

Table 1 The performance of MESM and other methods on SHS27k and SHS148k under different evaluation metrics

Evaluation metrics	Method	SHS27k			SHS148k		
		BFS(%)	DFS(%)	Random(%)	BFS(%)	DFS(%)	Random(%)
Accuracy	GNN-PPI	81.23±4.52	84.92±1.63	92.61±0.21	83.84±2.45	89.09±0.94	95.02±0.11
	MAPE-PPI	81.11±4.58	84.81±1.92	93.07±0.22	85.17±2.67	89.11±1.09	95.57±0.10
	BaPPI	82.48±3.27	84.60±3.09	90.75±0.90	87.34±1.08	88.13±0.72	95.08±0.24
	MESM	92.30±1.88	92.59±0.91	96.34±0.13	91.48±1.50	93.47±0.64	95.89±0.56
Recall	GNN-PPI	73.44±8.63	82.03±2.89	88.51±0.62	75.09±4.66	82.10±1.96	91.65±0.27
	MAPE-PPI	76.03±8.91	77.48±1.61	87.94±0.62	79.42±5.71	80.64±1.49	92.22±0.29
	BaPPI	90.55±2.43	93.11±1.76	97.21±0.41	87.21±2.67	84.18±0.95	95.96±0.36
	MESM	91.99±3.31	93.67±0.73	95.26±0.50	93.67±1.24	93.99±1.03	96.32±0.75
Precision	GNN-PPI	71.13±5.41	74.84±2.53	88.59±0.54	78.49±4.28	84.14±1.70	93.08±0.19
	MAPE-PPI	69.90±5.83	76.96±3.41	90.35±0.43	78.80±3.39	85.24±1.87	94.18±0.18
	BaPPI	67.31±5.16	70.40±4.57	79.03±1.98	79.10±1.46	80.44±1.58	89.77±0.68
	MESM	85.50±3.38	85.36±1.69	93.52±0.58	84.13±2.67	87.12±2.03	91.71±2.07
AUC-ROC	GNN-PPI	69.58±12.14	78.69±1.79	88.85±0.19	73.40±11.16	83.05±0.73	91.60±0.18
	MAPE-PPI	71.38±9.64	78.13±1.92	88.87±0.33	77.12±6.46	83.62±2.02	92.02±0.25
	BaPPI	80.80±4.25	83.34±1.88	90.96±0.67	84.17±2.24	85.24±1.22	93.99±0.29
	MESM	89.84±1.50	90.84±1.04	95.36±0.31	89.25±1.50	91.35±1.07	95.44±0.62
AUC-PR	GNN-PPI	52.06±11.87	59.07±2.57	76.84±0.54	57.53±11.97	67.38±1.51	82.24±0.27
	MAPE-PPI	53.46±11.18	59.87±1.85	77.87±0.67	60.95±9.40	68.10±2.83	83.47±0.35
	BaPPI	57.51±3.76	60.49±2.55	73.92±1.93	66.26±4.29	66.81±1.67	83.38±0.82
	MESM	78.45±2.94	77.09±1.34	89.17±0.70	76.62±1.90	79.14±1.55	87.37±1.71
Micro-F1	GNN-PPI	71.95±4.53	78.24±2.05	88.55±0.32	76.67±3.50	83.10±1.40	92.36±0.15
	MAPE-PPI	72.49±4.75	77.18±1.76	89.13±0.41	79.05±4.07	82.87±1.58	93.19±0.15
	BaPPI	77.14±3.89	80.10±2.95	87.17±1.11	82.95±1.81	82.26±1.00	92.76±0.32
	MESM	88.59±2.77	89.32±1.13	94.38±0.25	88.63±1.80	90.40±0.70	93.95±0.78

Table 2 The performance of MESM and other methods on SYS30k and SYS60k under different evaluation metrics

Evaluation metrics	Method	SYS30k			SYS60k		
		BFS(%)	DFS(%)	Random(%)	BFS(%)	DFS(%)	Random(%)
Accuracy	GNN-PPI	79.01±0.86	88.13±3.35	93.68±0.26	84.70±1.82	87.51±0.72	96.73±0.18
	MAPE-PPI	80.06±0.67	88.19±3.52	93.16±0.34	86.16±1.86	89.43±0.36	96.48±0.25
	BaPPI	81.39±0.84	87.86±3.48	88.93±0.59	85.47±0.91	87.84±0.17	92.62±0.47
	MESM	91.14±0.31	94.63±1.20	95.65±0.13	92.89±1.17	94.26±0.24	96.43±0.31
Recall	GNN-PPI	75.96±1.57	85.48±3.62	91.91±0.50	79.50±3.12	82.51±1.77	95.81±0.37
	MAPE-PPI	72.38±1.81	82.17±4.23	90.69±0.27	79.22±3.56	83.84±0.69	95.20±0.47
	BaPPI	92.54±1.14	94.68±1.87	96.46±0.42	92.12±1.08	92.77±1.10	96.52±0.83
	MESM	95.79±0.51	97.34±1.09	97.91±0.21	95.19±0.95	96.55±0.37	97.78±0.34
Precision	GNN-PPI	77.56±1.66	87.48±3.47	92.20±0.33	83.69±1.67	87.92±0.46	95.53±0.21
	MAPE-PPI	81.78±1.82	90.32±3.66	92.02±0.69	87.08±1.32	91.07±1.31	95.44±0.20
	BaPPI	73.49±1.36	81.21±3.87	79.93±1.23	77.81±1.02	81.66±0.82	85.73±1.36
	MESM	86.26±0.45	91.14±1.25	91.74±0.38	88.89±1.57	90.79±0.68	93.12±0.92
AUC-ROC	GNN-PPI	70.76±0.72	77.43±2.37	88.67±0.29	76.18±2.87	80.02±1.31	94.03±0.35
	MAPE-PPI	71.94±0.58	76.32±2.39	87.03±0.32	77.94±2.87	82.91±1.07	92.97±0.58
	BaPPI	76.93±0.87	80.55±2.51	84.29±0.36	81.17±1.16	83.33±0.39	88.80±0.22
	MESM	88.65±0.62	91.10±1.06	93.02±0.11	89.95±1.47	91.87±0.12	93.86±0.33
AUC-PR	GNN-PPI	62.21±0.80	68.39±2.47	83.65±0.86	67.36±3.60	72.66±1.37	91.60±0.50
	MAPE-PPI	64.45±0.91	68.88±2.58	82.03±0.91	71.04±3.35	77.46±1.04	90.55±0.60
	BaPPI	66.57±1.07	70.40±2.38	70.71±1.11	70.17±1.20	73.87±0.83	78.99±1.28
	MESM	82.40±0.59	85.41±0.75	87.42±0.54	84.48±2.66	87.10±0.51	89.68±0.91
Micro-F1	GNN-PPI	76.73±0.51	86.46±3.51	92.06±0.35	81.53±2.32	85.12±0.92	95.67±0.23
	MAPE-PPI	76.77±0.91	86.05±3.91	91.35±0.45	82.94±2.46	87.30±0.26	95.32±0.33
	BaPPI	81.91±0.82	87.41±3.05	87.41±0.56	84.36±0.95	86.86±0.29	90.80±0.54
	MESM	90.78±0.40	94.14±1.17	94.72±0.14	91.93±1.28	93.58±0.21	95.39±0.36