Table 1: Classification accuracies on small-sample datasets.

Data set	n	m	Method	Testing accuracy(%) ↑	Training time(ms)↓	Testing time(ms)↓
wine	178	13	CART	91.39±1.3	**1.0**	0.027
			RF	97.50±1.1	19	2.975
			XGboost	96.85±1.1	19	0.364
			catboost	97.04±0.9	786	0.396
			lightGBM	97.31±0.8	23	0.584
			LHT	**97.83±1.5**	1.4	**0.011**
seeds	210	7	CART	90.40±1.5	**1.1**	0.035
			RF	91.19±1.3	6	0.429
			XGboost	93.41±1.4	9.6	0.285
			catboost	93.17±1.6	343	0.354
			lightGBM	92.62±1.5	111	0.441
			LHT	**94.52±2.1**	2.3	**0.013**
WDBC	569	30	CART	92.19±1.9	**5.1**	0.052
			RF	95.79±1.3	30	3.069
			XGboost	96.67±0.7	58	0.285
			catboost	96.67±1.3	966	0.544
			lightGBM	96.17±0.6	44	0.442
			LHT	**98.26±1.1**	11.4	**0.023**
banknote	1372	3	CART	97.75±0.8	**2.1**	0.045
			RF	98.95±0.2	37	1.534
			XGboost	98.98±0.2	21	0.281
			catboost	99.53±0.2	170	0.354
			lightGBM	99.27±0.2	14	0.515
			LHT	**99.85±0.1**	4.7	**0.016**

Table 2: Classification accuracies on medium-scale and large-scale datasets.

Data set	n	m	Method	Testing accuracy(%) ↑	Training time(ms)↓	Testing time(ms) ↓
Rice	3810	7	CART	91.22±0.4	**10**	0.047
			RF	92.29±0.3	68	1.236
			XGboost	92.27±0.4	31	0.307
			catboost	**92.71±0.4**	429	0.377
			lightGBM	92.28±0.3	18	0.475
			LHT	91.35±0.5	49	**0.016**
Spambase	4601	57	CART	90.92±0.2	**22**	0.046
			RF	93.21±0.3	116	5.529
			XGboost	94.22±0.3	115	0.309
			catboost	94.18±0.3	634	0.602
			lightGBM	94.25±0.3	41	0.507
			LHT	**93.82±0.6**	476	**0.026**
EEG	14980	14	CART	83.67±0.2	**86**	0.044
			RF	91.15±0.2	902	5.633
			XGboost	94.60±0.3	256	0.334
			catboost	92.62±0.4	3502	0.428
			lightGBM	92.42±0.3	184	0.519
			LHT (50)	**94.88±0.3**	649	**0.025**
MAGIC Gamma Telescope	19020	10	CART	83.75±0.3	**77**	0.047
			RF	84.45±0.2	1227	5.494
			XGboost	87.83±0.2	275	0.309
			catboost	87.59±0.2	4481	0.401
			lightGBM	**87.80±0.2**	38	0.541
			LHT (50)	86.12±0.3	813	**0.022**
SKIN-SEGMEN-TATION	245057	3	CART	98.98±0.03	**115**	0.048
			RF	99.84±0.01	5973	5.715
			XGboost	99.93±0.01	267	0.301
			catboost	99.89±0.01	2626	0.351
			lightGBM	99.92±0.01	243	0.490
			LHT (100)	**99.93±0.01**	843	**0.017**

Table 3: Hyperparameters for CART, RF, XGBoost, CatBoost and LightGBM.

Data set	n	m	Method	max depth	learning rate	tree Num.
wine	178	13	CART	6	-	-
			RF	6	-	20
			XGboost	6	0.1	50
			catboost	8	0.05	100
			lightGBM	7	0.05	100
seeds	210	7	CART	6	-	-
			RF	6	-	20
			XGboost	7	0.1	50
			catboost	7	0.1	70
			lightGBM	6	0.1	50
WDBC	569	30	CART	6	-	-
			RF	6	-	20
			XGboost	6	0.1	50
			catboost	8	0.05	100
			lightGBM	7	0.05	100
banknote	1372	3	CART	6	-	-
			RF	6	-	25
			XGboost	6	0.1	50
			catboost	8	0.1	70
			lightGBM	6	0.1	50
Rice	3810	7	CART	6	-	-
			RF	7	-	20
			XGboost	6	0.1	60
			catboost	9	0.1	80
			lightGBM	6	0.1	50
Spambase	4601	57	CART	10	-	-
			RF	10	-	30
			XGboost	9	0.1	50
			catboost	8	0.1	60
			lightGBM	9	0.1	50
EEG	14980	14	CART	15	-	-
			RF	15	-	50
			XGboost	10	0.1	150
			catboost	15	0.1	150
			lightGBM	15	0.1	200
			LHT	-	-	50
MAGIC Gamma Telescope	19020	10	CART	6	-	-
			RF	6	-	50
			XGboost	10	0.1	50
			catboost	10	0.1	100
			lightGBM	10	0.1	50
SKIN-SEGMEN-TATION	245057	3	CART	6	-	-
			RF	10	-	100
			XGboost	6	0.1	100
			catboost	10	0.1	100
			lightGBM	6	0.1	100

Table 4: Hyperparameters for LHT are specified, where i represents the tree number, and '–' indicates that LH forests are not used.

Data set	n	m	γ	β	tree Num.
wine	178	13	2	0.25	-
seeds	210	7	2	$0.3i/20$	20
WDBC	569	30	2	0.05	-
banknote	1372	3	2	0	4
Rice	3810	7	3	0	-
Spambase	4601	57	4	0.01	20
EEG	14980	14	2	$0.3i/50$	50
MAGIC	19020	10	3	0	50
SKIN	245057	3	4	0	100
mnist	70000	784	6	$0.8i/200$	200