# Multi-Flow:
# Multi-View-Enriched Normalizing Flows for Industrial Anomaly Detection

Supplementary Material

## 6. Comprehensive Detection Results

We provide the full results for detection of all baselines on all classes of Real-IAD in Tab. 5 and Tab. 6.

| Classes | PaDiM [12] | Cflow [21] | SoftPatch [26] | DeSTSeg [64] | RD [13] | UniAD [58] | PatchCore [48] | SimpleNet [38] | *Multi-Flow* (ours) |
|---|---|---|---|---|---|---|---|---|---|
| Audiojack | 92.2 | 82.0 | 91.0 | 95.3 | 81.9 | 91.2 | 89.3 | 91.2 | **96.56** ± 0.12 |
| Bottle Cap | 98.1 | 98.8 | 99.1 | 92.4 | 93.7 | 97.3 | **99.4** | **99.4** | 98.00 ± 0.14 |
| Button Battery | 88.7 | 96.3 | 91.9 | 93.3 | 83.3 | 87.5 | 90.6 | 95.8 | **96.57** ± 0.16 |
| End Cap | 76.1 | 75.1 | 92.3 | 82.3 | 68.1 | 89.4 | 91.9 | **94.2** | 90.89 ± 0.09 |
| Eraser | **96.5** | 87.2 | 96.1 | 91.9 | 82.9 | 91.2 | 95.6 | 94.7 | 92.81 ± 0.14 |
| Fire Hood | **96.9** | 87 | 87.8 | **96.9** | 81.4 | 83.0 | 89.3 | 95.6 | 95.45 ± 0.10 |
| Mint | 69.1 | 79.1 | 82.1 | 77.7 | 67.7 | 73.0 | 85.7 | 86.8 | **87.84** ± 0.03 |
| Mounts | 98.4 | 98.2 | 99.3 | 99.1 | 92.5 | 97.0 | **99.7** | 99.4 | 99.46 ± 0.02 |
| PCB | 88.4 | 83.1 | 90.3 | 83.6 | 79.3 | 83.2 | 93 | 90.7 | **93.91** ± 0.11 |
| Phone Battery | 91.7 | 91.2 | 91.5 | 98.2 | 89.4 | 93.6 | 95.1 | 94.7 | **98.68** ± 0.06 |
| Plastic Nut | 98.2 | 88.6 | 95.7 | 94.4 | 72.8 | 87.1 | 97.8 | 95.7 | **98.96** ± 0.10 |
| Plastic Plug | 87.4 | 90.0 | 92.5 | 95.6 | 89.3 | 78.0 | **95.7** | 94.4 | 93.85 ± 0.07 |
| Porcelain Doll | 93.8 | 95.1 | 94.7 | 94.6 | 89.6 | 92.8 | 96.1 | **96.2** | 94.37 ± 0.42 |
| Regulator | **96.5** | 85.1 | 82.9 | 93.0 | 92.5 | 55.5 | 86.0 | 92.0 | 94.22 ± 0.22 |
| Rolled Strip Base | 98.6 | 98.8 | 99.7 | 98.9 | 80.3 | 99.3 | **99.7** | 99.6 | 99.57 ± 0.09 |
| SIM Card Set | 94.2 | 95.6 | 98.4 | 98.3 | 89.9 | 94.0 | **99.3** | 99.2 | 98.79 ± 0.04 |
| Switch | 82.1 | 92.9 | 97.8 | 96.6 | 87.3 | 95.3 | 94.6 | 98.8 | **99.27** ± 0.03 |
| Tape | 99.8 | 98.5 | 99.7 | 99.1 | 89.5 | 99.1 | 99.9 | **100** | 97.12 ± 0.12 |
| Terminal Block | 96.9 | 92.2 | 98.2 | 96.1 | 89.8 | 93.8 | 97.5 | 97.7 | **99.09** ± 0.02 |
| Toothbrush | 91.7 | 91.9 | 92.9 | **97.9** | 86.7 | 95.0 | 94.7 | 95.3 | 96.88 ± 0.13 |
| Toy | 91.4 | 78.8 | 91.3 | **96.5** | 75.0 | 77.2 | 92.8 | 92.9 | 96.46 ± 0.19 |
| Toy Brick | 84.3 | 82.9 | 78.2 | 87 | 72.5 | 78.3 | 82.6 | 85.7 | **91.73** ± 0.14 |
| Transistor1 | 90.3 | 96.6 | 99.3 | 99.0 | 94.7 | 99.3 | **99.8** | 99.7 | 98.55 ± 0.07 |
| U Block | 98.3 | 96.7 | 98.3 | 98.5 | 86.9 | 96.3 | **98.8** | 98.5 | 96.57 ± 0.10 |
| USB | 77.0 | 86.1 | 93.8 | 93.3 | 89.4 | 83.1 | 93.9 | 93.9 | **96.83** ± 0.04 |
| USB Adaptor | 93.2 | 86.8 | 91.9 | **93.6** | 65.3 | 85.1 | 90.6 | 93.0 | 93.39 ± 0.18 |
| Vcpill | 94.7 | 87.8 | 93.7 | 96.4 | 87.2 | 89.4 | 96.5 | **97.5** | 95.90 ± 0.11 |
| Wooden Beads | 91.1 | 89.3 | 90.9 | 91.9 | 85 | 82.5 | 91.4 | 92.9 | **94.72** ± 0.16 |
| Woodstick | 81.8 | 83.9 | 73.9 | **90.2** | 71.9 | 76.0 | 74.5 | 81.5 | 89.15 ± 0.19 |
| Zipper | 99.3 | 97.6 | 99.6 | 99.7 | 96.1 | 98.8 | **100** | 99.7 | 99.92 ± 0.00 |
| Average | 91.2 | 89.8 | 92.8 | 94.0 | 83.7 | 88.1 | 93.7 | 94.9 | **95.85** ± 0.02 |

Table 5. Performance in sample-wise anomaly detection on all classes of Real-IAD [54]. Here, the anomaly scores for all images belonging to the same object are aggregated into one value. Best performances are **bold**, with the runner-up underlined. We execute our method for $n = 5$ runs and report mean ± standard deviation.

| Classes | PaDiM [12] | Cflow [21] | SoftPatch [26] | DeSTSeg [64] | RD [13] | UniAD [58] | PatchCore [48] | SimpleNet [38] | *Multi-Flow* (ours) |
|---|---|---|---|---|---|---|---|---|---|
| Audiojack | 66.6 | 74.3 | 88.5 | 81.8 | 82.4 | 82.8 | 86.3 | 87.4 | **90.69** ± 0.06 |
| Bottle Cap | 87.7 | 91.3 | **95.9** | 87.1 | 89.2 | 89.8 | 94.3 | 91.6 | 94.62 ± 0.14 |
| Button Battery | 84.8 | 85.2 | 88.5 | **91.2** | 87.0 | 79 | 87.3 | 88.8 | 89.37 ± 0.16 |
| End Cap | 73.7 | 66.4 | **85.8** | 80.3 | 79.0 | 80.4 | 84.1 | 83.4 | 84.77 ± 0.10 |
| Eraser | 86.7 | 88.1 | **93.5** | 88.2 | 89.2 | 89.6 | 93.4 | 91.2 | 92.08 ± 0.11 |
| Fire Hood | 77.3 | 80.5 | 84.3 | 78.9 | 84.3 | 79.5 | 84.1 | 81.8 | **93.35** ± 0.13 |
| Mint | 66.9 | 70.7 | 74.5 | 70.5 | 71.6 | 67.6 | 76.2 | 77.2 | **79.38** ± 0.11 |
| Mounts | 82.5 | 85.3 | 85.9 | 85.1 | 85.7 | 87.2 | 88 | **88.2** | 84.26 ± 0.11 |
| PCB | 75.0 | 77.3 | 90.8 | 79.6 | 89.5 | 80.5 | **92.4** | 87.1 | 91.79 ± 0.09 |
| Phone Battery | 81.9 | 84.4 | 90.2 | 86.2 | 90.8 | 83.4 | **91.6** | 88.9 | 90.77 ± 0.35 |
| Plastic Nut | 73.8 | 79.8 | 89.3 | 90.2 | 85.0 | 79.3 | **90.8** | 89.3 | 88.04 ± 0.13 |
| Plastic Plug | 80.0 | 83.9 | 88.7 | 86.0 | **90.5** | 78.2 | 89.7 | 87.1 | 88.45 ± 0.11 |
| Porcelain Doll | 74.3 | 76.0 | 86.1 | 83.7 | 87.8 | 84.1 | **88.2** | 86.1 | 86.62 ± 0.23 |
| Regulator | 76.5 | 62.9 | 82.1 | **89.8** | 87.3 | 51.8 | 81.9 | 82.2 | 87.69 ± 0.18 |
| Rolled Strip Base | 97.4 | 97.1 | 99.1 | 98.3 | 94.3 | 98.6 | 98.9 | **99.4** | 98.15 ± 0.12 |
| SIM Card Set | 91.8 | 94.4 | 95.8 | 91.8 | 93.6 | 91.1 | **97.1** | 96.1 | 90.65 ± 0.16 |
| Switch | 80.8 | 83.9 | 94.7 | 92.5 | 87.2 | 85.7 | 89.4 | 94.8 | **96.03** ± 0.12 |
| Tape | 93.7 | 96.0 | 97.9 | 96.1 | 93.1 | 97.2 | **98.2** | 96.9 | 94.32 ± 0.11 |
| Terminal Block | 86.7 | 85.1 | 96.2 | 91.4 | 94.5 | 85.9 | 94.1 | 93.4 | **96.41** ± 0.19 |
| Toothbrush | 74.4 | 79.9 | **89.3** | 87.5 | 83.4 | 82.7 | 88.0 | 86.1 | 85.21 ± 0.17 |
| Toy | 82.5 | 67.8 | 86.7 | 82.1 | 81.5 | 67.3 | 87.3 | 82.2 | **88.31** ± 0.10 |
| Toy Brick | 71.0 | 80.7 | 79.8 | 76.8 | 73.9 | 77.9 | 81.4 | 80.8 | **87.35** ± 0.01 |
| Transistor1 | 86.5 | 92.8 | 97.2 | 95.6 | 95.8 | 94.1 | **97.8** | 97.3 | 94.86 ± 0.14 |
| U Block | 84.1 | 90.5 | 91.6 | 90.1 | 91.7 | 88.8 | **91.9** | 90.7 | 90.45 ± 0.19 |
| USB | 69.7 | 78.1 | 91.2 | 90.3 | 92.1 | 80.9 | 90.7 | 90.0 | **93.37** ± 0.03 |
| USB Adaptor | 81.9 | 75.2 | 86 | 73.1 | 71.9 | 77.3 | 83.8 | 82.7 | **88.07** ± 0.13 |
| Vcpill | 67.4 | 85.8 | 89.6 | 90.0 | 90.2 | 88.6 | **91.4** | 91.1 | 89.50 ± 0.19 |
| Wooden Beads | 82.4 | 87.4 | **89.2** | 86.2 | 87.4 | 80.7 | 88.6 | 85.7 | 87.28 ± 0.05 |
| Woodstick | 79.9 | 78.9 | 76.0 | **89** | 84.2 | 78.9 | 77.2 | 77.9 | 88.04 ± 0.17 |
| Zipper | 90.4 | 93.8 | 97.9 | 98.4 | 97.8 | 98.2 | 98.1 | 98.2 | **98.23** ± 0.08 |
| Average | 80.3 | 82.5 | 89.4 | 86.9 | 87.1 | 82.9 | 89.4 | 88.5 | **90.27** ± 0.02 |

Table 6. Performance in image-wise anomaly detection on all classes of Real-IAD [54]. Here, the anomaly scores for all images belonging to the same object are aggregated into one value. Best performances are **bold**, with the runner-up underlined. We execute our method for $n = 5$ runs and report mean ± standard deviation.

| Metrics | PaDiM [12] | Cflow [21] | SoftPatch [26] | DeSTSeg [64] | RD [13] | UniAD [58] | PatchCore [48] | SimpleNet [38] | *Multi-Flow* (ours) |
|---|---|---|---|---|---|---|---|---|---|
| AUPRO | 81.8 | 90.5 | 90.8 | 81.5 | **93.8** | 86.1 | 91.5 | 84.6 | 87.91 ± 0.01 |
| Pixel-AUROC | - | - | - | - | - | - | - | - | 96.47 ± 0.00 |

Table 7. **Average** segmentation performance of various methods across all classes in Real-IAD [54]. Pixel-wise AUROC has not been reported for the baselines. Best performances are **bold**, with the runner-up underlined. We execute our method for $n = 5$ runs and report mean ± standard deviation.