## 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** |


(a) $BA$ (b) $F_{macro}$

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 other 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.


(a) $BA$ (b) $F_{macro}$

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 other 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 method 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** |


(a) $BA$ (b) $F_{macro}$

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 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.

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** |