

Supplemental Results

Due to the space limitation, this section provides those experimental results that are not included in the main body of the paper.

0.1 Comparison with Semi-supervised Methods

In this subsection, we present and discuss the comparison results between CDSC-AL and semi-supervised approaches using 5%, 15%, and 20% of labeled data. The best results are in bold-face and the Nemenyi post-hoc test is performed here.

Table 1: Comparison with semi-supervised approaches using 5% labeled data.

Datasets	Metric	LNP	OReSSL	CDSC-AL
Synthetic-1	BA	0.8836	0.9214	0.9323
	F_{macro}	0.7706	0.9220	0.9344
Synthetic-2	BA	0.8278	0.8329	0.8297
	F_{macro}	0.6078	0.7796	0.8013
Sea	BA	0.5048	0.8068	0.9554
	F_{macro}	0.5879	0.8169	0.9601
KDD cup 99	BA	0.5125	0.6182	0.8219
	F_{macro}	0.5007	0.6205	0.7829
Forest covtype	BA	0.4838	0.6752	0.8256
	F_{macro}	0.4821	0.6755	0.8066
Gas Sensor Drift	BA	0.5695	0.8474	0.8866
	F_{macro}	0.5951	0.8299	0.8934
Shuttle	BA	0.3635	0.4475	0.4459
	F_{macro}	0.3661	0.4508	0.4457
MNIST	BA	0.7231	0.8322	0.9307
	F_{macro}	0.7286	0.8327	0.9313
CIFAR-10	BA	0.4114	0.6304	0.7625
	F_{macro}	0.4075	0.6198	0.7619

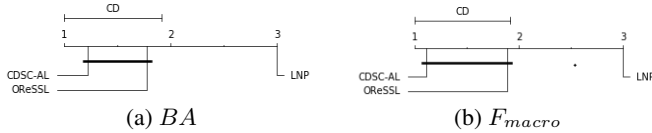


Figure 1: Comparison of CDSC-AL against semi-supervised methods with the Nemenyi test with $\alpha = 0.05$ using 5% labeled data.

Discussions: Table 1 summarizes the experimental results for CDSC-AL and two semi-supervised methods when there is 5% labeled data in each incoming data chunk. As shown in Table 1, CDSC-AL provides better performance on most data streams except for Shuttle. In Figure 1, the Nemenyi post-hoc test indicates that CDSC-AL achieves statistically comparable performance than OReSSL method while showing statistically better performance than LNP method using 5% of labeled data.

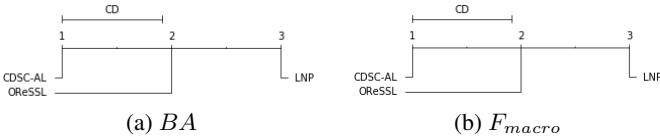


Figure 2: Comparison of CDSC-AL against semi-supervised methods with the Nemenyi test with $\alpha = 0.05$ using 15% labeled data.

Table 2: Comparison with semi-supervised approaches using 15% labeled data.

Datasets	Metric	LNP	OReSSL	CDSC-AL
Synthetic-1	BA	0.8939	0.9307	0.9495
	F_{macro}	0.8126	0.9318	0.9537
Synthetic-2	BA	0.8416	0.8542	0.8549
	F_{macro}	0.6598	0.7937	0.8287
Sea	BA	0.5418	0.8596	0.9713
	F_{macro}	0.6271	0.8619	0.9754
KDD cup 99	BA	0.5528	0.7458	0.8366
	F_{macro}	0.5739	0.7535	0.7923
Forest covtype	BA	0.5420	0.7512	0.8612
	F_{macro}	0.5438	0.7485	0.8442
Gas Sensor Drift	BA	0.6756	0.9202	0.9291
	F_{macro}	0.6858	0.9238	0.9299
Shuttle	BA	0.4259	0.5004	0.5015
	F_{macro}	0.4256	0.5193	0.5205
MNIST	BA	0.7874	0.9451	0.9772
	F_{macro}	0.7955	0.9479	0.9773
CIFAR-10	BA	0.4251	0.6596	0.8051
	F_{macro}	0.4264	0.6426	0.8208

Discussions: Table 2 presents the experimental results of CDSC-AL and two semi-supervised methods with 15% labeled data in each incoming data chunk. In Table 2, we can observe that CDSC-AL outperforms the OReSSL and LNP methods on all data streams in terms of BA and F_{macro} . From Figure 2, the CD diagram reveals that CDSC-AL provides statistically better performance than OReSSL and LNP methods using 15% of labeled data.

Table 3: Comparison with semi-supervised approaches using 20% labeled data.

Datasets	Metric	LNP	OReSSL	CDSC-AL
Synthetic-1	BA	0.9043	0.9333	0.9634
	F_{macro}	0.8343	0.9428	0.9684
Synthetic-2	BA	0.8562	0.8634	0.8616
	F_{macro}	0.6862	0.7988	0.8367
Sea	BA	0.5620	0.8970	0.9715
	F_{macro}	0.6497	0.9145	0.9758
KDD cup 99	BA	0.6088	0.7645	0.8369
	F_{macro}	0.6121	0.7812	0.7927
Forest covtype	BA	0.5692	0.7898	0.8809
	F_{macro}	0.5735	0.7834	0.8668
Gas Sensor Drift	BA	0.6791	0.9210	0.9293
	F_{macro}	0.6892	0.9248	0.9301
Shuttle	BA	0.4436	0.5197	0.5223
	F_{macro}	0.4643	0.5361	0.5455
MNIST	BA	0.8148	0.9612	0.9816
	F_{macro}	0.8249	0.9646	0.9824
CIFAR-10	BA	0.4291	0.6872	0.8208
	F_{macro}	0.4381	0.6778	0.8263

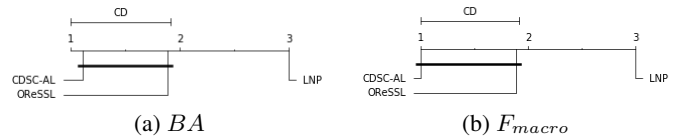


Figure 3: Comparison of CDSC-AL against semi-supervised methods with the Nemenyi test with $\alpha = 0.05$ using 20% labeled data.

Discussions: Table 3 shows the experimental results of CDSC-AL and two semi-supervised methods with 20% labeled data in each incoming data chunk. From Table 2, it is clear that CDSC-AL achieves better performance than two

compared semi-supervised methods on all data streams for both BA and F_{macro} . As shown in Figure 3, it is observed that CDSC-AL also shows statistically comparable performance than OReSSL method while showing statistically better performance than LNP method using 20% of labeled data.

Summary of Discussions: In summary, the performance of CDSC-AL method shows better improvement than the two compared semi-supervised methods on all data streams as the label proportion increases.

0.2 Comparison with Supervised Methods

In this subsection, we summarize the comparison results between CDSC-AL and supervised approaches in Tables 4, 5, and 6. Here, we only use 5%, 15%, and 20% of labeled data for CDSC-AL method while the supervised approaches utilize all labels (100%) of the data stream. The best results are in bold-face.

Table 4: Comparison with supervised approaches when CDSC-AL only uses 5% labeled data.

Datasets	Metric	LB	OBA	AHT	SAMkNN	CDSC-AL
Syn-1	BA	0.7910	0.6640	0.6354	0.6247	0.9123
	F_{macro}	0.7965	0.6675	0.6513	0.6313	0.9044
Syn-2	BA	0.7124	0.7204	0.6926	0.6784	0.8297
	F_{macro}	0.7218	0.7219	0.6977	0.6864	0.8013
Sea	BA	0.8204	0.7498	0.7493	0.7205	0.9554
	F_{macro}	0.8227	0.7501	0.7505	0.7345	0.9601
KDD 99	BA	0.7585	0.7812	0.8541	0.7495	0.8219
	F_{macro}	0.7564	0.7798	0.8012	0.7682	0.7829
covtype	BA	0.8888	0.8707	0.8612	0.8545	0.8256
	F_{macro}	0.8901	0.8709	0.8688	0.8588	0.8066
GSD	BA	0.7185	0.6345	0.6111	0.6357	0.8866
	F_{macro}	0.7199	0.6361	0.6188	0.6412	0.8934
Shuttle	BA	0.4789	0.4477	0.4508	0.4424	0.4459
	F_{macro}	0.5187	0.5112	0.4987	0.4894	0.4457
MNIST	BA	0.8909	0.8498	0.8393	0.8549	0.9307
	F_{macro}	0.8946	0.8501	0.8412	0.8596	0.9319
CIFAR10	BA	0.7199	0.6208	0.7366	0.6218	0.7625
	F_{macro}	0.7208	0.6325	0.7381	0.6295	0.7619

Table 5: Comparison with supervised approaches when CDSC-AL only uses 15% labeled data.

Datasets	Metric	LB	OBA	AHT	SAMkNN	CDSC-AL
Syn-1	BA	0.7910	0.6640	0.6354	0.6247	0.9195
	F_{macro}	0.7965	0.6675	0.6513	0.6313	0.9137
Syn-2	BA	0.7124	0.7204	0.6926	0.6784	0.8549
	F_{macro}	0.7218	0.7219	0.6977	0.6864	0.8616
Sea	BA	0.8204	0.7498	0.7493	0.7205	0.9713
	F_{macro}	0.8227	0.7501	0.7505	0.7345	0.9729
KDD 99	BA	0.7585	0.7812	0.8541	0.7495	0.8366
	F_{macro}	0.7564	0.7798	0.8012	0.7682	0.7923
covtype	BA	0.8888	0.8707	0.8612	0.8545	0.8616
	F_{macro}	0.8901	0.8709	0.8688	0.8588	0.8442
GSD	BA	0.7185	0.6345	0.6111	0.6357	0.9291
	F_{macro}	0.7199	0.6361	0.6188	0.6412	0.9299
Shuttle	BA	0.4789	0.4477	0.4508	0.4424	0.5015
	F_{macro}	0.5187	0.5112	0.4987	0.4894	0.5205
MNIST	BA	0.8909	0.8498	0.8393	0.8549	0.9772
	F_{macro}	0.8946	0.8501	0.8412	0.8596	0.9773
CIFAR10	BA	0.7199	0.6208	0.7366	0.6218	0.8051
	F_{macro}	0.7208	0.6325	0.7381	0.6295	0.8083

Summary of Discussions: As mentioned in the paper, we increased the label proportion for CDSC-AL method up to 20% and presented the results in Tables 4, 5, and 6. As shown

Table 6: Comparison with supervised approaches when CDSC-AL only uses 20% labeled data.

Datasets	Metric	LB	OBA	AHT	SAMkNN	CDSC-AL
Syn-1	BA	0.7910	0.6640	0.6354	0.6247	0.9234
	F_{macro}	0.7965	0.6675	0.6513	0.6313	0.9184
Syn-2	BA	0.7124	0.7204	0.6926	0.6784	0.8616
	F_{macro}	0.7218	0.7219	0.6977	0.6864	0.8367
Sea	BA	0.8204	0.7498	0.7493	0.7205	0.9715
	F_{macro}	0.8227	0.7501	0.7505	0.7345	0.9758
KDD 99	BA	0.7585	0.7812	0.8541	0.7495	0.8469
	F_{macro}	0.7564	0.7798	0.8012	0.7682	0.7927
covtype	BA	0.8888	0.8707	0.8612	0.8545	0.8809
	F_{macro}	0.8901	0.8709	0.8688	0.8588	0.8668
GSD	BA	0.7185	0.6345	0.6111	0.6357	0.9293
	F_{macro}	0.7199	0.6361	0.6188	0.6412	0.9301
Shuttle	BA	0.4789	0.4477	0.4508	0.4424	0.5223
	F_{macro}	0.5187	0.5112	0.4987	0.4894	0.5445
MNIST	BA	0.8909	0.8498	0.8393	0.8549	0.9816
	F_{macro}	0.8946	0.8501	0.8412	0.8596	0.9824
CIFAR10	BA	0.7199	0.6208	0.7366	0.6218	0.8208
	F_{macro}	0.7208	0.6325	0.7381	0.6295	0.8263

in Tables 4, 5, and 6, the performance of CDSC-AL method improves as the proportion of labeled data increases. More importantly, with 20% labeled data, CDSC-AL achieves the best performance on all benchmark data streams except for the KDD cup 99 and Forest covtype. For KDD cup 99 and Forest covtype, CDSC-AL shows comparable performance using only 20% labeled data.