5034	0.5032	0.5017	0.5014	0.5033	✓ (1.0151)	○ (0.9951)	○ (0.9998)	○ (1.0006)	○ (1.0064)	○ (1.0079)
	5.0×10^{-4}	0.4993	0.5010	0.5059	0.5036	0.5017	0.5005	0.5021	○ (1.0109)	○ (1.0043)	✗ (0.9847)	○ (0.9939)	○ (1.0015)	○ (1.0064)
	2.0×10^{-4}	0.4992	0.4995	0.5016	0.5048	0.5007	0.4978	0.4995	○ (1.0012)	○ (1.0000)	○ (0.9915)	✗ (0.9788)	○ (0.9951)	○ (1.0067)
	1.0×10^{-4}	0.4989	0.4995	0.5031	0.5028	0.5017	0.4996	0.4973	○ (0.9934)	○ (0.9911)	✗ (0.9770)	✗ (0.9782)	✗ (0.9826)	○ (0.9909)
$d = 10$	1.0×10^{-2}	0.5006	0.5036	0.5046	0.5003	0.5053	0.5070	0.5103	✓ (1.0395)	✓ (1.0270)	✓ (1.0230)	✓ (1.0407)	✓ (1.0200)	○ (1.0133)
	5.0×10^{-3}	0.5006	0.5049	0.5065	0.5048	0.5010	0.5040	0.5075	✓ (1.0278)	○ (1.0102)	○ (1.0038)	○ (1.0109)	✓ (1.0262)	✓ (1.0139)
	2.0×10^{-3}	0.4999	0.5047	0.5039	0.5030	0.5045	0.5045	0.5054	✓ (1.0222)	○ (1.0027)	○ (1.0057)	○ (1.0094)	○ (1.0034)	○ (1.0036)
	1.0×10^{-3}	0.4991	0.5037	0.5051	0.5064	0.5064	0.5049	0.5053	✓ (1.0250)	○ (1.0066)	○ (1.0007)	○ (0.9955)	○ (0.9957)	○ (1.0015)
	5.0×10^{-4}	0.5000	0.5036	0.5057	0.5043	0.5048	0.5034	0.5051	✓ (1.0208)	○ (1.0060)	○ (0.9978)	○ (1.0032)	○ (1.0013)	○ (1.0068)
	2.0×10^{-4}	0.5014	0.5034	0.5039	0.5063	0.5056	0.5025	0.5044	○ (1.0121)	○ (1.0039)	○ (1.0017)	○ (0.9923)	○ (0.9949)	○ (1.0076)
	1.0×10^{-4}	0.4993	0.5030	0.5056	0.5067	0.5038	0.5038	0.5050	✓ (1.0228)	○ (1.0078)	○ (0.9976)	○ (0.9932)	○ (1.0048)	○ (1.0047)

TABLE A.11

FSCS VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR POINT PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.4999	0.5047	0.5032	0.5035	0.5068	0.5050	0.5033	✓ (1.0134)	○ (0.9941)	○ (1.0003)	○ (0.9991)	✗ (0.9858)	○ (0.9929)
	5.0×10^{-3}	0.4993	0.5047	0.5018	0.5002	0.5048	0.5021	0.5054	✓ (1.0247)	○ (1.0028)	✓ (1.0144)	✓ (1.0209)	○ (1.0026)	○ (1.0133)
	2.0×10^{-3}	0.5007	0.5047	0.5012	0.5000	0.5061	0.5048	0.5039	○ (1.0125)	○ (0.9965)	○ (1.0109)	✓ (1.0155)	○ (0.9911)	○ (0.9962)
	1.0×10^{-3}	0.5010	0.5052	0.5021	0.5010	0.5044	0.5048	0.5047	✓ (1.0147)	○ (0.9981)	○ (1.0102)	✓ (1.0148)	○ (1.0012)	○ (0.9993)
	5.0×10^{-4}	0.4992	0.5049	0.4996	0.5019	0.5051	0.5059	0.5049	✓ (1.0233)	○ (1.0001)	✓ (1.0216)	○ (1.0121)	○ (0.9992)	○ (0.9962)
	2.0×10^{-4}	0.5021	0.5061	0.4991	0.4996	0.5054	0.5037	0.5041	○ (1.0080)	○ (0.9921)	✓ (1.0204)	✓ (1.0182)	○ (0.9947)	○ (1.0015)
	1.0×10^{-4}	0.5005	0.5048	0.4989	0.4998	0.5052	0.5056	0.5051	✓ (1.0184)	○ (1.0010)	✓ (1.0252)	✓ (1.0212)	○ (0.9993)	○ (0.9981)
$d = 2$	1.0×10^{-2}	0.0002	0.4915	0.4924	0.4915	0.4917	0.4923	0.4913	✗ (0.9706)	○ (0.9994)	○ (0.9956)	○ (0.9993)	○ (0.9986)	○ (0.9961)
	5.0×10^{-3}	0.0002	0.4953	0.4917	0.4911	0.4954	0.4957	0.4935	✗ (0.9824)	○ (0.9926)	○ (1.0071)	○ (1.0097)	○ (0.9925)	○ (0.9911)
	2.0×10^{-3}	0.0002	0.4987	0.4916	0.4934	0.4965	0.4982	0.4992	○ (0.9986)	○ (1.0019)	✓ (1.0311)	✓ (1.0234)	○ (1.0110)	○ (1.0040)
	1.0×10^{-3}	0.0002	0.4997	0.4933	0.4960	0.5000	0.5000	0.5023	○ (1.0117)	○ (1.0104)	✓ (1.0364)	✓ (1.0253)	○ (1.0090)	○ (1.0091)
	5.0×10^{-4}	0.0002	0.5032	0.4973	0.4973	0.5016	0.5000	0.5005	○ (1.0008)	○ (0.9892)	○ (1.0127)	○ (1.0126)	○ (0.9953)	○ (1.0018)
	2.0×10^{-4}	0.0002	0.5038	0.4979	0.4985	0.5040	0.5025	0.5028	○ (1.0064)	○ (0.9959)	✓ (1.0199)	✓ (1.0173)	○ (0.9952)	○ (1.0011)
	1.0×10^{-4}	0.0002	0.5041	0.4990	0.4978	0.5045	0.5020	0.5042	✓ (1.0169)	○ (1.0001)	✓ (1.0207)	✓ (1.0258)	○ (0.9987)	○ (1.0089)
$d = 3$	1.0×10^{-2}	0.4987	0.4525	0.4485	0.4483	0.4485	0.4493	0.4529	✗ (0.8320)	○ (1.0017)	✓ (1.0179)	✓ (1.0186)	✓ (1.0178)	✓ (1.0148)
	5.0×10^{-3}	0.4990	0.4625	0.4542	0.4550	0.4600	0.4608	0.4615	✗ (0.8602)	○ (0.9960)	✓ (1.0298)	✓ (1.0263)	○ (1.0061)	○ (1.0029)
	2.0×10^{-3}	0.4999	0.4730	0.4623	0.4643	0.4730	0.4721	0.4747	✗ (0.9041)	○ (1.0070)	✓ (1.0511)	✓ (1.0428)	○ (1.0070)	○ (1.0108)
	1.0×10^{-3}	0.5011	0.4782	0.4684	0.4710	0.4790	0.4795	0.4815	✗ (0.9246)	○ (1.0132)	✓ (1.0540)	✓ (1.0429)	○ (1.0101)	○ (1.0082)
	5.0×10^{-4}	0.5002	0.4849	0.4753	0.4759	0.4846	0.4859	0.4861	✗ (0.9449)	○ (1.0047)	✓ (1.0440)	✓ (1.0416)	○ (1.0059)	○ (1.0006)
	2.0×10^{-4}	0.5010	0.4892	0.4802	0.4811	0.4881	0.4886	0.4911	✗ (0.9614)	○ (1.0079)	✓ (1.0447)	✓ (1.0408)	○ (1.0123)	○ (1.0103)
	1.0×10^{-4}	0.4989	0.4935	0.4839	0.4837	0.4944	0.4934	0.4932	✗ (0.9777)	○ (0.9989)	✓ (1.0380)	✓ (1.0388)	○ (0.9952)	○ (0.9991)
$d = 4$	1.0×10^{-2}	0.4981	0.3895	0.3928	0.3898	0.3911	0.3953	0.3900	✗ (0.6441)	○ (1.0019)	○ (0.9880)	○ (1.0009)	○ (0.9953)	✗ (0.9778)
	5.0×10^{-3}	0.4978	0.4067	0.3994	0.3984	0.4092	0.4115	0.4086	✗ (0.6972)	○ (1.0081)	✓ (1.0390)	✓ (1.0434)	○ (0.9979)	○ (0.9883)
	2.0×10^{-3}	0.4975	0.4269	0.4130	0.4107	0.4284	0.4332	0.4309	✗ (0.7651)	✓ (1.0166)	✓ (1.0765)	✓ (1.0865)	○ (1.0105)	○ (0.9907)
	1.0×10^{-3}	0.4991	0.4394	0.4221	0.4227	0.4404	0.4452	0.4462	✗ (0.8087)	✓ (1.0281)	✓ (1.1034)	✓ (1.1007)	✓ (1.0238)	○ (1.0040)
	5.0×10^{-4}	0.4991	0.4483	0.4308	0.4298	0.4489	0.4552	0.4585	✗ (0.8497)	✓ (1.0420)	✓ (1.1186)	✓ (1.1230)	✓ (1.0394)	○ (1.0130)
	2.0×10^{-4}	0.4987	0.4612	0.4431	0.4415	0.4602	0.4654	0.4683	✗ (0.8854)	✓ (1.0288)	✓ (1.1071)	✓ (1.1140)	✓ (1.0330)	○ (1.0117)
	1.0×10^{-4}	0.4988	0.4671	0.4519	0.4506	0.4668	0.4719	0.4751	✗ (0.9094)	✓ (1.0325)	✓ (1.0979)	✓ (1.1035)	✓ (1.0340)	○ (1.0129)
$d = 5$	1.0×10^{-2}	0.5014	0.3297	0.3370	0.3355	0.3504	0.3330	0.3334	✗ (0.4972)	✓ (1.0164)	✗ (0.9838)	○ (0.9904)	✗ (0.9270)	○ (1.0014)
	5.0×10^{-3}	0.4983	0.3483	0.3443	0.3421	0.3579	0.3527	0.3532	✗ (0.5499)	✓ (1.0220)	✓ (1.0400)	✓ (1.0504)	✗ (0.9799)	○ (1.0023)
	2.0×10^{-3}	0.4964	0.3747	0.3570	0.3573	0.3757	0.3815	0.3822	✗ (0.6278)	✓ (1.0326)	✓ (1.1146)	✓ (1.1132)	✓ (1.0281)	○ (1.0032)
	1.0×10^{-3}	0.4978	0.3902	0.3662	0.3661	0.3934	0.4013	0.4024	✗ (0.6794)	✓ (1.0526)	✓ (1.1653)	✓ (1.1662)	✓ (1.0385)	○ (1.0045)
	5.0×10^{-4}	0.4998	0.4048	0.3764	0.3756	0.4039	0.4156	0.4215	✗ (0.7292)	✓ (1.0714)	✓ (1.2072)	✓ (1.2115)	✓ (1.0753)	✓ (1.0246)
	2.0×10^{-4}	0.5012	0.4225	0.3912	0.3907	0.4224	0.4322	0.4403	✗ (0.7827)	✓ (1.0752)	✓ (1.2240)	✓ (1.2267)	✓ (1.0757)	✓ (1.0335)
	1.0×10^{-4}	0.4983	0.4352	0.4011	0.4014	0.4328	0.4404	0.4517	✗ (0.8294)	✓ (1.0691)	✓ (1.2301)	✓ (1.2285)	✓ (1.0796)	✓ (1.0468)
$d = 10$	1.0×10^{-2}	0.4993	0.2011	0.2033	0.2087	0.2985	0.2091	0.2108	✗ (0.2679)	✓ (1.0607)	✓ (1.0463)	○ (1.0124)	✗ (0.6277)	○ (1.0103)
	5.0×10^{-3}	0.5062	0.1801	0.1813	0.1813	0.2408	0.1799	0.1948	✗ (0.2360)	✓ (1.1013)	✓ (1.0920)	✓ (1.0920)	✗ (0.7625)	✓ (1.1026)
	2.0×10^{-3}	0.5001	0.1761	0.1567	0.1546	0.2004	0.1735	0.1892	✗ (0.2332)	✓ (1.0918)	✓ (1.2553)	✓ (1.2763)	✗ (0.9312)	✓ (1.1111)
	1.0×10^{-3}	0.5013	0.1806	0.1461	0.1464	0.1940	0.1846	0.2044	✗ (0.2557)	✓ (1.1656)	✓ (1.5024)	✓ (1.4978)	✓ (1.0676)	✓ (1.1349)
	5.0×10^{-4}	0.5011	0.1893	0.1411	0.1415	0.1989	0.2033	0.2288	✗ (0.2954)	✓ (1.2703)	✓ (1.8057)	✓ (1.7994)	✓ (1.1949)	✓ (1.1625)
	2.0×10^{-4}	0.5015	0.2031	0.1404	0.1411	0.2075	0.2252	0.2531	✗ (0.3370)	✓ (1.3297)	✓ (2.0755)	✓ (2.0637)	✓ (1.2948)	✓ (1.1661)
	1.0×10^{-4}	0.5010	0.2179	0.1452	0.1464	0.2207	0.2403	0.2918	✗ (0.4103)	✓ (1.4781)	✓ (2.4248)	✓ (2.4026)	✓ (1.4542)	✓ (1.3026)

TABLE A.12

RRT VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR BLOCK PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.5016	0.6558	0.6518	0.6526	0.5912	0.6570	0.6573	✓ (1.9051)	○ (1.0065)	✓ (1.0246)	✓ (1.0207)	✓ (1.3260)	○ (1.0012)
	5.0×10^{-3}	0.5022	0.6554	0.5711	0.5760	0.5462	0.6565	0.6540	✓ (1.8742)	○ (0.9939)	✓ (1.4197)	✓ (1.3916)	✓ (1.5708)	○ (0.9890)
	2.0×10^{-3}	0.4991	0.6573	0.5136	0.5229	0.5221	0.6567	0.6562	✓ (1.9158)	○ (0.9953)	✓ (1.8078)	✓ (1.7414)	✓ (1.7476)	○ (0.9977)
	1.0×10^{-3}	0.4997	0.6589	0.5050	0.5098	0.5147	0.6591	0.6573	✓ (1.9208)	○ (0.9931)	✓ (1.8806)	✓ (1.8448)	✓ (1.8088)	○ (0.9922)
	5.0×10^{-4}	0.5001	0.6587	0.4999	0.5073	0.5065	0.6586	0.6588	✓ (1.9307)	○ (1.0008)	✓ (1.9319)	✓ (1.8755)	✓ (1.8819)	○ (1.0011)
	2.0×10^{-4}	0.5000	0.6587	0.4996	0.5039	0.5024	0.6576	0.6578	✓ (1.9224)	○ (0.9959)	✓ (1.9252)	✓ (1.8924)	✓ (1.9037)	○ (1.0008)
$d = 2$	1.0×10^{-2}	0.5009	0.6592	0.4992	0.5009	0.5015	0.6592	0.6579	✓ (1.9158)	○ (0.9942)	✓ (1.9292)	✓ (1.9157)	✓ (1.9111)	○ (0.9943)
	5.0×10^{-3}	0.5000	0.5941	0.5907	0.5914	0.5929	0.5958	0.5909	✓ (1.4443)	○ (0.9869)	○ (1.0009)	○ (0.9980)	○ (0.9917)	✗ (0.9797)
	5.0×10^{-3}	0.4987	0.6008	0.5636	0.5634	0.5959	0.6002	0.5936	✓ (1.4684)	✗ (0.9705)	✓ (1.1314)	✓ (1.1321)	○ (0.9907)	✗ (0.9733)
	2.0×10^{-3}	0.4995	0.6071	0.5136	0.5208	0.6008	0.6027	0.5936	✓ (1.4640)	✗ (0.9453)	✓ (1.3836)	✓ (1.3440)	✗ (0.9709)	✗ (0.9631)
	1.0×10^{-3}	0.4988	0.6083	0.5001	0.5034	0.5626	0.6081	0.5966	✓ (1.4860)	✗ (0.9521)	✓ (1.4782)	✓ (1.4586)	✓ (1.1496)	✗ (0.9531)
	5.0×10^{-4}	0.5011	0.6111	0.4968	0.4990	0.5337	0.6110	0.5959	✓ (1.4681)	✗ (0.9384)	✓ (1.4938)	✓ (1.4806)	✓ (1.2884)	✗ (0.9390)
$d = 3$	2.0×10^{-4}	0.4997	0.6124	0.4963	0.4991	0.5162	0.6108	0.5983	✓ (1.4909)	✗ (0.9425)	✓ (1.5117)	✓ (1.4947)	✓ (1.3960)	✗ (0.9488)
	1.0×10^{-4}	0.4978	0.6119	0.4966	0.4984	0.5087	0.6117	0.5969	✓ (1.4940)	✗ (0.9392)	✓ (1.5009)	✓ (1.4905)	✓ (1.4301)	✗ (0.9400)
	1.0×10^{-2}	0.4983	0.5404	0.5357	0.5373	0.5387	0.5394	0.5385	✓ (1.1749)	○ (0.9925)	○ (1.0114)	○ (1.0049)	○ (0.9994)	○ (0.9966)
	5.0×10^{-3}	0.4947	0.5434	0.5221	0.5298	0.5438	0.5488	0.5400	✓ (1.1991)	✗ (0.9865)	✓ (1.0746)	✓ (1.0418)	✗ (0.9849)	✗ (0.9651)
	2.0×10^{-3}	0.4979	0.5558	0.5005	0.5028	0.5543	0.5573	0.5436	✓ (1.2009)	✗ (0.9520)	✓ (1.1886)	✓ (1.1776)	✗ (0.9577)	✗ (0.9460)
	1.0×10^{-3}	0.4995	0.5619	0.4888	0.4934	0.5592	0.5597	0.5470	✓ (1.2097)	✗ (0.9414)	✓ (1.2627)	✓ (1.2395)	✗ (0.9516)	✗ (0.9498)
$d = 4$	5.0×10^{-4}	0.4994	0.5663	0.4843	0.4885	0.5614	0.5630	0.5503	✓ (1.2265)	✗ (0.9369)	✓ (1.3029)	✓ (1.2812)	✗ (0.9558)	✗ (0.9496)
	2.0×10^{-4}	0.5017	0.5715	0.4834	0.4867	0.5628	0.5701	0.5509	✓ (1.2180)	✗ (0.9196)	✓ (1.3106)	✓ (1.2937)	✗ (0.9529)	✗ (0.9249)
	1.0×10^{-4}	0.4994	0.5727	0.4851	0.4847	0.5399	0.5731	0.5511	✓ (1.2303)	✗ (0.9161)	✓ (1.3030)	✓ (1.3049)	✓ (1.0463)	✗ (0.9145)
	1.0×10^{-2}	0.4931	0.4922	0.5037	0.5036	0.5016	0.5005	0.4974	✓ (1.0173)	✓ (1.0212)	✗ (0.9751)	✗ (0.9754)	✗ (0.9833)	○ (0.9879)
	5.0×10^{-3}	0.4986	0.5059	0.4910	0.4953	0.5053	0.5099	0.5065	✓ (1.0322)	○ (1.0024)	✓ (1.0639)	✓ (1.0458)	○ (1.0048)	✗ (0.9866)
	2.0×10^{-3}	0.4966	0.5163	0.4824	0.4867	0.5162	0.5193	0.5111	✓ (1.0595)	✗ (0.9796)	✓ (1.1218)	✓ (1.1027)	✗ (0.9796)	✗ (0.9676)
$d = 5$	1.0×10^{-3}	0.4984	0.5221	0.4729	0.4769	0.5235	0.5251	0.5178	✓ (1.0806)	✗ (0.9828)	✓ (1.1969)	✓ (1.1779)	✗ (0.9773)	✗ (0.9708)
	5.0×10^{-4}	0.5002	0.5271	0.4703	0.4710	0.5289	0.5303	0.5223	✓ (1.0922)	✗ (0.9808)	✓ (1.2315)	✓ (1.2278)	✗ (0.9738)	✗ (0.9683)
	2.0×10^{-4}	0.4990	0.5323	0.4716	0.4690	0.5317	0.5351	0.5226	✓ (1.0993)	✗ (0.9620)	✓ (1.2267)	✓ (1.2395)	✗ (0.9642)	✗ (0.9512)
	1.0×10^{-4}	0.5010	0.5375	0.4709	0.4726	0.5343	0.5385	0.5241	✓ (1.0969)	✗ (0.9475)	✓ (1.2373)	✓ (1.2289)	✗ (0.9597)	✗ (0.9436)
	1.0×10^{-2}	0.5044	0.4745	0.4862	0.4813	0.4835	0.4951	0.4747	✗ (0.8878)	○ (1.0006)	✗ (0.9547)	✗ (0.9737)	✗ (0.9652)	✗ (0.9215)
	5.0×10^{-3}	0.4971	0.4829	0.4797	0.4725	0.4776	0.4904	0.4863	✗ (0.9579)	✓ (1.0136)	✓ (1.0267)	✓ (1.0570)	✓ (1.0354)	✗ (0.9837)
$d = 10$	2.0×10^{-3}	0.4963	0.4888	0.4673	0.4681	0.4877	0.4946	0.4939	○ (0.9907)	✓ (1.0209)	✓ (1.1128)	✓ (1.1092)	✓ (1.0253)	○ (0.9974)
	1.0×10^{-3}	0.5005	0.4957	0.4611	0.4598	0.4938	0.4997	0.5022	○ (1.0072)	✓ (1.0265)	✓ (1.1794)	✓ (1.1854)	✓ (1.0344)	○ (1.0103)
	5.0×10^{-4}	0.5027	0.4973	0.4574	0.4554	0.4982	0.5008	0.5053	○ (1.0106)	✓ (1.0325)	✓ (1.2115)	✓ (1.2214)	✓ (1.0287)	✓ (1.0181)
	2.0×10^{-4}	0.5011	0.5037	0.4572	0.4580	0.5063	0.5068	0.5079	✓ (1.0277)	✓ (1.0170)	✓ (1.2252)	✓ (1.2215)	○ (1.0062)	○ (1.0043)
	1.0×10^{-4}	0.5003	0.5089	0.4583	0.4569	0.5108	0.5106	0.5101	✓ (1.0399)	○ (1.0047)	✓ (1.2309)	✓ (1.2379)	○ (0.9972)	○ (0.9980)
	1.0×10^{-2}	0.5033	0.4235	0.4525	0.4659	0.4683	0.4421	0.4426	✗ (0.7837)	✓ (1.0808)	✗ (0.9606)	✗ (0.9103)	✗ (0.9016)	○ (1.0019)
$d = 10$	5.0×10^{-3}	0.5141	0.4223	0.4449	0.4435	0.4479	0.4415	0.4515	✗ (0.7779)	✓ (1.1260)	✓ (1.0268)	✓ (1.0327)	✓ (1.0146)	✓ (1.0411)
	2.0×10^{-3}	0.5021	0.4189	0.4477	0.4399	0.4423	0.4429	0.4635	✗ (0.8567)	✓ (1.1981)	✓ (1.0657)	✓ (1.1000)	✓ (1.0891)	✓ (1.0863)
	1.0×10^{-3}	0.5002	0.4257	0.4355	0.4353	0.4310	0.4397	0.4725	✗ (0.8949)	✓ (1.2084)	✓ (1.1609)	✓ (1.1622)	✓ (1.1827)	✓ (1.1415)
	5.0×10^{-4}	0.4973	0.4282	0.4322	0.4322	0.4328	0.4395	0.4763	✗ (0.9193)	✓ (1.2143)	✓ (1.1946)	✓ (1.1948)	✓ (1.1918)	✓ (1.1597)
	2.0×10^{-4}	0.4984	0.4290	0.4337	0.4340	0.4347	0.4501	0.4839	✗ (0.9437)	✓ (1.2480)	✓ (1.2245)	✓ (1.2232)	✓ (1.2193)	✓ (1.1457)
	1.0×10^{-4}	0.4999	0.4312	0.4327	0.4331	0.4344	0.4601	0.4924	✗ (0.9705)	✓ (1.2796)	✓ (1.2717)	✓ (1.2697)	✓ (1.2632)	✓ (1.1383)

TABLE A.13
RRT VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR STRIP PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
$d = 1$	1.0×10^{-2}	0.4999	0.6543	0.6498	0.6521	0.5901	0.6564	0.6566	✓ (1.9131)	○ (1.0105)	✓ (1.0305)	✓ (1.0200)	✓ (1.3282)	○ (1.0010)
	5.0×10^{-3}	0.5033	0.6559	0.5723	0.5779	0.5489	0.6574	0.6559	✓ (1.8813)	○ (0.9999)	✓ (1.4249)	✓ (1.3923)	✓ (1.5667)	○ (0.9936)
	2.0×10^{-3}	0.4986	0.6562	0.5136	0.5242	0.5232	0.6560	0.6548	✓ (1.9075)	○ (0.9937)	✓ (1.7966)	✓ (1.7217)	✓ (1.7284)	○ (0.9945)
	1.0×10^{-3}	0.5001	0.6579	0.5040	0.5113	0.5122	0.6619	0.6566	✓ (1.9112)	○ (0.9945)	✓ (1.8823)	✓ (1.8279)	✓ (1.8209)	✗ (0.9768)
	5.0×10^{-4}	0.4994	0.6584	0.5022	0.5061	0.5064	0.6577	0.6561	✓ (1.9122)	○ (0.9897)	✓ (1.8908)	✓ (1.8617)	✓ (1.8593)	○ (0.9930)
	2.0×10^{-4}	0.4977	0.6597	0.4992	0.5031	0.5031	0.6586	0.6568	✓ (1.9314)	○ (0.9868)	✓ (1.9196)	✓ (1.8895)	✓ (1.8897)	○ (0.9918)
	1.0×10^{-4}	0.5003	0.6584	0.4990	0.5005	0.5020	0.6589	0.6567	✓ (1.9106)	○ (0.9926)	✓ (1.9204)	✓ (1.9093)	✓ (1.8975)	○ (0.9901)
$d = 2$	1.0×10^{-2}	0.5020	0.5165	0.5177	0.5177	0.5171	0.5177	0.5152	✓ (1.0540)	○ (0.9945)	○ (0.9899)	○ (0.9900)	○ (0.9922)	○ (0.9900)
	5.0×10^{-3}	0.4986	0.5104	0.5077	0.5079	0.5110	0.5111	0.5088	✓ (1.0418)	○ (0.9937)	○ (1.0045)	○ (1.0038)	○ (0.9912)	○ (0.9911)
	2.0×10^{-3}	0.5006	0.5069	0.5019	0.5043	0.5063	0.5083	0.5057	✓ (1.0206)	○ (0.9954)	✓ (1.0152)	○ (1.0057)	○ (0.9975)	○ (0.9898)
	1.0×10^{-3}	0.5020	0.5058	0.4999	0.5025	0.5023	0.5060	0.5065	✓ (1.0183)	○ (1.0029)	✓ (1.0269)	✓ (1.0162)	✓ (1.0168)	○ (1.0018)
	5.0×10^{-4}	0.4985	0.5036	0.4987	0.5004	0.5011	0.5035	0.5027	✓ (1.0167)	○ (0.9962)	✓ (1.0158)	○ (1.0091)	○ (1.0064)	○ (0.9966)
	2.0×10^{-4}	0.5010	0.5045	0.5004	0.5000	0.4995	0.5038	0.5015	○ (1.0023)	○ (0.9883)	○ (1.0046)	○ (1.0060)	○ (1.0080)	○ (0.9909)
	1.0×10^{-4}	0.5005	0.5023	0.5007	0.5028	0.4985	0.5029	0.5006	○ (1.0001)	○ (0.9930)	○ (0.9996)	○ (0.9911)	○ (1.0081)	○ (0.9908)
$d = 3$	1.0×10^{-2}	0.5058	0.5054	0.5060	0.5073	0.5118	0.5085	0.5073	○ (1.0060)	○ (1.0074)	○ (1.0052)	○ (1.0000)	✗ (0.9822)	○ (0.9952)
	5.0×10^{-3}	0.5006	0.5030	0.5039	0.5083	0.5065	0.5055	0.5045	✓ (1.0159)	○ (1.0061)	○ (1.0027)	✗ (0.9849)	○ (0.9922)	○ (0.9960)
	2.0×10^{-3}	0.4996	0.5016	0.5036	0.5028	0.5037	0.5028	0.5014	○ (1.0071)	○ (0.9992)	○ (0.9910)	○ (0.9944)	○ (0.9909)	○ (0.9944)
	1.0×10^{-3}	0.5010	0.5026	0.5027	0.5045	0.4997	0.5010	0.5013	○ (1.0013)	○ (0.9950)	○ (0.9945)	○ (0.9875)	○ (1.0067)	○ (1.0015)
	5.0×10^{-4}	0.5014	0.5014	0.5014	0.5020	0.5012	0.5013	0.5007	○ (0.9972)	○ (0.9972)	○ (0.9973)	○ (0.9950)	○ (0.9980)	○ (0.9977)
	2.0×10^{-4}	0.4999	0.5016	0.5025	0.5018	0.4994	0.5006	0.5017	○ (1.0074)	○ (1.0005)	○ (0.9967)	○ (0.9995)	○ (1.0095)	○ (1.0044)
	1.0×10^{-4}	0.4996	0.5008	0.5005	0.5006	0.4995	0.4987	0.4990	○ (0.9976)	○ (0.9930)	○ (0.9942)	○ (0.9937)	○ (0.9980)	○ (1.0013)
$d = 4$	1.0×10^{-2}	0.5037	0.5028	0.5053	0.5038	0.5054	0.5039	0.5048	○ (1.0044)	○ (1.0078)	○ (0.9980)	○ (1.0039)	○ (0.9975)	○ (1.0033)
	5.0×10^{-3}	0.4978	0.5001	0.5058	0.5033	0.5034	0.5012	0.5037	✓ (1.0242)	✓ (1.0145)	○ (0.9918)	○ (1.0019)	○ (1.0015)	○ (1.0100)
	2.0×10^{-3}	0.4990	0.5021	0.5050	0.5027	0.5018	0.5024	0.5035	✓ (1.0183)	○ (1.0059)	○ (0.9940)	○ (1.0035)	○ (1.0071)	○ (1.0047)
	1.0×10^{-3}	0.5001	0.5005	0.5038	0.5014	0.5020	0.5006	0.5018	○ (1.0066)	○ (1.0052)	○ (0.9917)	○ (1.0012)	○ (0.9991)	○ (1.0046)
	5.0×10^{-4}	0.5003	0.4998	0.5016	0.5012	0.5004	0.5010	0.4994	○ (0.9963)	○ (0.9981)	○ (0.9913)	○ (0.9928)	○ (0.9961)	○ (0.9937)
	2.0×10^{-4}	0.4986	0.4996	0.5042	0.5020	0.4998	0.4990	0.5011	○ (1.0104)	○ (1.0063)	○ (0.9877)	○ (0.9967)	○ (1.0054)	○ (1.0086)
	1.0×10^{-4}	0.4997	0.5005	0.5030	0.5011	0.4994	0.4991	0.4999	○ (1.0008)	○ (0.9978)	○ (0.9878)	○ (0.9955)	○ (1.0021)	○ (1.0034)
$d = 5$	1.0×10^{-2}	0.4969	0.5047	0.5058	0.5064	0.5033	0.5018	0.5061	✓ (1.0376)	○ (1.0058)	○ (1.0013)	○ (0.9991)	○ (1.0113)	✓ (1.0176)
	5.0×10^{-3}	0.4977	0.5027	0.5054	0.5047	0.5029	0.5034	0.5014	✓ (1.0149)	○ (0.9951)	✗ (0.9842)	○ (0.9871)	○ (0.9942)	○ (0.9920)
	2.0×10^{-3}	0.4990	0.5022	0.5039	0.5031	0.5002	0.5021	0.5013	○ (1.0092)	○ (0.9966)	○ (0.9899)	○ (0.9931)	○ (1.0044)	○ (0.9970)
	1.0×10^{-3}	0.4996	0.5013	0.5029	0.5044	0.5021	0.5026	0.5012	○ (1.0067)	○ (0.9999)	○ (0.9934)	○ (0.9874)	○ (0.9966)	○ (0.9944)
	5.0×10^{-4}	0.4993	0.5003	0.5009	0.5018	0.5024	0.5019	0.5010	○ (1.0065)	○ (1.0025)	○ (1.0001)	○ (0.9965)	○ (0.9943)	○ (0.9962)
	2.0×10^{-4}	0.4992	0.5018	0.5028	0.5042	0.4995	0.5000	0.5012	○ (1.0081)	○ (0.9975)	○ (0.9937)	○ (0.9880)	○ (1.0069)	○ (1.0048)
	1.0×10^{-4}	0.4989	0.5022	0.5009	0.5027	0.5010	0.4999	0.5003	○ (1.0054)	○ (0.9925)	○ (0.9976)	○ (0.9904)	○ (0.9970)	○ (1.0015)
$d = 10$	1.0×10^{-2}	0.5006	0.5016	0.5048	0.5028	0.5022	0.5038	0.4999	○ (0.9974)	○ (0.9935)	✗ (0.9809)	○ (0.9888)	○ (0.9912)	✗ (0.9848)
	5.0×10^{-3}	0.5006	0.4980	0.4997	0.4981	0.4990	0.5018	0.4982	○ (0.9902)	○ (1.0009)	○ (0.9939)	○ (1.0002)	○ (0.9967)	✗ (0.9858)
	2.0×10^{-3}	0.4999	0.5012	0.4999	0.4986	0.5008	0.5015	0.5009	○ (1.0042)	○ (0.9988)	○ (1.0039)	○ (1.0095)	○ (1.0006)	○ (0.9976)
	1.0×10^{-3}	0.4991	0.4992	0.5019	0.4986	0.5022	0.4992	0.4985	○ (0.9977)	○ (0.9973)	✗ (0.9867)	○ (0.9999)	✗ (0.9856)	○ (0.9972)
	5.0×10^{-4}	0.5000	0.5010	0.5022	0.5014	0.5019	0.4996	0.5005	○ (1.0021)	○ (0.9977)	○ (0.9930)	○ (0.9961)	○ (0.9942)	○ (1.0034)
	2.0×10^{-4}	0.5014	0.5000	0.5042	0.5022	0.5004	0.5022	0.5006	○ (0.9971)	○ (1.0023)	✗ (0.9858)	○ (0.9936)	○ (1.0007)	○ (0.9936)
	1.0×10^{-4}	0.4993	0.5016	0.5025	0.5014	0.5005	0.5029	0.5001	○ (1.0030)	○ (0.9941)	○ (0.9903)	○ (0.9947)	○ (0.9982)	○ (0.9887)

TABLE A.14

RRT VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR POINT PATTERN SIMULATIONS

Dimension (d)	Failure Rate (θ)	Methods							LSH					
		<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
$d = 1$	1.0×10^{-2}	0.4999	0.5055	0.5040	0.5036	0.5046	0.5040	0.5049	✓ (1.0201)	○ (0.9974)	○ (1.0035)	○ (1.0051)	○ (1.0009)	○ (1.0034)
	5.0×10^{-3}	0.4993	0.5036	0.5023	0.5021	0.5021	0.5050	0.5041	✓ (1.0193)	○ (1.0020)	○ (1.0071)	○ (1.0081)	○ (1.0080)	○ (0.9963)
	2.0×10^{-3}	0.5007	0.5045	0.4992	0.4994	0.5009	0.5053	0.5045	✓ (1.0149)	○ (0.9999)	✓ (1.0211)	✓ (1.0202)	✓ (1.0143)	○ (0.9967)
	1.0×10^{-3}	0.5010	0.5042	0.4987	0.5006	0.5017	0.5055	0.5065	✓ (1.0222)	○ (1.0093)	✓ (1.0317)	✓ (1.0240)	✓ (1.0193)	○ (1.0041)
	5.0×10^{-4}	0.4992	0.5042	0.4993	0.5013	0.5006	0.5048	0.5041	✓ (1.0199)	○ (0.9996)	✓ (1.0192)	○ (1.0112)	✓ (1.0141)	○ (0.9970)
	2.0×10^{-4}	0.5021	0.5048	0.4996	0.4993	0.4995	0.5064	0.5057	✓ (1.0147)	○ (1.0036)	✓ (1.0248)	✓ (1.0262)	✓ (1.0254)	○ (0.9975)
	1.0×10^{-4}	0.5005	0.5061	0.4997	0.4995	0.4988	0.5045	0.5041	✓ (1.0143)	○ (0.9919)	✓ (1.0178)	✓ (1.0186)	✓ (1.0213)	○ (0.9983)
$d = 2$	1.0×10^{-2}	0.0002	0.4987	0.4994	0.4996	0.4995	0.5004	0.4991	○ (1.0012)	○ (1.0014)	○ (0.9987)	○ (0.9978)	○ (0.9985)	○ (0.9946)
	5.0×10^{-3}	0.0002	0.4983	0.4988	0.4981	0.4999	0.4993	0.4999	○ (1.0079)	○ (1.0064)	○ (1.0045)	○ (1.0073)	○ (0.9998)	○ (1.0022)
	2.0×10^{-3}	0.0002	0.5013	0.4967	0.4973	0.5019	0.5008	0.5027	○ (1.0126)	○ (1.0057)	✓ (1.0242)	✓ (1.0219)	○ (1.0031)	○ (1.0075)
	1.0×10^{-3}	0.0002	0.5041	0.4971	0.4997	0.5003	0.5049	0.5043	✓ (1.0200)	○ (1.0009)	✓ (1.0291)	✓ (1.0186)	✓ (1.0163)	○ (0.9976)
	5.0×10^{-4}	0.0002	0.5039	0.4978	0.4982	0.5019	0.5047	0.5038	✓ (1.0143)	○ (0.9998)	✓ (1.0243)	✓ (1.0227)	○ (1.0076)	○ (0.9965)
	2.0×10^{-4}	0.0002	0.5042	0.4996	0.4988	0.5001	0.5020	0.5040	○ (1.0110)	○ (0.9991)	✓ (1.0174)	✓ (1.0207)	✓ (1.0157)	○ (1.0079)
	1.0×10^{-4}	0.0002	0.5040	0.4982	0.5000	0.5010	0.5053	0.5058	✓ (1.0236)	○ (1.0074)	✓ (1.0307)	✓ (1.0233)	✓ (1.0195)	○ (1.0019)
$d = 3$	1.0×10^{-2}	0.4987	0.4859	0.4817	0.4841	0.4825	0.4844	0.4840	✗ (0.9428)	○ (0.9922)	○ (1.0091)	○ (0.9997)	○ (1.0061)	○ (0.9986)
	5.0×10^{-3}	0.4990	0.4859	0.4833	0.4846	0.4844	0.4853	0.4890	✗ (0.9605)	○ (1.0124)	✓ (1.0228)	✓ (1.0177)	✓ (1.0186)	✓ (1.0148)
	2.0×10^{-3}	0.4999	0.4922	0.4858	0.4873	0.4921	0.4926	0.4929	✗ (0.9725)	○ (1.0032)	✓ (1.0289)	✓ (1.0229)	○ (1.0035)	○ (1.0012)
	1.0×10^{-3}	0.5011	0.4942	0.4896	0.4909	0.4964	0.4946	0.4959	✗ (0.9795)	○ (1.0068)	✓ (1.0257)	✓ (1.0204)	○ (0.9983)	○ (1.0054)
	5.0×10^{-4}	0.5002	0.4959	0.4915	0.4906	0.4961	0.4955	0.4982	○ (0.9919)	○ (1.0092)	✓ (1.0272)	✓ (1.0309)	○ (1.0085)	○ (1.0110)
	2.0×10^{-4}	0.5010	0.4975	0.4935	0.4952	0.5001	0.4975	0.4997	○ (0.9950)	○ (1.0090)	✓ (1.0254)	✓ (1.0181)	○ (0.9984)	○ (1.0090)
	1.0×10^{-4}	0.4989	0.4996	0.4941	0.4950	0.4997	0.4988	0.5014	○ (1.0101)	○ (1.0069)	✓ (1.0293)	✓ (1.0259)	○ (1.0069)	○ (1.0102)
$d = 4$	1.0×10^{-2}	0.4981	0.4643	0.4694	0.4716	0.4702	0.4641	0.4652	✗ (0.8765)	○ (1.0037)	✗ (0.9832)	✗ (0.9746)	✗ (0.9801)	○ (1.0046)
	5.0×10^{-3}	0.4978	0.4683	0.4696	0.4707	0.4702	0.4728	0.4750	✗ (0.9128)	✓ (1.0271)	✓ (1.0219)	✓ (1.0173)	✓ (1.0193)	○ (1.0090)
	2.0×10^{-3}	0.4975	0.4755	0.4741	0.4750	0.4766	0.4765	0.4822	✗ (0.9407)	✓ (1.0272)	✓ (1.0330)	✓ (1.0290)	✓ (1.0227)	✓ (1.0231)
	1.0×10^{-3}	0.4991	0.4802	0.4778	0.4773	0.4790	0.4811	0.4872	✗ (0.9535)	✓ (1.0286)	✓ (1.0383)	✓ (1.0405)	✓ (1.0333)	✓ (1.0245)
	5.0×10^{-4}	0.4991	0.4810	0.4791	0.4789	0.4853	0.4864	0.4914	✗ (0.9696)	✓ (1.0424)	✓ (1.0503)	✓ (1.0514)	✓ (1.0248)	✓ (1.0203)
	2.0×10^{-4}	0.4987	0.4864	0.4831	0.4829	0.4896	0.4894	0.4937	✗ (0.9802)	✓ (1.0298)	✓ (1.0435)	✓ (1.0440)	✓ (1.0165)	✓ (1.0175)
	1.0×10^{-4}	0.4988	0.4897	0.4855	0.4852	0.4934	0.4892	0.4994	○ (1.0021)	✓ (1.0394)	✓ (1.0570)	✓ (1.0584)	✓ (1.0240)	✓ (1.0415)
$d = 5$	1.0×10^{-2}	0.5014	0.4599	0.4627	0.4556	0.4568	0.4631	0.4545	✗ (0.8284)	✗ (0.9785)	✗ (0.9673)	○ (0.9954)	○ (0.9908)	✗ (0.9659)
	5.0×10^{-3}	0.4983	0.4584	0.4593	0.4545	0.4579	0.4618	0.4642	✗ (0.8723)	✓ (1.0235)	✓ (1.0197)	✓ (1.0400)	✓ (1.0257)	○ (1.0096)
	2.0×10^{-3}	0.4964	0.4608	0.4620	0.4596	0.4639	0.4666	0.4757	✗ (0.9207)	✓ (1.0620)	✓ (1.0568)	✓ (1.0668)	✓ (1.0487)	✓ (1.0373)
	1.0×10^{-3}	0.4978	0.4651	0.4634	0.4613	0.4677	0.4698	0.4828	✗ (0.9418)	✓ (1.0735)	✓ (1.0811)	✓ (1.0902)	✓ (1.0623)	✓ (1.0536)
	5.0×10^{-4}	0.4998	0.4676	0.4668	0.4661	0.4695	0.4729	0.4871	✗ (0.9506)	✓ (1.0814)	✓ (1.0851)	✓ (1.0881)	✓ (1.0733)	✓ (1.0589)
	2.0×10^{-4}	0.5012	0.4728	0.4720	0.4706	0.4747	0.4786	0.4899	✗ (0.9556)	✓ (1.0707)	✓ (1.0744)	✓ (1.0806)	✓ (1.0630)	✓ (1.0462)
	1.0×10^{-4}	0.4983	0.4773	0.4744	0.4731	0.4818	0.4807	0.4946	✗ (0.9853)	✓ (1.0716)	✓ (1.0842)	✓ (1.0899)	✓ (1.0526)	✓ (1.0571)
$d = 10$	1.0×10^{-2}	0.4993	0.4560	0.4739	0.4787	0.4718	0.4699	0.4628	✗ (0.8641)	✓ (1.0278)	✗ (0.9564)	✗ (0.9381)	✗ (0.9645)	✗ (0.9718)
	5.0×10^{-3}	0.5062	0.4495	0.4607	0.4637	0.4558	0.4617	0.4617	✗ (0.8368)	✓ (1.0505)	○ (1.0041)	○ (0.9920)	✓ (1.0240)	○ (1.0001)
	2.0×10^{-3}	0.5001	0.4416	0.4574	0.4542	0.4477	0.4518	0.4678	✗ (0.8785)	✓ (1.1116)	✓ (1.0428)	✓ (1.0562)	✓ (1.0844)	✓ (1.0664)
	1.0×10^{-3}	0.5013	0.4380	0.4457	0.4475	0.4373	0.4454	0.4723	✗ (0.8906)	✓ (1.1483)	✓ (1.1129)	✓ (1.1052)	✓ (1.1517)	✓ (1.1144)
	5.0×10^{-4}	0.5011	0.4346	0.4435	0.4455	0.4324	0.4435	0.4768	✗ (0.9077)	✓ (1.1857)	✓ (1.1438)	✓ (1.1343)	✓ (1.1964)	✓ (1.1439)
	2.0×10^{-4}	0.5015	0.4326	0.4447	0.4454	0.4343	0.4481	0.4829	✗ (0.9283)	✓ (1.2245)	✓ (1.1662)	✓ (1.1626)	✓ (1.2162)	✓ (1.1502)
	1.0×10^{-4}	0.5010	0.4323	0.4435	0.4457	0.4327	0.4566	0.4870	✗ (0.9457)	✓ (1.2465)	✓ (1.1913)	✓ (1.1808)	✓ (1.2446)	✓ (1.1299)

TABLE A.15

FSCS VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR REAL-LIFE PROGRAMS

Test Set Size ($ T $)	Methods							LSH					
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>DF</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>DF</i>	vs. <i>KD</i>
2	0.0022	0.0028	0.0027	0.0026	0.0025	0.0026	0.0026	✓ (1.1661)	✗ (0.9323)	✗ (0.9477)	○ (0.9914)	✓ (1.0453)	○ (0.9779)
4	0.0048	0.0058	0.0055	0.0053	0.0053	0.0055	0.0054	✓ (1.1196)	✗ (0.9288)	✗ (0.9746)	✓ (1.0216)	✓ (1.0242)	✗ (0.9790)
6	0.0072	0.0082	0.0083	0.0082	0.0081	0.0081	0.0079	✓ (1.1081)	✗ (0.9615)	✗ (0.9563)	✗ (0.9650)	✗ (0.9792)	✗ (0.9824)
8	0.0094	0.0110	0.0109	0.0109	0.0108	0.0107	0.0105	✓ (1.1128)	✗ (0.9470)	✗ (0.9558)	✗ (0.9603)	✗ (0.9707)	✗ (0.9736)
10	0.0116	0.0135	0.0137	0.0133	0.0133	0.0132	0.0129	✓ (1.1129)	✗ (0.9550)	✗ (0.9429)	✗ (0.9732)	✗ (0.9733)	✗ (0.9773)
15	0.0169	0.0195	0.0196	0.0193	0.0194	0.0192	0.0188	✓ (1.1128)	✗ (0.9637)	✗ (0.9598)	✗ (0.9745)	✗ (0.9708)	✗ (0.9786)
20	0.0221	0.0255	0.0257	0.0252	0.0254	0.0252	0.0247	✓ (1.1188)	✗ (0.9682)	✗ (0.9606)	✗ (0.9795)	✗ (0.9736)	✗ (0.9816)
25	0.0274	0.0311	0.0314	0.0312	0.0310	0.0309	0.0304	✓ (1.1156)	✗ (0.9783)	✗ (0.9675)	✗ (0.9761)	✗ (0.9829)	✗ (0.9861)
30	0.0328	0.0367	0.0368	0.0368	0.0367	0.0364	0.0360	✓ (1.1017)	✗ (0.9807)	✗ (0.9778)	✗ (0.9770)	✗ (0.9807)	✗ (0.9885)
35	0.0378	0.0423	0.0423	0.0423	0.0422	0.0422	0.0421	✓ (1.1173)	○ (0.9945)	○ (0.9956)	○ (0.9937)	○ (0.9970)	○ (0.9981)
40	0.0426	0.0477	0.0478	0.0478	0.0479	0.0476	0.0476	✓ (1.1235)	○ (0.9993)	○ (0.9961)	○ (0.9959)	✗ (0.9937)	○ (1.0013)
45	0.0474	0.0529	0.0528	0.0529	0.0532	0.0526	0.0532	✓ (1.1305)	○ (1.0058)	✓ (1.0083)	○ (1.0059)	○ (1.0014)	✓ (1.0131)
50	0.0523	0.0581	0.0580	0.0580	0.0582	0.0579	0.0582	✓ (1.1212)	○ (1.0021)	○ (1.0047)	○ (1.0044)	○ (1.0013)	✓ (1.0069)
55	0.0571	0.0630	0.0632	0.0632	0.0635	0.0630	0.0631	✓ (1.1139)	○ (1.0026)	○ (0.9984)	○ (0.9999)	○ (0.9946)	○ (1.0024)
60	0.0614	0.0680	0.0681	0.0679	0.0683	0.0682	0.0681	✓ (1.1170)	○ (1.0019)	○ (1.0010)	○ (1.0029)	○ (0.9971)	○ (0.9988)
65	0.0659	0.0727	0.0727	0.0728	0.0730	0.0729	0.0731	✓ (1.1189)	✓ (1.0064)	✓ (1.0061)	○ (1.0046)	○ (1.0018)	○ (1.0032)
70	0.0702	0.0775	0.0775	0.0777	0.0778	0.0778	0.0777	✓ (1.1171)	○ (1.0038)	○ (1.0028)	○ (1.0000)	○ (0.9987)	○ (0.9993)
75	0.0745	0.0823	0.0819	0.0827	0.0823	0.0825	0.0824	✓ (1.1166)	○ (1.0009)	✓ (1.0067)	○ (0.9969)	○ (1.0012)	○ (0.9993)
80	0.0787	0.0866	0.0866	0.0872	0.0868	0.0869	0.0869	✓ (1.1134)	○ (1.0032)	○ (1.0037)	○ (0.9965)	○ (1.0010)	○ (0.9998)
85	0.0828	0.0914	0.0911	0.0918	0.0912	0.0913	0.0914	✓ (1.1138)	○ (1.0004)	○ (1.0035)	○ (0.9955)	○ (1.0026)	○ (1.0018)
90	0.0868	0.0960	0.0958	0.0961	0.0957	0.0955	0.0957	✓ (1.1133)	○ (0.9970)	○ (0.9995)	○ (0.9963)	○ (1.0001)	○ (1.0031)
95	0.0909	0.1002	0.1002	0.1003	0.1001	0.0995	0.1001	✓ (1.1127)	○ (0.9985)	○ (0.9990)	○ (0.9980)	○ (1.0002)	✓ (1.0072)
100	0.0946	0.1045	0.1045	0.1045	0.1043	0.1038	0.1044	✓ (1.1151)	○ (0.9982)	○ (0.9988)	○ (0.9982)	○ (1.0010)	✓ (1.0058)

TABLE A.16
RRT VERSION: MEAN P-MEASURE RESULTS AND STATISTICAL PAIRWISE COMPARISONS OF LSH AGAINST OTHER METHODS FOR REAL-LIFE PROGRAMS

Test Set Size ($ T $)	Methods							LSH						
	RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD	
2	0.0022	0.0022	0.0024	0.0022	0.0024	0.0025	0.0023	✓ (1.0304)	✓ (1.0450)	✗ (0.9718)	✓ (1.0369)	✗ (0.9646)	✗ (0.9165)	
4	0.0048	0.0046	0.0048	0.0046	0.0047	0.0051	0.0047	✗ (0.9780)	○ (1.0186)	○ (0.9880)	✓ (1.0260)	○ (1.0139)	✗ (0.9344)	
6	0.0072	0.0070	0.0071	0.0071	0.0071	0.0075	0.0071	○ (0.9851)	○ (1.0111)	○ (0.9886)	○ (0.9925)	○ (0.9999)	✗ (0.9433)	
8	0.0094	0.0095	0.0094	0.0095	0.0094	0.0098	0.0095	○ (1.0097)	○ (1.0007)	○ (1.0055)	○ (1.0012)	○ (1.0112)	✗ (0.9642)	
10	0.0116	0.0117	0.0119	0.0118	0.0117	0.0122	0.0119	✓ (1.0284)	✓ (1.0168)	○ (1.0039)	✓ (1.0153)	✓ (1.0197)	✗ (0.9823)	
15	0.0169	0.0174	0.0176	0.0175	0.0179	0.0178	0.0176	✓ (1.0425)	✓ (1.0131)	○ (1.0005)	○ (1.0087)	✗ (0.9874)	○ (0.9915)	
20	0.0221	0.0230	0.0232	0.0230	0.0235	0.0235	0.0232	✓ (1.0492)	○ (1.0084)	○ (1.0015)	○ (1.0076)	✗ (0.9857)	✗ (0.9879)	
25	0.0274	0.0285	0.0287	0.0287	0.0291	0.0291	0.0290	✓ (1.0615)	✓ (1.0201)	✓ (1.0114)	✓ (1.0110)	○ (0.9952)	○ (0.9973)	
30	0.0328	0.0340	0.0338	0.0339	0.0344	0.0347	0.0343	✓ (1.0479)	✓ (1.0090)	✓ (1.0147)	✓ (1.0118)	○ (0.9960)	✗ (0.9870)	
35	0.0378	0.0395	0.0391	0.0393	0.0396	0.0398	0.0398	✓ (1.0540)	✓ (1.0087)	✓ (1.0176)	✓ (1.0134)	○ (1.0045)	○ (1.0001)	
40	0.0426	0.0445	0.0443	0.0446	0.0448	0.0445	0.0452	✓ (1.0628)	✓ (1.0153)	✓ (1.0201)	✓ (1.0137)	✓ (1.0087)	✓ (1.0145)	
45	0.0474	0.0494	0.0492	0.0495	0.0501	0.0497	0.0503	✓ (1.0652)	✓ (1.0191)	✓ (1.0237)	✓ (1.0170)	○ (1.0054)	✓ (1.0138)	
50	0.0523	0.0545	0.0541	0.0544	0.0551	0.0548	0.0553	✓ (1.0620)	✓ (1.0157)	✓ (1.0249)	✓ (1.0171)	○ (1.0046)	✓ (1.0104)	
55	0.0571	0.0594	0.0587	0.0592	0.0599	0.0597	0.0601	✓ (1.0565)	✓ (1.0125)	✓ (1.0256)	✓ (1.0159)	○ (1.0032)	✓ (1.0061)	
60	0.0614	0.0643	0.0636	0.0639	0.0644	0.0644	0.0653	✓ (1.0668)	✓ (1.0163)	✓ (1.0288)	✓ (1.0223)	✓ (1.0135)	✓ (1.0149)	
65	0.0659	0.0688	0.0681	0.0687	0.0691	0.0689	0.0700	✓ (1.0678)	✓ (1.0185)	✓ (1.0295)	✓ (1.0203)	✓ (1.0141)	✓ (1.0175)	
70	0.0702	0.0736	0.0729	0.0734	0.0735	0.0735	0.0746	✓ (1.0691)	✓ (1.0156)	✓ (1.0258)	✓ (1.0182)	✓ (1.0171)	✓ (1.0171)	
75	0.0745	0.0779	0.0773	0.0779	0.0780	0.0781	0.0790	✓ (1.0668)	✓ (1.0161)	✓ (1.0238)	✓ (1.0153)	✓ (1.0140)	✓ (1.0127)	
80	0.0787	0.0822	0.0818	0.0822	0.0823	0.0825	0.0834	✓ (1.0649)	✓ (1.0158)	✓ (1.0221)	✓ (1.0159)	✓ (1.0149)	✓ (1.0125)	
85	0.0828	0.0866	0.0859	0.0865	0.0864	0.0868	0.0878	✓ (1.0661)	✓ (1.0153)	✓ (1.0246)	✓ (1.0173)	✓ (1.0184)	✓ (1.0133)	
90	0.0868	0.0908	0.0905	0.0906	0.0905	0.0912	0.0918	✓ (1.0628)	✓ (1.0124)	✓ (1.0160)	✓ (1.0141)	✓ (1.0154)	✓ (1.0074)	
95	0.0909	0.0949	0.0946	0.0947	0.0948	0.0953	0.0960	✓ (1.0627)	✓ (1.0133)	✓ (1.0170)	✓ (1.0154)	✓ (1.0149)	✓ (1.0088)	
100	0.0946	0.0991	0.0985	0.0986	0.0988	0.0994	0.1000	✓ (1.0631)	✓ (1.0104)	✓ (1.0169)	✓ (1.0155)	✓ (1.0135)	✓ (1.0062)	

C. Test Case Generation Time Results

Table A.17 presents the test-case generation time for each dimension, when the number of test cases, n , was fixed at four representative values: 500; 1000; 5000; and 10,000.

TABLE A.17
TEST-CASE GENERATION TIME (MS) FOR VARIOUS INPUT DOMAIN DIMENSIONS

No. of Test Cases (n)	Dimension (d)	RT	FSCS							RRT					
			ART	RF	CR	DF	KD	LSH		ART	RF	CR	DF	KD	LSH
500	1	0.04	5.89	1.62	1.55	4.41	1.74	3.27		1.22	0.35	0.30	1.02	0.75	0.59
	2	0.07	118.05	26.20	26.13	22.52	4.41	15.62		20.32	4.39	4.45	6.56	1.27	3.05
	3	0.07	115.62	26.76	26.64	49.46	8.84	16.13		18.33	4.02	4.02	11.71	1.98	2.64
	4	0.08	117.85	27.66	27.43	118.91	16.55	16.65		16.68	3.80	3.75	16.69	2.85	2.44
	5	0.11	118.55	28.35	28.05	242.99	27.43	17.04		15.69	3.57	3.58	29.78	4.40	2.33
	10	0.21	129.15	31.23	30.84	25,482.86	123.89	19.43		13.80	3.33	3.31	3309.81	14.79	2.25
1000	1	0.08	23.75	3.41	3.25	9.36	3.99	5.49		4.96	0.64	0.60	2.13	1.66	1.27
	2	0.12	462.69	54.03	53.86	49.32	9.80	30.87		82.59	9.04	9.16	12.65	2.72	5.97
	3	0.13	465.75	55.16	54.93	124.10	19.98	31.61		74.31	8.26	8.28	28.74	4.45	5.04
	4	0.15	479.44	56.91	56.51	260.46	39.14	32.59		68.33	7.74	7.73	45.98	6.62	4.63
	5	0.18	488.80	58.24	57.87	559.45	69.31	33.65		63.83	7.31	7.35	70.79	10.90	4.40
	10	0.42	545.25	63.94	63.32	54,028.88	397.38	39.01		54.92	6.75	6.77	6716.84	49.40	4.29
5000	1	0.35	867.52	16.52	16.54	54.97	29.18	28.80		169.22	3.22	3.05	23.09	11.74	8.31
	2	0.47	12,437.34	277.16	275.27	303.39	70.78	161.78		2075.89	45.75	45.83	88.53	17.84	30.39
	3	0.62	12,490.50	281.77	280.80	720.40	143.25	160.99		1903.45	41.80	41.93	214.44	30.14	24.59
	4	0.75	12,944.05	290.88	289.74	1872.55	290.50	167.54		1775.23	39.14	39.04	433.19	48.46	22.01
	5	0.91	13,100.93	296.88	295.74	4258.27	525.25	176.16		1659.43	37.08	37.34	737.68	92.98	20.97
	10	1.79	14,525.07	324.36	322.69	285,124.95	3484.91	212.26		1397.30	34.26	34.33	35,368.72	459.43	20.94
10000	1	0.63	3593.18	32.95	33.42	134.68	73.41	66.61		736.22	6.41	6.17	78.77	29.34	19.25
	2	0.90	52,621.16	553.44	551.72	699.51	171.08	336.49		8479.74	92.76	91.60	233.49	42.51	63.81
	3	1.20	53,710.08	563.62	563.07	1760.79	332.75	329.19		7833.07	84.76	84.40	470.63	74.43	50.37
	4	1.48	53,969.25	581.25	579.64	4280.44	684.20	343.00		7327.47	79.26	77.93	1050.82	127.29	44.29
	5	1.77	53,092.07	593.57	592.32	9948.03	1255.29	360.86		6852.10	75.10	74.75	2199.77	236.66	41.94
	10	3.58	64,604.96	653.26	650.55	580,503.85	9034.07	453.11		5784.59	69.22	68.67	73,111.90	1209.26	42.91

D. F-time Results

Tables A.18 and A.19 present the F-time results for the 23 subject programs.

TABLE A.18
FSCS VERSION: MEAN F-TIME RESULTS (MS) AND STATISTICAL PAIRWISE COMPARISONS OF LSH-FSCS AGAINST OTHER METHODS FOR REAL-LIFE PROGRAMS

ID	Program	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
P1	airy	0.44	23.93	4.02	4.07	10.54	7.17	3.44	✖ (0.08)	✓ (0.74)	○ (0.49)	○ (0.50)	✓ (0.81)	✓ (0.70)
P2	bessj0	0.21	6.95	2.11	2.06	5.82	3.70	1.94	✖ (0.10)	✓ (0.64)	✖ (0.47)	✖ (0.46)	✓ (0.79)	✓ (0.67)
P3	erfcc	0.62	43.85	5.60	5.58	13.81	10.00	4.50	✖ (0.09)	✓ (0.77)	○ (0.51)	○ (0.51)	✓ (0.81)	✓ (0.71)
P4	probks	22.67	109.97	29.00	30.52	32.35	26.85	19.31	○ (0.49)	✓ (0.74)	✓ (0.56)	✓ (0.58)	✓ (0.67)	✓ (0.60)
P5	tanh	0.13	3.08	1.52	1.46	3.92	2.41	1.47	✖ (0.10)	✓ (0.57)	✖ (0.45)	✖ (0.45)	✓ (0.78)	✓ (0.62)
P6	bessj	0.94	77.80	12.63	12.13	23.95	5.37	8.90	✖ (0.12)	✓ (0.70)	✓ (0.57)	✓ (0.57)	✓ (0.71)	✖ (0.38)
P7	gammq	0.61	579.62	26.12	25.36	51.45	14.57	23.25	✖ (0.05)	✓ (0.78)	✓ (0.54)	✓ (0.53)	✓ (0.67)	✖ (0.38)
P8	sncndn	0.31	182.50	15.21	14.99	27.30	8.53	11.10	✖ (0.06)	✓ (0.73)	✓ (0.57)	✓ (0.56)	✓ (0.69)	✖ (0.42)
P9	golden	4.48	1864.62	52.79	49.90	231.22	50.80	41.66	✖ (0.11)	✓ (0.82)	✓ (0.56)	✓ (0.55)	✓ (0.81)	✓ (0.52)
P10	plgndr	12.49	1388.90	34.51	34.64	186.38	31.27	46.68	✖ (0.26)	✓ (0.77)	✖ (0.44)	✖ (0.44)	✓ (0.74)	✖ (0.41)
P11	cel	1.09	1453.20	62.92	60.82	561.43	33.79	38.11	✖ (0.03)	✓ (0.82)	✓ (0.63)	✓ (0.62)	✓ (0.91)	✖ (0.44)
P12	el2	0.87	281.63	21.79	21.87	153.01	28.47	16.78	✖ (0.07)	✓ (0.72)	✓ (0.56)	✓ (0.56)	✓ (0.86)	✓ (0.59)
P13	calDay	3.35	992.78	51.85	52.53	632.28	50.93	36.99	✖ (0.10)	✓ (0.77)	✓ (0.60)	✓ (0.60)	✓ (0.92)	○ (0.51)
P14	complex	0.71	919.45	44.08	44.09	1293.19	141.18	32.70	✖ (0.03)	✓ (0.78)	✓ (0.58)	✓ (0.58)	✓ (0.96)	✓ (0.73)
P15	pntLinePos	0.40	1389.30	55.30	57.68	1828.03	184.45	39.33	✖ (0.02)	✓ (0.79)	✓ (0.58)	✓ (0.59)	✓ (0.96)	✓ (0.74)
P16	triangle	0.30	1236.02	49.31	47.38	1511.93	174.42	37.09	✖ (0.01)	✓ (0.79)	✓ (0.57)	✓ (0.57)	✓ (0.96)	✓ (0.74)
P17	line	0.87	8983.43	143.61	138.00	26,233.93	1175.99	112.20	✖ (0.01)	✓ (0.85)	✓ (0.57)	✓ (0.56)	✓ (0.99)	✓ (0.85)
P18	pntTrianglePos	1.90	31,000.93	227.43	233.69	51,183.37	2254.26	183.23	✖ (0.01)	✓ (0.89)	✓ (0.57)	✓ (0.57)	✓ (0.99)	✓ (0.87)
P19	twoLinePos	1.89	68,651.27	404.30	405.69	86,900.29	3799.22	289.96	✖ (0.01)	✓ (0.91)	✓ (0.59)	✓ (0.59)	✓ (0.99)	✓ (0.89)
P20	calGCD	0.98	712.46	46.90	47.49	51,723.98	465.63	36.47	✖ (0.03)	✓ (0.74)	✓ (0.56)	✓ (0.57)	✓ (1.00)	✓ (0.79)
P21	nearestDistance	2.63	955.16	51.79	51.84	64,057.85	507.92	44.52	✖ (0.08)	✓ (0.74)	✓ (0.54)	✓ (0.54)	✓ (1.00)	✓ (0.80)
P22	select	3.38	5852.98	132.51	128.42	423,722.92	1967.47	111.40	✖ (0.04)	✓ (0.84)	✓ (0.56)	✓ (0.55)	✓ (1.00)	✓ (0.86)
P23	tcas	0.86	6076.567	99.64	100.31	897,880.01	81.53	93.40	✖ (0.02)	✓ (0.81)	✓ (0.54)	✓ (0.54)	✓ (1.00)	✖ (0.43)

TABLE A.19
RRT VERSION: MEAN F-TIME RESULTS (MS) AND STATISTICAL PAIRWISE COMPARISONS OF LSH-RRT AGAINST OTHER METHODS FOR REAL-LIFE PROGRAMS

ID	Program	Methods							LSH					
		RT	ART	RF	CR	DF	KD	LSH	vs. RT	vs. ART	vs. RF	vs. CR	vs. DF	vs. KD
P1	airy	0.44	6.59	1.29	1.20	4.97	2.05	1.19	✖ (0.29)	✓ (0.70)	○ (0.50)	○ (0.49)	✓ (0.74)	✓ (0.64)
P2	bessj0	0.21	1.75	0.66	0.58	2.11	1.01	0.63	✖ (0.34)	✓ (0.61)	○ (0.51)	○ (0.49)	✓ (0.73)	✓ (0.61)
P3	erfcc	0.62	11.15	1.77	1.69	7.56	2.73	1.68	✖ (0.28)	✓ (0.72)	○ (0.50)	○ (0.48)	✓ (0.74)	✓ (0.63)
P4	probks	22.67	36.89	24.54	24.16	34.68	17.18	15.35	✓ (0.57)	✓ (0.63)	✓ (0.59)	✓ (0.59)	✓ (0.64)	✓ (0.54)
P5	tanh	0.13	0.89	0.45	0.42	1.52	0.70	0.39	✖ (0.38)	✓ (0.59)	✓ (0.52)	○ (0.51)	✓ (0.74)	✓ (0.61)
P6	bessj	0.94	20.62	3.18	3.10	7.40	1.84	2.33	✖ (0.30)	✓ (0.73)	✓ (0.57)	✓ (0.56)	✓ (0.74)	✖ (0.44)
P7	gammq	0.61	89.00	5.14	4.92	12.48	3.51	4.49	✖ (0.16)	✓ (0.77)	✓ (0.55)	✓ (0.53)	✓ (0.72)	✖ (0.44)
P8	sncndn	0.31	33.96	2.96	2.93	7.18	2.12	2.31	✖ (0.18)	✓ (0.75)	✓ (0.55)	✓ (0.55)	✓ (0.76)	✖ (0.47)
P9	golden	4.48	267.79	13.23	12.55	65.64	13.99	10.12	✖ (0.32)	✓ (0.80)	✓ (0.57)	✓ (0.56)	✓ (0.83)	✓ (0.56)
P10	plgndr	12.49	268.46	19.33	19.09	69.32	14.42	16.26	✖ (0.44)	✓ (0.79)	✓ (0.54)	✓ (0.55)	✓ (0.77)	✖ (0.47)
P11	cel	1.09	425.76	10.63	10.43	169.24	9.83	8.93	✖ (0.13)	✓ (0.85)	✓ (0.55)	✓ (0.54)	✓ (0.90)	○ (0.50)
P12	el2	0.87	94.22	5.56	5.39	73.16	8.29	4.76	✖ (0.18)	✓ (0.78)	✓ (0.55)	✓ (0.54)	✓ (0.89)	✓ (0.60)
P13	calDay	3.35	183.02	9.51	9.28	130.42	11.38	7.75	✖ (0.31)	✓ (0.79)	✓ (0.55)	✓ (0.55)	✓ (0.91)	✓ (0.54)
P14	complex	0.71	99.90	5.83	5.82	201.98	19.23	3.82	✖ (0.17)	✓ (0.80)	✓ (0.60)	✓ (0.61)	✓ (0.97)	✓ (0.74)
P15	pntLinePos	0.40	155.23	6.80	6.79	264.39	24.73	3.93	✖ (0.12)	✓ (0.83)	✓ (0.63)	✓ (0.63)	✓ (0.98)	✓ (0.79)
P16	triangle	0.30	152.99	6.65	6.58	247.65	24.33	4.13	✖ (0.11)	✓ (0.82)	✓ (0.62)	✓ (0.61)	✓ (0.98)	✓ (0.78)
P17	line	0.87	866.60	18.02	18.26	3825.61	146.36	10.38	✖ (0.09)	✓ (0.87)	✓ (0.64)	✓ (0.64)	✓ (1.00)	✓ (0.87)
P18	pntTrianglePos	1.90	3808.69	32.86	32.94	8635.47	292.00	19.40	✖ (0.09)	✓ (0.90)	✓ (0.64)	✓ (0.63)	✓ (1.00)	✓ (0.88)
P19	twoLinePos	1.89	5063.62	42.55	42.53	10,752.27	408.21	23.72	✖ (0.08)	✓ (0.91)	✓ (0.65)	✓ (0.65)	✓ (1.00)	✓ (0.90)
P20	calGCD	0.98	86.21	7.28	7.60	6651.21	67.77	5.44	✖ (0.14)	✓ (0.76)	✓ (0.56)	✓ (0.58)	✓ (1.00)	✓ (0.79)
P21	nearestDistance	2.63	279.36	9.85	9.51	11,885.06	116.52	6.61	✖ (0.33)	✓ (0.84)	✓ (0.59)	✓ (0.59)	✓ (1.00)	✓ (0.86)
P22	select	3.38	812.52	18.36	18.66	54,539.72	279.17	13.91	✖ (0.20)	✓ (0.85)	✓ (0.57)	✓ (0.57)	✓ (1.00)	✓ (0.87)
P23	tcas	0.86	281.82	11.71	11.75	76,311.26	7.27	8.11	✖ (0.12)	✓ (0.82)	✓ (0.59)	✓ (0.59)	✓ (1.00)	✖ (0.44)

B DETAILED EXPERIMENT RESULTS FOR NON-NUMERICAL INPUT DOMAINS

Tables B.1 to B.6 show the mean number of test cases required to identify each fault in the three configurable SUTs — the $F^{f,x}$ -measure of BUSYBOX, LINUX KERNEL, and DRUPAL.

TABLE B.1
FSCS VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM DRUPAL

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	4.0630	2.6957	2.6987	2.7120	2.7667	2.7713	✓ (0.58)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.2	4.0983	3.0850	3.0617	3.2053	3.2220	3.1693	✓ (0.55)	○ (0.49)	○ (0.48)	○ (0.50)	○ (0.51)
f.3	4.0723	3.1357	3.1010	3.1890	3.1040	3.1457	✓ (0.55)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.4	4.0557	3.3333	3.3960	3.3847	3.4353	3.3833	✓ (0.53)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.5	4.0497	3.0613	3.1570	3.1957	3.1107	3.1483	✓ (0.55)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.50)
f.6	3.9743	3.2927	3.3377	3.4180	3.4183	3.4160	✓ (0.53)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.7	4.0497	3.0613	3.1570	3.1957	3.1107	3.1483	✓ (0.55)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.50)
f.8	4.0270	3.0083	2.9413	3.0773	2.9620	2.9900	✓ (0.56)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.9	4.0630	2.6957	2.6987	2.7120	2.7667	2.7713	✓ (0.58)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.10	4.1370	2.7163	2.7347	2.7613	2.7233	2.7287	✓ (0.60)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.11	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.12	16.2290	6.6070	6.5600	7.2170	6.6417	6.8843	✓ (0.70)	✖ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.13	4.0657	2.5013	2.4903	2.5433	2.5330	2.5297	✓ (0.62)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.14	4.0630	2.6957	2.6987	2.7120	2.7667	2.7713	✓ (0.58)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.15	4.0630	2.6957	2.6987	2.7120	2.7667	2.7713	✓ (0.58)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.16	8.0583	4.5690	4.4783	4.7090	4.5417	4.5320	✓ (0.64)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.17	4.0630	2.6957	2.6987	2.7120	2.7667	2.7713	✓ (0.58)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.18	4.0657	2.5013	2.4903	2.5433	2.5330	2.5297	✓ (0.62)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.19	16.3370	9.0363	8.5657	9.4570	9.1943	8.8843	✓ (0.64)	○ (0.50)	✖ (0.48)	○ (0.51)	○ (0.51)
f.20	8.1540	4.3750	4.3033	4.4977	4.4577	4.3787	✓ (0.64)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.21	16.3347	6.7700	6.7750	6.9550	6.6573	6.6327	✓ (0.71)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.22	31.9553	13.6223	13.5813	14.6383	13.5773	13.6597	✓ (0.70)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.50)
f.23	16.3347	6.7700	6.7750	6.9550	6.6573	6.6327	✓ (0.71)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.24	64.7450	27.7430	28.1590	31.4433	27.7650	27.7033	✓ (0.70)	○ (0.50)	○ (0.51)	✓ (0.53)	○ (0.50)
f.25	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.26	8.0543	3.6283	3.6613	3.7900	3.6247	3.6393	✓ (0.69)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.27	8.2147	4.6543	4.7173	4.9003	4.7653	4.8670	✓ (0.62)	○ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.28	8.2147	4.6543	4.7173	4.9003	4.7653	4.8670	✓ (0.62)	○ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.29	4.0340	3.1513	3.1490	3.2067	3.1343	3.1893	✓ (0.55)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.30	4.0340	3.1513	3.1490	3.2067	3.1343	3.1893	✓ (0.55)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.31	7.9517	6.0973	6.1293	6.4980	6.2410	6.2020	✓ (0.56)	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)
f.32	4.0340	3.1513	3.1490	3.2067	3.1343	3.1893	✓ (0.55)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.33	8.0297	5.7780	5.8483	6.0240	5.8957	5.8167	✓ (0.57)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)
f.34	4.0107	3.5630	3.6107	3.6437	3.5957	3.5987	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.35	4.0107	3.5630	3.6107	3.6437	3.5957	3.5987	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.36	2.0103	1.7963	1.8390	1.8213	1.8003	1.8227	○ (0.52)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)
f.37	4.1007	2.4817	2.5060	2.5330	2.4733	2.5163	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
f.38	8.2147	4.6543	4.7173	4.9003	4.7653	4.8670	✓ (0.62)	○ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.39	8.2147	4.6543	4.7173	4.9003	4.7653	4.8670	✓ (0.62)	○ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.40	15.7327	6.0393	6.0747	6.1720	5.9660	6.0590	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.41	4.1007	2.4817	2.5060	2.5330	2.4733	2.5163	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
f.42	4.1007	2.4817	2.5060	2.5330	2.4733	2.5163	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
f.43	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.44	15.7327	6.0393	6.0747	6.1720	5.9660	6.0590	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.45	2.0220	1.8190	1.7840	1.8240	1.8157	1.8260	✓ (0.52)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.46	4.1007	2.4817	2.5060	2.5330	2.4733	2.5163	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
f.47	3.9860	2.7850	2.8530	2.8410	2.8377	2.8130	✓ (0.58)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.48	3.9990	2.8850	2.8773	2.8413	2.8630	2.8327	✓ (0.58)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.49	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.50	8.2147	4.6543	4.7173	4.9003	4.7653	4.8670	✓ (0.62)	○ (0.48)	○ (0.48)	○ (0.50)	○ (0.49)
f.51	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.52	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.53	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.54	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.55	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.56	2.0160	1.7897	1.8080	1.8067	1.8637	1.8170	○ (0.52)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.51)
f.57	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.58	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.59	15.7327	6.0393	6.0747	6.1720	5.9660	6.0590	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.60	4.1007	2.4817	2.5060	2.5330	2.4733	2.5163	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)
f.61	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.62	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.63	6.6833	3.6000	3.5513	3.5910	3.6420	3.6463	✓ (0.64)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.64	3.2853	1.9733	1.9790	1.9387	1.9540	1.9620	✓ (0.63)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
f.65	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.66	3.2853	1.9733	1.9790	1.9387	1.9540	1.9620	✓ (0.63)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
f.67	63.0940	22.6710	22.2080	25.1767	22.4570	22.4173	✓ (0.75)	○ (0.50)	○ (0.49)	✓ (0.52)	○ (0.50)
f.68	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.69	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.70	2.0247	1.5167	1.5207	1.5337	1.5307	1.5350	✓ (0.56)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.71	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.72	1.9917	1.7973	1.8167	1.7890	1.8027	1.8050	○ (0.52)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.73	2.0247	1.5167	1.5207	1.5337	1.5307	1.5350	✓ (0.56)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.74	2.0103	1.7963	1.8390	1.8213	1.8003	1.8227	○ (0.52)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)
f.75	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.76	4.0220	3.3723	3.4920	3.3597	3.3807	3.4057	✓ (0.53)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
f.77	2.0247	1.5167	1.5207	1.5337	1.5307	1.5350	✓ (0.56)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.78	4.0407	2.7267	2.7017	2.7200	2.7413	2.7090	✓ (0.59)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.79	3.9420	3.3933	3.3503	3.3587	3.4727	3.3803	✓ (0.53)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.80	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)

(Continue.)

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.81	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.82	12.7533	5.9493	5.8247	6.1170	5.9733	5.8427	✓ (0.68)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.83	25.1877	11.6820	12.0427	13.1077	12.2490	12.1843	✓ (0.67)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.84	4.0487	2.9773	2.9697	3.0460	3.0133	3.0767	✓ (0.56)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
f.85	31.7293	11.4743	11.2567	12.2433	11.4383	11.2607	✓ (0.74)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.86	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.87	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.88	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.89	3.8707	3.3467	3.3493	3.4230	3.3980	3.4217	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.90	3.2853	1.9733	1.9790	1.9387	1.9540	1.9620	✓ (0.63)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
f.91	3.9990	2.8850	2.8773	2.8413	2.8630	2.8327	✓ (0.58)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.92	16.2187	9.8010	10.0483	10.3737	9.8880	10.0577	✓ (0.61)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.93	8.1267	5.1690	5.2500	5.4427	5.3277	5.0893	✓ (0.60)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.52)
f.94	12.5663	5.9000	5.9180	6.0463	5.8017	5.8357	✓ (0.68)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.95	15.8107	7.9227	7.9733	8.5723	8.0073	7.7887	✓ (0.67)	○ (0.51)	○ (0.50)	✓ (0.52)	○ (0.51)
f.96	15.8107	7.9227	7.9733	8.5723	8.0073	7.7887	✓ (0.67)	○ (0.51)	○ (0.50)	✓ (0.52)	○ (0.51)
f.97	31.1940	12.1513	12.2927	13.4000	11.8753	12.0780	✓ (0.72)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.98	8.0193	5.9143	5.9400	6.1900	5.9253	5.8897	✓ (0.57)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.99	15.8107	7.9227	7.9733	8.5723	8.0073	7.7887	✓ (0.67)	○ (0.51)	○ (0.50)	✓ (0.52)	○ (0.51)
f.100	8.1607	4.6273	4.7020	4.8043	4.6730	4.7017	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
f.101	1.9917	1.7973	1.8167	1.7890	1.8027	1.8050	○ (0.52)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.102	8.2253	4.6673	4.7690	4.8880	4.7877	4.7137	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
f.103	1.9547	1.7323	1.7297	1.7520	1.7580	1.7523	✓ (0.52)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.104	16.1183	6.1387	6.1740	6.5327	6.1853	6.2180	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.105	16.1183	6.1387	6.1740	6.5327	6.1853	6.2180	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.106	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.107	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.108	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.109	32.1740	14.9877	15.5533	16.8423	15.4377	15.0283	✓ (0.68)	○ (0.50)	○ (0.51)	✓ (0.52)	○ (0.51)
f.110	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.111	7.8680	4.3180	4.3510	4.4763	4.4050	4.4597	✓ (0.64)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.112	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.113	43.0357	17.6603	17.6247	19.5533	17.3340	17.2093	✓ (0.71)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.50)
f.114	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.115	32.6667	11.7603	11.4533	12.0597	11.0143	11.5333	✓ (0.75)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.116	4.0347	2.9847	2.9950	2.9813	3.0143	2.9983	✓ (0.57)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.117	4.0347	2.9847	2.9950	2.9813	3.0143	2.9983	✓ (0.57)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.118	63.7667	22.1903	21.7313	22.8430	21.2130	21.8907	✓ (0.76)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.119	4.0347	2.9847	2.9950	2.9813	3.0143	2.9983	✓ (0.57)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.120	25.6350	7.3537	7.1273	7.6160	7.3410	7.2737	✓ (0.79)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.121	42.4070	11.6717	11.5030	12.8523	11.6260	11.9717	✓ (0.78)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
f.122	8.2830	3.6030	3.5530	3.6677	3.6373	3.6890	✓ (0.70)	○ (0.49)	✗ (0.48)	○ (0.50)	○ (0.49)
f.123	31.9577	13.5150	13.7480	15.0577	14.0590	13.8590	✓ (0.70)	○ (0.49)	○ (0.49)	○ (0.51)	○ (0.50)
f.124	42.4070	11.6717	11.5030	12.8523	11.6260	11.9717	✓ (0.78)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
f.125	42.4070	11.6717	11.5030	12.8523	11.6260	11.9717	✓ (0.78)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
f.126	25.6350	7.3537	7.1273	7.6160	7.3410	7.2737	✓ (0.79)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.127	86.8363	20.5613	19.7293	24.0117	20.7093	20.5153	✓ (0.81)	○ (0.50)	○ (0.49)	✓ (0.53)	○ (0.50)
f.128	63.6483	20.7440	20.9557	22.7380	20.8617	20.6700	✓ (0.76)	○ (0.50)	○ (0.50)	○ (0.52)	○ (0.50)
f.129	63.6483	20.7440	20.9557	22.7380	20.8617	20.6700	✓ (0.76)	○ (0.50)	○ (0.50)	○ (0.52)	○ (0.50)
f.130	85.1583	20.2927	20.0090	23.1647	20.1080	20.0737	✓ (0.81)	○ (0.50)	○ (0.50)	✓ (0.52)	○ (0.50)
f.131	15.7327	6.0393	6.0747	6.1720	5.9660	6.0590	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.132	15.7327	6.0393	6.0747	6.1720	5.9660	6.0590	✓ (0.73)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.133	31.1767	11.4133	11.4443	12.1507	11.2247	11.6247	✓ (0.73)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.134	31.1767	11.4133	11.4443	12.1507	11.2247	11.6247	✓ (0.73)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.135	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.136	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.137	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.138	1.9720	1.8260	1.7837	1.8207	1.8127	1.8117	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.139	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.140	3.8967	2.9803	2.9663	3.0260	3.0120	2.9627	✓ (0.55)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)
f.141	4.0990	2.5203	2.5137	2.5233	2.5883	2.5057	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.142	2.0303	1.6753	1.6680	1.6763	1.6590	1.6850	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.143	4.0043	2.4113	2.4107	2.4380	2.4230	2.4137	✓ (0.62)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.144	2.0103	1.7963	1.8390	1.8213	1.8003	1.8227	○ (0.52)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)
f.145	6.1930	5.4200	5.4230	5.6327	5.4653	5.4220	✓ (0.53)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.146	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.147	6.4487	3.5807	3.6090	3.6537	3.5770	3.5720	✓ (0.65)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.148	3.2853	1.9733	1.9790	1.9387	1.9540	1.9620	✓ (0.63)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.50)
f.149	13.2380	6.9680	6.9317	7.3427	6.8320	6.9453	✓ (0.65)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.150	6.3033	3.4457	3.4670	3.4460	3.5267	3.4990	✓ (0.64)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.151	49.9740	12.7070	12.1923	13.7577	12.2563	12.1590	✓ (0.81)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.50)
f.152	8.5217	4.1230	4.0313	4.1287	4.0240	4.0887	✓ (0.68)	○ (0.51)	○ (0.49)	○ (0.50)	○ (0.49)
f.153	12.6157	5.9717	6.0047	6.1123	5.9693	5.9520	✓ (0.68)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.154	6.2923	3.2567	3.2277	3.2290	3.2610	3.2487	✓ (0.66)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.155	8.2553	4.8047	4.7683	4.8910	4.7440	4.8173	✓ (0.63)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.156	4.1087	3.1677	3.1560	3.1757	3.1453	3.1747	✓ (0.55)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.157	8.2553	4.8047	4.7683	4.8910	4.7440	4.8173	✓ (0.63)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.158	8.2553	4.8047	4.7683	4.8910	4.7440	4.8173	✓ (0.63)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.159	7.7903	5.7400	5.7840	5.8033	5.8650	5.6980	✓ (0.58)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.160	8.2553	4.8047	4.7683	4.8910	4.7440	4.8173	✓ (0.63)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)

TABLE B.2
RRT VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM DRUPAL

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	4.0630	4.0320	3.9583	4.0690	4.0557	3.9763	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.2	4.0983	4.0167	4.0217	3.9367	3.9373	4.0013	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.3	4.0723	3.9450	3.8730	3.9027	4.1197	4.0387	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)
f.4	4.0557	3.9613	4.0040	4.0407	3.9963	3.8907	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.5	4.0497	3.9790	4.0310	3.9713	3.9770	4.0587	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.6	3.9743	3.9660	4.0340	4.0057	3.9957	3.9330	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)
f.7	4.0497	3.9790	4.0310	3.9713	3.9770	4.0587	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.8	4.0270	3.9343	3.9727	3.8290	3.9923	4.0390	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.48)	○ (0.49)
f.9	4.0630	4.0320	3.9583	4.0690	4.0557	3.9763	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.10	4.1370	3.9407	4.0130	3.9713	4.1140	3.9470	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.11	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.12	16.2290	16.4460	15.7923	15.5857	16.0993	15.6460	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)
f.13	4.0657	4.0580	3.9990	3.9463	3.9717	3.9383	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.14	4.0630	4.0320	3.9583	4.0690	4.0557	3.9763	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.15	4.0630	4.0320	3.9583	4.0690	4.0557	3.9763	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.16	8.0583	8.0447	7.7020	7.9680	8.0057	8.1170	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.17	4.0630	4.0320	3.9583	4.0690	4.0557	3.9763	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.18	4.0657	4.0580	3.9990	3.9463	3.9717	3.9383	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.19	16.3370	16.1963	15.3827	15.9123	16.0947	16.1713	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.20	8.1540	8.0813	7.9243	7.9430	8.0627	7.8793	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.21	16.3347	16.3280	15.4850	16.3033	15.9057	16.0023	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.22	31.9553	32.2663	31.0737	31.8057	31.0083	32.1707	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)
f.23	16.3347	16.3280	15.4850	16.3033	15.9057	16.0023	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.24	64.7450	62.4897	63.4180	64.7723	61.8353	62.2910	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.50)
f.25	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.26	8.0543	8.0423	7.9337	7.8240	8.0523	7.9153	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.27	8.2147	8.1413	7.9420	8.0027	7.9987	7.9393	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.28	8.2147	8.1413	7.9420	8.0027	7.9987	7.9393	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.29	4.0340	3.9340	3.9737	3.9603	4.0100	3.9800	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.30	4.0340	3.9340	3.9737	3.9603	4.0100	3.9800	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.31	7.9517	7.8213	7.9953	7.9700	8.0280	8.1473	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.32	4.0340	3.9340	3.9737	3.9603	4.0100	3.9800	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.33	8.0297	7.8993	7.9953	8.0620	8.2250	7.9060	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.34	4.0107	3.8747	3.9357	4.0827	4.0837	4.1180	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.35	4.0107	3.8747	3.9357	4.0827	4.0837	4.1180	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.36	2.0103	1.9363	2.0017	2.0033	1.9920	1.9603	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.37	4.1007	4.0330	3.9703	3.9900	4.0353	4.0190	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.38	8.2147	8.1413	7.9420	8.0027	7.9987	7.9393	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.39	8.2147	8.1413	7.9420	8.0027	7.9987	7.9393	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.40	15.7327	15.3957	15.6523	16.0503	15.5730	16.1240	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.41	4.1007	4.0330	3.9703	3.9900	4.0353	4.0190	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.42	4.1007	4.0330	3.9703	3.9900	4.0353	4.0190	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.43	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.44	15.7327	15.3957	15.6523	16.0503	15.5730	16.1240	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.45	2.0220	2.0090	2.0073	2.0257	1.9680	2.0103	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.46	4.1007	4.0330	3.9703	3.9900	4.0353	4.0190	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.47	3.9860	3.9563	4.0893	3.9567	3.9210	3.9887	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.50)
f.48	3.9990	4.0530	3.8513	3.9857	3.9510	4.0030	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.49	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.50	8.2147	8.1413	7.9420	8.0027	7.9987	7.9393	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.51	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.52	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.53	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.54	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.55	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.56	2.0160	2.0257	1.9813	2.0000	1.9990	2.0360	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)
f.57	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.58	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.59	15.7327	15.3957	15.6523	16.0503	15.5730	16.1240	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.60	4.1007	4.0330	3.9703	3.9900	4.0353	4.0190	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.61	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.62	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.63	6.6833	6.4613	6.1587	6.5197	6.3723	6.2883	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.64	3.2853	3.2267	3.1790	3.1393	3.1283	3.1280	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.65	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.66	3.2853	3.2267	3.1790	3.1393	3.1283	3.1280	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.67	63.0940	61.6070	63.2657	64.3060	63.4397	61.0117	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.68	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.69	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.70	2.0247	1.9973	2.0067	1.9633	2.0123	1.9900	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.71	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.72	1.9917	2.0133	1.9880	1.9980	1.9630	1.9683	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.73	2.0247	1.9973	2.0067	1.9633	2.0123	1.9900	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.74	2.0103	1.9363	2.0017	2.0033	1.9920	1.9603	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.75	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.76	4.0220	4.0940	4.0623	3.9550	3.9313	3.9207	○ (0.51)	○ (0.52)	○ (0.52)	○ (0.51)	○ (0.50)
f.77	2.0247	1.9973	2.0067	1.9633	2.0123	1.9900	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.78	4.0407	4.0067	4.0297	3.9883	3.9977	3.9373	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.79	3.9420	4.0417	4.1717	4.0980	3.9027	3.9210	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.80	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)

(Continue.)

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.81	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.82	12.7533	13.0633	12.6553	12.1040	13.1467	12.4887	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.49)	○ (0.51)
f.83	25.1877	25.7820	25.8513	25.7507	26.1200	25.5387	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.84	4.0487	4.0170	4.0630	4.0160	3.9217	4.0177	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.85	31.7293	30.5097	31.7427	32.7957	31.5767	30.7853	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)
f.86	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.87	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.88	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.89	3.8707	3.9867	4.2210	4.0850	3.9447	4.0040	○ (0.49)	○ (0.50)	○ (0.52)	○ (0.51)	○ (0.49)
f.90	3.2853	3.2267	3.1790	3.1393	3.1283	3.1280	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.91	3.9990	4.0530	3.8513	3.9857	3.9510	4.0030	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.92	16.2187	16.5803	15.9523	15.9790	16.2513	15.7700	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)
f.93	8.1267	8.1060	7.9923	7.9557	8.1970	7.8997	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.94	12.5663	12.8357	12.8877	12.3410	12.8697	12.6117	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)
f.95	15.8107	15.9907	16.0307	16.1257	15.9560	15.4870	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
f.96	15.8107	15.9907	16.0307	16.1257	15.9560	15.4870	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
f.97	31.1940	31.7303	32.1240	32.3643	32.8240	31.6067	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.98	8.0193	8.0980	7.9837	7.9890	8.1533	7.8353	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.99	15.8107	15.9907	16.0307	16.1257	15.9560	15.4870	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
f.100	8.1607	7.9000	7.8260	7.8357	8.4290	8.0230	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.101	1.9917	2.0133	1.9880	1.9980	1.9630	1.9683	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)
f.102	8.2253	7.9407	7.9017	7.8447	7.9843	7.8143	✓ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
f.103	1.9547	2.0350	2.0647	2.0237	2.0017	1.9630	○ (0.50)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.104	16.1183	15.9610	15.5850	15.5783	16.0833	16.0007	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.105	16.1183	15.9610	15.5850	15.5783	16.0833	16.0007	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.106	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.107	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.108	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.109	32.1740	31.7153	32.7077	31.6673	32.6893	31.4527	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.49)	○ (0.51)
f.110	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.111	7.8680	7.9357	7.9843	7.9013	7.9883	8.0010	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.112	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.113	43.0357	42.2223	42.8217	42.4067	42.4440	42.9617	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.114	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.115	32.6667	30.5880	31.2937	32.9427	32.6160	32.3640	○ (0.50)	○ (0.48)	○ (0.49)	○ (0.50)	○ (0.50)
f.116	4.0347	4.0687	3.9797	4.0103	3.9390	3.9607	○ (0.51)	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)
f.117	4.0347	4.0687	3.9797	4.0103	3.9390	3.9607	○ (0.51)	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)
f.118	63.7667	64.1297	65.8530	63.7877	63.3217	63.3877	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
f.119	4.0347	4.0687	3.9797	4.0103	3.9390	3.9607	○ (0.51)	○ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)
f.120	25.6350	25.0123	25.7283	25.3650	25.8030	25.9243	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.121	42.4070	42.3943	41.0750	42.9420	43.3517	42.3837	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.122	8.2830	7.8837	8.0757	8.1390	7.8360	7.9610	✓ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)
f.123	31.9577	31.5003	32.6263	31.5967	31.3643	31.3693	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
f.124	42.4070	42.3943	41.0750	42.9420	43.3517	42.3837	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.125	42.4070	42.3943	41.0750	42.9420	43.3517	42.3837	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.126	25.6350	25.0123	25.7283	25.3650	25.8030	25.9243	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.127	86.8363	83.5927	83.2507	87.1707	85.6230	81.2973	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)	○ (0.51)
f.128	63.6483	63.7627	63.1057	65.6850	64.2847	63.0530	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
f.129	63.6483	63.7627	63.1057	65.6850	64.2847	63.0530	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
f.130	85.1583	82.7670	83.5137	86.4100	84.6780	79.5760	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.52)	○ (0.51)
f.131	15.7327	15.3957	15.6523	16.0503	15.5730	16.1240	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.132	15.7327	15.3957	15.6523	16.0503	15.5730	16.1240	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.133	31.1767	32.2943	31.6013	30.9517	31.6363	31.5263	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.49)
f.134	31.1767	32.2943	31.6013	30.9517	31.6363	31.5263	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.49)
f.135	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.136	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.137	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.138	1.9720	1.9973	2.0087	1.9967	1.9613	2.0163	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.139	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.140	3.8967	4.0477	4.1353	3.9020	3.9517	3.8997	○ (0.50)	○ (0.51)	✓ (0.52)	○ (0.50)	○ (0.50)
f.141	4.0990	3.9760	3.9343	3.9550	3.9050	3.9153	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.142	2.0303	1.9990	1.9903	1.9590	1.9870	2.0270	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.143	4.0043	4.0543	3.9920	3.8847	4.0907	3.9230	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.144	2.0103	1.9363	2.0017	2.0033	1.9920	1.9603	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.145	6.1930	6.5013	6.2753	6.3363	6.3263	6.3670	○ (0.49)	○ (0.51)	○ (0.49)	○ (0.50)	○ (0.50)
f.146	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.147	6.4487	6.4407	6.2477	6.1720	6.1497	6.3290	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.148	3.2853	3.2267	3.1790	3.1393	3.1283	3.1280	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)
f.149	13.2380	12.9500	12.6460	12.7170	12.6540	12.4413	✓ (0.52)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
f.150	6.3033	6.5150	6.3100	6.1980	6.4203	6.2060	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.151	49.9740	49.6703	49.9923	51.4307	51.0390	50.6140	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.152	8.5217	8.5683	8.3823	8.4163	8.6177	8.3453	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
f.153	12.6157	12.8667	12.5463	12.1230	12.7273	12.6543	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.154	6.2923	6.4777	6.3193	6.2177	6.1660	6.4107	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.155	8.2553	8.0567	7.9240	7.8820	7.7823	8.0627	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.156	4.1087	4.0240	4.0173	3.9247	3.9503	4.0493	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.157	8.2553	8.0567	7.9240	7.8820	7.7823	8.0627	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.158	8.2553	8.0567	7.9240	7.8820	7.7823	8.0627	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.159	7.7903	7.6913	8.0727	7.9977	8.0183	8.1387	○ (0.50)	○ (0.48)	○ (0.50)	○ (0.50)	○ (0.50)
f.160	8.2553	8.0567	7.9240	7.8820	7.7823	8.0627	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)

TABLE B.3
FSCS VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM BUSYBOX

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	6.0553	5.6820	5.6550	5.4823	5.5247	5.6737	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.2	1.9880	1.7880	1.8187	1.8323	1.8283	1.8280	○ (0.51)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.3	1.9913	1.8333	1.8447	1.8363	1.8393	1.8167	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.4	1.3427	1.2923	1.2957	1.2660	1.2787	1.2970	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)
f.5	32.4917	28.0937	27.2970	29.0703	27.8867	27.9310	✓ (0.53)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.6	5.1470	5.4730	5.5533	5.5517	5.5660	5.4917	○ (0.48)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
f.7	4.1007	3.5547	3.5970	3.5617	3.5940	3.6407	✓ (0.53)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.8	3.9270	3.6827	3.5810	3.6100	3.6030	3.5657	✓ (0.52)	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)
f.9	2.0157	1.6983	1.6937	1.7180	1.7090	1.7363	✓ (0.53)	○ (0.49)	✖ (0.48)	○ (0.49)	○ (0.49)

TABLE B.4
RRT VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM BUSYBOX

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	6.0553	6.0173	6.1587	6.1270	5.9973	6.1610	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.2	1.9880	2.0413	2.0420	1.9833	2.0420	2.0293	○ (0.49)	○ (0.51)	○ (0.50)	○ (0.49)	○ (0.50)
f.3	1.9913	1.9643	2.0553	2.0257	1.9967	2.0090	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.51)	○ (0.50)
f.4	1.3427	1.3463	1.3323	1.3217	1.3287	1.3290	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.5	32.4917	31.9430	33.0497	31.9413	31.5933	31.2703	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.51)	○ (0.50)
f.6	5.1470	5.3900	5.3397	5.2187	5.3497	5.3493	○ (0.48)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)
f.7	4.1007	4.1010	4.0190	4.0593	4.0057	3.9310	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.8	3.9270	4.0930	4.0393	4.0827	3.9037	3.9050	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.49)
f.9	2.0157	2.0180	1.9887	2.0163	2.0200	1.9570	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)

TABLE B.5
FSCS VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM LINUX KERNEL

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	1.9743	1.8550	1.9150	1.8340	1.8580	1.8330	✓ (0.52)	○ (0.50)	✓ (0.52)	○ (0.50)	○ (0.51)
f.2	1.9770	1.8453	1.8427	1.9223	1.8363	1.8597	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.52)	○ (0.50)
f.3	1.9663	1.8007	1.8263	1.8250	1.7930	1.7863	✓ (0.52)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.50)
f.4	16.0240	13.3863	13.5443	13.9347	14.0003	14.5613	✓ (0.53)	✖ (0.48)	○ (0.48)	○ (0.49)	○ (0.50)
f.5	2.0453	1.8670	1.8223	1.8850	1.8530	1.8757	✓ (0.52)	○ (0.50)	○ (0.49)	○ (0.51)	○ (0.50)
f.6	5.2663	3.7253	3.6757	3.7840	3.7677	3.8657	✓ (0.57)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.7	2.5013	2.2380	2.2613	2.2133	2.2100	2.2050	✓ (0.52)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)
f.8	9.1710	6.4973	6.3717	6.5187	6.5350	6.7187	✓ (0.58)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.9	3.9657	3.1637	3.0930	3.1697	3.1900	3.1987	✓ (0.54)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.10	64.0833	33.5990	32.8650	39.7997	33.1220	40.3693	✓ (0.61)	✖ (0.46)	✖ (0.46)	○ (0.50)	✖ (0.46)
f.11	3.9717	3.5987	3.6773	3.6677	3.5657	3.5717	✓ (0.52)	○ (0.51)	○ (0.51)	○ (0.52)	○ (0.50)
f.12	1.3307	1.2993	1.2940	1.3003	1.3143	1.2903	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.51)
f.13	1.2533	1.2203	1.2340	1.2350	1.2147	1.2343	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)
f.14	7.8347	6.4703	6.5253	6.6977	6.5243	6.8677	✓ (0.53)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.49)
f.15	30.9003	44.5557	43.1783	38.4223	46.1330	35.2667	✖ (0.46)	✓ (0.55)	✓ (0.54)	○ (0.51)	✓ (0.54)
f.16	3.9447	2.8057	2.8303	2.8457	2.9093	2.8613	✓ (0.57)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)
f.17	31.8710	26.2590	25.7720	27.7353	25.9397	27.8103	✓ (0.53)	○ (0.48)	✖ (0.48)	○ (0.49)	✖ (0.48)
f.18	2.0243	1.7680	1.8080	1.8070	1.8087	1.8350	○ (0.51)	○ (0.48)	○ (0.49)	○ (0.49)	○ (0.49)
f.19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.20	16.3117	13.5007	13.8070	13.9317	13.7157	14.1240	✓ (0.53)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.21	4.0163	3.5093	3.6627	3.5970	3.6843	3.7463	○ (0.51)	✖ (0.48)	○ (0.49)	○ (0.49)	○ (0.49)
f.22	1.9930	1.8640	1.8527	1.8410	1.8713	1.8967	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.50)
f.23	1.9967	1.8713	1.8830	1.8620	1.8847	1.8380	○ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)
f.24	3.9670	3.3657	3.5053	3.3713	3.4853	3.5313	○ (0.52)	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)
f.25	31.9600	29.8830	28.5503	29.4330	28.3320	30.6747	○ (0.52)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.48)
f.26	8.1563	8.0560	7.5760	7.5627	7.4970	7.6910	○ (0.52)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.49)
f.27	2.0247	1.8930	1.8837	1.8693	1.8477	1.8513	✓ (0.52)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)
f.28	8.0870	7.8843	7.7933	7.8957	7.8150	7.9220	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)

TABLE B.6
RRT VERSION: MEAN NUMBER OF TEST CASES TO DETECT EACH FAULT AND STATISTICAL PAIRWISE COMPARISONS OF LSH FOR PROGRAM LINUX KERNEL

Fault ID	Methods						LSH				
	<i>RT</i>	<i>ART</i>	<i>RF</i>	<i>CR</i>	<i>KD</i>	<i>LSH</i>	vs. <i>RT</i>	vs. <i>ART</i>	vs. <i>RF</i>	vs. <i>CR</i>	vs. <i>KD</i>
f.1	1.9743	2.0213	2.0083	1.9807	2.0220	1.9997	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.2	1.9770	2.0373	1.9890	2.0223	1.9643	2.0317	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.49)
f.3	1.9663	2.0300	2.0070	2.0503	1.9917	1.9877	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.4	16.0240	16.3890	16.1507	16.1723	16.0700	15.4287	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.51)	○ (0.50)
f.5	2.0453	1.9953	2.0030	2.0040	1.9710	2.0090	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.6	5.2663	5.3923	5.3057	5.2893	5.4537	5.1720	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
f.7	2.5013	2.4450	2.4963	2.5150	2.4783	2.4863	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.50)	○ (0.50)
f.8	9.1710	9.2087	8.9760	8.9893	9.1900	9.2320	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.9	3.9657	4.0220	3.9367	3.9917	4.0560	4.0123	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)
f.10	64.0833	62.7513	63.0830	66.2237	64.6307	58.6940	○ (0.51)	○ (0.51)	○ (0.51)	✓ (0.53)	○ (0.52)
f.11	3.9717	4.1053	3.9913	3.9570	4.1010	4.0257	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.51)
f.12	1.3307	1.3537	1.3310	1.3460	1.3260	1.3337	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.13	1.2533	1.2613	1.2517	1.2580	1.2467	1.2540	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.14	7.8347	7.9477	7.9603	7.9177	7.9657	8.2083	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)
f.15	30.9003	32.2917	32.2590	31.3933	32.7190	32.2303	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.16	3.9447	3.9530	3.8513	3.9323	3.9960	3.9193	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)
f.17	31.8710	32.1097	32.1107	31.5397	32.2263	31.4430	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.50)	○ (0.50)
f.18	2.0243	2.0233	2.0047	2.0247	1.9320	1.9797	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.49)
f.19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.50)
f.20	16.3117	16.1780	16.3323	15.9793	16.2277	16.4177	○ (0.49)	○ (0.50)	○ (0.49)	○ (0.49)	○ (0.49)
f.21	4.0163	3.9820	4.0223	4.0270	4.0217	3.9570	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)	○ (0.51)
f.22	1.9930	2.0087	2.0073	1.9700	1.9940	2.0097	○ (0.50)	○ (0.50)	○ (0.50)	○ (0.49)	○ (0.50)
f.23	1.9967	1.9617	2.0280	2.0437	2.0117	2.0013	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.51)	○ (0.50)
f.24	3.9670	4.0317	4.0223	3.9223	3.9413	4.1193	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)	○ (0.49)
f.25	31.9600	32.3303	31.1600	31.7943	32.1687	30.7957	○ (0.51)	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.51)
f.26	8.1563	8.0197	8.0457	8.1810	8.0770	7.7520	✓ (0.53)	○ (0.52)	✓ (0.52)	○ (0.52)	○ (0.52)
f.27	2.0247	1.9517	1.9857	1.9877	1.9830	2.0113	○ (0.50)	○ (0.49)	○ (0.50)	○ (0.50)	○ (0.50)
f.28	8.0870	7.8013	8.3667	7.8513	7.9533	8.0120	○ (0.51)	○ (0.50)	○ (0.51)	○ (0.50)	○ (0.50)