

Supplementary Material of IPS for Time Series Classification

I. OVERALL ACCURACY PERFORMANCE

All accuracy results of 85 datasets are presented in Table I. We do the Friedman test among all the methods and Wilcoxon signed rank test between other ten methods and our IPS. The Friedman test is a non-parametric statistical test, to detect the differences in 85 datasets across all compared methods. Our statistical significance is $p < 0.0001$, which is smaller than 0.05. Thus, we reject the null hypothesis, and there is a significant difference among these methods. We further conduct the Wilcoxon test (last row in Table I) against all baselines and find out that all results are statistically significant at $p < 0.05$, except ResNet and COTE (larger than 0.05) in Table I.

TABLE I: Accuracy of our method IPS and related methods on UCR ARCHIVE

| Dataset | RotF | DTW_Rn_1NN | ST | LTS | FS | BSPCOVER | ResNet | COTE | COTE-IPS | BASE | IPS |
|-------------------------------|--------------|------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|
| Adiac | 77.49 | 60.87 | 78.26 | 52.17 | 59.34 | 76.94 | 82.9 | 79.03 | 80.56 | 62.24 | 78.26 |
| ArrowHead | 73.71 | 80 | 73.71 | 84.57 | 59.43 | 80.57 | 84.5 | 81.14 | 84 | 61.14 | 85.14 |
| Beef | 86.67 | 66.67 | 90 | 86.67 | 56.67 | 73.33 | 75.3 | 86.67 | 90 | 50 | 73.33 |
| BeetleFly | 90 | 65 | 90 | 80 | 70 | 90 | 85 | 80 | 90 | 75 | 90 |
| BirdChicken | 85 | 70 | 80 | 80 | 75 | 100 | 88.5 | 90 | 100 | 100 | 100 |
| Car | 80 | 76.67 | 91.67 | 76.67 | 75 | 81.67 | 92.5 | 90 | 90 | 80 | 92.5 |
| CBF | 92.89 | 99.44 | 97.44 | 99.11 | 94 | 99.67 | 99.5 | 99.56 | 99.78 | 68 | 99.78 |
| ChlorineConcentration | 84.74 | 65 | 69.97 | 59.24 | 54.64 | 61.22 | 84.4 | 72.71 | 70.5 | 54.66 | 63.41 |
| CinCECGtorso | 80.58 | 93.04 | 95.43 | 86.96 | 85.94 | 96.47 | 82.6 | 99.49 | 99.49 | 90.5 | 98.72 |
| Coffee | 100 | 100 | 96.43 | 100 | 92.86 | 100 | 100 | 100 | 100 | 95.14 | 100 |
| Computers | 70 | 62.4 | 73.6 | 58.4 | 50 | 67.2 | 81.5 | 74 | 74 | 66.8 | 74 |
| CricketX | 63.33 | 77.95 | 77.18 | 74.1 | 48.46 | 77.08 | 79.1 | 80.77 | 80.77 | 70.48 | 80.28 |
| CricketY | 61.03 | 75.64 | 77.95 | 71.79 | 53.08 | 76.37 | 80.3 | 82.56 | 82.56 | 72.37 | 80.84 |
| CricketZ | 65.64 | 73.59 | 78.72 | 74.1 | 46.41 | 74.1 | 81.2 | 81.54 | 81.54 | 37.44 | 78.46 |
| DiatomSizeReduction | 87.25 | 93.46 | 92.48 | 98.04 | 86.6 | 87.25 | 30.1 | 92.81 | 92.81 | 89.2 | 88.89 |
| DistalPhalanxOutlineCorrect | 75.72 | 72.46 | 77.54 | 77.9 | 75 | 83.17 | 71.7 | 76.09 | 80.17 | 78.83 | 83.67 |
| DistalPhalanxOutlineAgeGroup | 74.82 | 62.59 | 76.98 | 71.94 | 65.47 | 85.25 | 77.1 | 74.82 | 80.55 | 78.31 | 85.25 |
| DistalPhalanxTW | 70.5 | 63.31 | 66.19 | 62.59 | 62.59 | 79.25 | 66.5 | 69.78 | 73.65 | 71.59 | 79.25 |
| Earthquakes | 74.82 | 72.66 | 74.1 | 74.1 | 70.5 | 81.68 | 71.2 | 74.82 | 78.99 | 81.99 | 81.99 |
| ECG200 | 85 | 88 | 83 | 88 | 81 | 92 | 87.4 | 88 | 88 | 88 | 88 |
| ECG5000 | 94.58 | 92.51 | 94.38 | 93.22 | 92.27 | 94.44 | 93.4 | 94.6 | 94.44 | 92.34 | 94.44 |
| ECGFiveDays | 90.82 | 79.67 | 98.37 | 100 | 99.77 | 100 | 97.5 | 99.88 | 99.88 | 77.82 | 99.88 |
| ElectricDevices | 78.58 | 63.08 | 74.7 | 58.75 | 57.9 | 24.24 | 72.9 | 71.33 | 70.6 | 53.99 | 55.47 |
| FaceAll | 91.12 | 80.77 | 77.87 | 74.85 | 62.6 | 76.33 | 83.9 | 91.78 | 85.6 | 70.18 | 76.36 |
| FaceFour | 81.82 | 89.77 | 85.23 | 96.59 | 90.91 | 96.59 | 95.5 | 89.77 | 91.58 | 81.82 | 92.78 |
| FacesUCR | 80.29 | 90.78 | 90.59 | 93.9 | 70.59 | 78.29 | 95.5 | 94.24 | 93.9 | 67.61 | 80.58 |
| FiftyWords | 66.15 | 76.48 | 70.55 | 72.97 | 48.13 | 75.38 | 74 | 79.78 | 79.78 | 70.02 | 77.93 |
| Fish | 82.86 | 83.43 | 98.86 | 96 | 78.29 | 92 | 97.9 | 98.29 | 98.83 | 90.27 | 98.83 |
| FordA | 84.47 | 66.52 | 97.12 | 95.68 | 78.71 | 96.31 | 92 | 95.68 | 94.12 | 63.32 | 84.78 |
| FordB | 77.16 | 59.88 | 80.74 | 91.73 | 72.84 | 90.16 | 91.3 | 80.37 | 85.62 | 82.36 | 91.3 |
| GunPoint | 92 | 91.33 | 100 | 100 | 94.67 | 100 | 99.1 | 100 | 100 | 82.67 | 100 |
| Ham | 71.43 | 60 | 68.57 | 66.67 | 64.76 | 76.19 | 75.7 | 64.76 | 69.68 | 68.57 | 72.38 |
| HandOutlines | 91.08 | 87.84 | 93.24 | 48.11 | 81.08 | 86.7 | 91.1 | 91.89 | 90.62 | 73.8 | 89.9 |
| Haptics | 43.83 | 41.56 | 52.27 | 46.75 | 39.29 | 45.13 | 51.9 | 52.27 | 52.27 | 30.19 | 43.51 |
| Herring | 65.63 | 53.13 | 67.19 | 62.5 | 53.13 | 70.31 | 61.9 | 62.5 | 64.52 | 60.04 | 70.31 |
| InlineSkate | 37.09 | 38.73 | 37.27 | 43.82 | 18.91 | 38.73 | 37.3 | 49.45 | 48.75 | 21.27 | 43.82 |
| InsectWingbeatSound | 63.64 | 57.37 | 62.68 | 60.61 | 48.94 | 57.42 | 50.7 | 65.25 | 63.55 | 17.63 | 56.52 |
| ItalyPowerDemand | 97.28 | 95.53 | 94.75 | 96.02 | 91.74 | 96.5 | 96.3 | 96.11 | 96.11 | 92.63 | 96.6 |
| LargeKitchenAppliances | 60.8 | 79.47 | 85.87 | 70.13 | 56 | 86.13 | 90 | 84.53 | 84.53 | 57.6 | 85.34 |
| Lightning2 | 68.85 | 86.89 | 73.77 | 81.97 | 70.49 | 90.16 | 77 | 86.89 | 90.2 | 84.45 | 90.2 |
| Lightning7 | 72.6 | 71.23 | 72.6 | 79.45 | 64.38 | 71.23 | 84.5 | 80.82 | 80.82 | 67.89 | 80.08 |
| Mallat | 94.93 | 91.43 | 96.42 | 95.01 | 97.61 | 76.8 | 97.2 | 95.39 | 95.39 | 90.54 | 94.69 |
| Meat | 96.67 | 93.33 | 85 | 73.33 | 83.33 | 75 | 96.8 | 91.67 | 92.88 | 93.33 | 93.33 |
| MedicalImages | 77.24 | 74.74 | 66.97 | 66.45 | 62.37 | 72.09 | 77 | 75.79 | 75.79 | 68.46 | 75.99 |
| MiddlePhalanxOutlineCorrect | 80.07 | 76.63 | 79.38 | 78.01 | 72.85 | 64.67 | 56.9 | 80.41 | 80.41 | 60.82 | 77.84 |
| MiddlePhalanxOutlineAgeGroup | 57.14 | 51.95 | 64.29 | 57.14 | 54.55 | 80.5 | 80.9 | 63.64 | 72.56 | 70.56 | 80.9 |
| MiddlePhalanxTW | 62.99 | 50.65 | 51.95 | 50.65 | 53.25 | 63.16 | 48.4 | 57.14 | 61.48 | 60.18 | 65.47 |
| MoteStrain | 88.02 | 86.58 | 89.7 | 88.34 | 77.72 | 91.07 | 92.8 | 93.69 | 93.69 | 85.54 | 93.23 |
| NonInvasiveFatalECGThorax1 | 90.53 | 82.9 | 94.96 | 25.9 | 71.04 | 91.47 | 94.5 | 93.13 | 93.13 | 56.74 | 92.06 |
| NonInvasiveFatalECGThorax2 | 92.47 | 87.02 | 95.11 | 77.05 | 75.37 | 93.82 | 94.6 | 94.55 | 94.55 | 90.05 | 94.6 |
| OliveOil | 86.67 | 86.67 | 90 | 16.67 | 73.33 | 83.33 | 83 | 90 | 90 | 83.33 | 86.67 |
| OSULeaf | 57.02 | 59.92 | 66.69 | 77.69 | 67.77 | 83.88 | 97.9 | 96.69 | 95.45 | 57.44 | 71.49 |
| PhalangesOutlinesCorrect | 86.01 | 76.11 | 76.34 | 76.46 | 74.36 | 78.44 | 83.9 | 77.04 | 79.63 | 73.52 | 80.97 |
| Phoneme | 12.97 | 22.68 | 32.07 | 21.84 | 17.35 | 20.73 | 33.4 | 34.92 | 33.58 | 18.41 | 28.43 |
| Plane | 99.05 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| ProximalPhalanxOutlineCorrect | 86.25 | 79.04 | 88.32 | 84.88 | 80.41 | 84.54 | 85.3 | 86.94 | 86.94 | 82.35 | 86.94 |

TABLE I: Accuracy of our method IPS and related methods on UCR ARCHIVE (continued)

| Dataset | RotF | DTW_Rn_INN | ST | LTS | FS | BSPCOVER | ResNet | COTE | COTE-IPS | BASE | IPS |
|--------------------------------|--------------|------------|--------------|--------------|------------|--------------|-------------|--------------|--------------|-------|--------------|
| ProximalPhalanxOutlineAgeGroup | 85.37 | 78.54 | 84.39 | 83.41 | 78.05 | 81.95 | 92.1 | 85.37 | 86.34 | 79.61 | 88.78 |
| ProximalPhalanxTW | 82.44 | 76.1 | 80.49 | 77.56 | 70.24 | 79.75 | 78 | 78.05 | 79.75 | 75.46 | 80.48 |
| RefrigerationDevices | 56.53 | 44 | 58.13 | 51.47 | 33.33 | 54.67 | 52.5 | 54.67 | 58.67 | 49.87 | 78.33 |
| ScreenType | 44 | 41.07 | 52 | 42.93 | 41.33 | 51.73 | 62.2 | 54.67 | 56.8 | 48.23 | 60.7 |
| ShapeletSim | 41.11 | 69.44 | 95.56 | 95 | 100 | 84.44 | 77.9 | 96.11 | 96.67 | 54.44 | 84.33 |
| ShapesAll | 74.33 | 80.17 | 84.17 | 76.83 | 58 | 83.33 | 92.1 | 89.17 | 90.35 | 80.37 | 90.35 |
| SmallKitchenAppliances | 72.8 | 67.2 | 79.2 | 66.4 | 33.33 | 73.33 | 78.6 | 77.6 | 77.6 | 70.4 | 79.2 |
| SonyAIBORobotSurface1 | 80.87 | 69.55 | 84.36 | 81.03 | 68.55 | 88.35 | 95.8 | 84.53 | 92.4 | 87.35 | 98.5 |
| SonyAIBORobotSurface2 | 80.8 | 85.94 | 93.39 | 87.51 | 79.01 | 93.49 | 97.8 | 95.17 | 93.84 | 82.78 | 91.71 |
| StarlightCurves | 96.93 | 89.83 | 97.85 | 94.66 | 91.78 | 97.06 | 97.2 | 97.96 | 97.96 | 92.58 | 97.85 |
| Strawberry | 97.3 | 94.59 | 96.22 | 91.08 | 90.27 | 94.29 | 98.1 | 95.14 | 96.9 | 87.6 | 96.72 |
| SwedishLeaf | 88.16 | 84.64 | 92.8 | 90.72 | 76.8 | 91.84 | 95.6 | 95.52 | 96 | 88.32 | 94.4 |
| Symbols | 79.3 | 93.77 | 88.24 | 93.17 | 93.37 | 93.37 | 90.6 | 96.38 | 96.38 | 69.45 | 94.1 |
| SyntheticControl | 97.33 | 98.33 | 98.33 | 99.67 | 91 | 99.67 | 99.8 | 100 | 100 | 94.67 | 99.67 |
| ToeSegmentation1 | 53.07 | 75 | 96.49 | 93.42 | 95.61 | 96.49 | 96.3 | 97.37 | 97.37 | 70.18 | 96.49 |
| ToeSegmentation2 | 58.46 | 90.77 | 90.77 | 91.54 | 69.23 | 91.54 | 90.6 | 91.54 | 91.54 | 84.62 | 91.54 |
| Trace | 93 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 100 |
| TwoLeadECG | 97.01 | 86.83 | 99.74 | 99.65 | 92.45 | 99.65 | 100 | 99.3 | 99.3 | 88.85 | 97.1 |
| TwoPatterns | 92.8 | 99.85 | 95.5 | 99.33 | 90.83 | 99.8 | 100 | 100 | 100 | 91.5 | 99.05 |
| UWaveGestureLibraryX | 78.28 | 77.44 | 80.29 | 79.12 | 69.46 | 79.01 | 78 | 82.19 | 82.19 | 75.42 | 80.39 |
| UWaveGestureLibraryY | 71.44 | 70.18 | 73.03 | 70.3 | 59.58 | 64.01 | 67 | 75.85 | 75.85 | 53.81 | 65.21 |
| UWaveGestureLibraryZ | 72.28 | 67.5 | 74.85 | 74.68 | 63.82 | 73.49 | 75 | 75.04 | 75.04 | 66.72 | 75.04 |
| UWaveGestureLibraryAll | 94.44 | 96.23 | 94.22 | 95.34 | 78.87 | 94.95 | 86 | 96.43 | 96.43 | 85.26 | 92.28 |
| Wafer | 99.45 | 99.59 | 100 | 99.61 | 99.68 | 99.81 | 99.9 | 99.98 | 99.98 | 96.24 | 99.51 |
| Wine | 94.44 | 61.11 | 79.63 | 50 | 75.93 | 55.56 | 74.4 | 64.81 | 72.22 | 53.7 | 77.78 |
| WordSynonyms | 59.87 | 74.92 | 57.05 | 60.66 | 43.1 | 68.49 | 62.2 | 75.71 | 76.02 | 63.37 | 72.66 |
| Worms | 61.04 | 53.25 | 74.03 | 61.04 | 64.94 | 60.77 | 79.1 | 62.34 | 65.75 | 58.49 | 66.75 |
| WormsTwoClass | 68.83 | 58.44 | 83.12 | 72.73 | 72.73 | 74.59 | 74.7 | 80.52 | 80.52 | 42.54 | 73.48 |
| Yoga | 82.43 | 84.3 | 81.77 | 83.43 | 69.5 | 88.2 | 87 | 87.67 | 87.67 | 70.53 | 85.73 |
| Total best acc | 9 | 2 | 16 | 9 | 4 | 15 | 19 | 28 | 30 | 3 | 22 |
| Ours 1-to-1 Wins | 63 | 69 | 46 | 58 | 79 | 54 | 41 | 33 | 26 | 79 | - |
| Ours 1-to-1 Draw | 3 | 5 | 8 | 8 | 2 | 14 | 7 | 10 | 17 | 5 | - |
| Ours 1-to-1 Losses | 19 | 11 | 31 | 19 | 4 | 17 | 37 | 42 | 42 | 1 | - |
| Rank Mean | 5.92 | 6.91 | 4.1 | 5.84 | 8.48 | 4.36 | 3.66 | 2.79 | 2.15 | 7.71 | 3.08 |
| Wilcoxon Signed Ranks Test | 0 | 0 | 0.044 | 0 | 0 | 0 | 0.631 | 0.698 | 0.059 | 0 | - |