Original Model Results

**Table 1. SVM Normal Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 94.0 | 1.0 | 5.0 | 3.0 | 2.0 | 1.0 |
| CCW Circle | 1.0 | 97.0 | 6.0 | 2.0 | 1.0 | 2.0 |
| Up Arrow | 3.0 | 0 | 88.0 | 2.0 | 0 | 0 |
| Down Arrow | 0 | 0 | 0 | 93.0 | 1.0 | 3.0 |
| Left Arrow | 2.0 | 2.0 | 1.0 | 0 | 94.0 | 1.0 |
| Right Arrow | 0 | 0 | 0 | 0 | 2.0 | 93.0 |

**Table 2. DTW Normal Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 96.0 | 2.0 | 3.0 | 1.0 | 1.0 | 0 |
| CCW Circle | 1.0 | 96.0 | 0 | 0 | 0 | 2.0 |
| Up Arrow | 0 | 2.0 | 82.0 | 6.0 | 0 | 0 |
| Down Arrow | 1.0 | 0 | 3.0 | 91.0 | 0 | 0 |
| Left Arrow | 0 | 1.0 | 12.0 | 2.0 | 89.0 | 12.0 |
| Right Arrow | 2.0 | 0 | 0 | 0 | 10.0 | 86.0 |

**Table 3. SVM Slow Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 96.0 | 2.0 | 2.0 | 2.0 | 1.0 | 2.0 |
| CCW Circle | 1.0 | 95.0 | 1.0 | 1.0 | 3.0 | 0 |
| Up Arrow | 1.0 | 0 | 97.0 | 3.0 | 2.0 | 4.0 |
| Down Arrow | 0 | 2.0 | 0 | 93.0 | 0 | 2.0 |
| Left Arrow | 2.0 | 0 | 0 | 0 | 92.0 | 3.0 |
| Right Arrow | 0 | 1.0 | 0 | 1.0 | 2.0 | 89.0 |

**Table 4. DTW Slow Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 61.0 | 3.0 | 9.0 | 8.0 | 2.0 | 11.0 |
| CCW Circle | 5.0 | 72.0 | 12.0 | 9.0 | 13.0 | 6.0 |
| Up Arrow | 7.0 | 4.0 | 64.0 | 11.0 | 9.0 | 2.0 |
| Down Arrow | 9.0 | 8.0 | 10.0 | 62.0 | 2.0 | 4.0 |
| Left Arrow | 10.0 | 3.0 | 3.0 | 4.0 | 65.0 | 3.0 |
| Right Arrow | 8.0 | 10.0 | 2.0 | 6.0 | 9.0 | 74.0 |

**Table 5. SVM 45 Degree Tilt Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 93.0 | 3.0 | 5.0 | 1.0 | 0 | 1.0 |
| CCW Circle | 2.0 | 94.0 | 4.0 | 0 | 2.0 | 3.0 |
| Up Arrow | 3.0 | 0 | 88.0 | 1.0 | 1.0 | 0 |
| Down Arrow | 0 | 1.0 | 1.0 | 98.0 | 0 | 1.0 |
| Left Arrow | 1.0 | 2.0 | 0 | 0 | 96.0 | 1.0 |
| Right Arrow | 1.0 | 0 | 2.0 | 0 | 1.0 | 94.0 |

**Table 6. DTW 45 Degree Tilt Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 18.0 | 4.0 | 3.0 | 0 | 2.0 | 4.0 |
| CCW Circle | 3.0 | 21.0 | 5.0 | 0 | 1.0 | 5.0 |
| Up Arrow | 9.0 | 3.0 | 62.0 | 2.0 | 0 | 0 |
| Down Arrow | 68.0 | 72.0 | 30.0 | 98.0 | 82.0 | 73.0 |
| Left Arrow | 2.0 | 0 | 0 | 0 | 15.0 | 3.0 |
| Right Arrow | 0 | 0 | 0 | 0 | 0 | 14.0 |

**Table 7. SVM Shape Execution Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 92.0 | 2.0 | 7.0 | 3.0 | 0 | 1.0 |
| CCW Circle | 1.0 | 95.0 | 2.0 | 1.0 | 3.0 | 3.0 |
| Up Arrow | 3.0 | 2.0 | 90.0 | 2.0 | 2.0 | 1.0 |
| Down Arrow | 2.0 | 0 | 0 | 91.0 | 2.0 | 3.0 |
| Left Arrow | 2.0 | 1.0 | 0 | 2.0 | 92.0 | 1.0 |
| Right Arrow | 0 | 0 | 1.0 | 1.0 | 1.0 | 91.0 |

**Table 8. DTW Shape Execution Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 91.0 | 2.0 | 1.0 | 5.0 | 0 | 1.0 |
| CCW Circle | 1.0 | 89.0 | 1.0 | 2.0 | 1.0 | 2.0 |
| Up Arrow | 3.0 | 3.0 | 85.0 | 3.0 | 4.0 | 1.0 |
| Down Arrow | 1.0 | 1.0 | 3.0 | 87.0 | 1.0 | 4.0 |
| Left Arrow | 2.0 | 4.0 | 8.0 | 1.0 | 88.0 | 2.0 |
| Right Arrow | 2.0 | 1.0 | 2.0 | 2.0 | 6.0 | 90.0 |

Updated Model Results

**Table 9. SVM SMOTE Normal Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 95.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 |
| CCW Circle | 2.0 | 98.0 | 1.0 | 2.0 | 1.0 | 2.0 |
| Up Arrow | 0 | 0 | 96.0 | 1.0 | 0 | 0 |
| Down Arrow | 0 | 0 | 0 | 95.0 | 1.0 | 2.0 |
| Left Arrow | 1.0 | 0 | 0 | 0 | 96.0 | 0 |
| Right Arrow | 2.0 | 1.0 | 2.0 | 0 | 0 | 95.0 |

**Table 10. SVM SMOTE Slow Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 94.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 |
| CCW Circle | 2.0 | 95.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Up Arrow | 0 | 1.0 | 98.0 | 0 | 0 | 0 |
| Down Arrow | 0 | 2.0 | 0 | 96.0 | 0 | 2.0 |
| Left Arrow | 0 | 0 | 0 | 0 | 97.0 | 0 |
| Right Arrow | 4.0 | 1.0 | 0 | 2.0 | 0 | 95.0 |

**Table 11. SVM SMOTE 45 Degree Tilt Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 96.0 | 2.0 | 0 | 1.0 | 1.0 | 1.0 |
| CCW Circle | 2.0 | 95.0 | 1.0 | 2.0 | 2.0 | 2.0 |
| Up Arrow | 0 | 0 | 98.0 | 0 | 0 | 0 |
| Down Arrow | 1.0 | 2.0 | 0 | 97.0 | 0 | 0 |
| Left Arrow | 0 | 0 | 0 | 0 | 97.0 | 0 |
| Right Arrow | 1.0 | 1.0 | 1.0 | 0 | 0 | 97.0 |

**Table 12. SVM SMOTE Shape Execution Traces**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Shapes | CW Circle | CCW Circle | Up Arrow | Down Arrow | Left Arrow | Right Arrow |
| CW Circle | 97.0 | 4.0 | 1.0 | 1.0 | 2.0 | 2.0 |
| CCW Circle | 1.0 | 93.0 | 1.0 | 2.0 | 2.0 | 2.0 |
| Up Arrow | 0 | 0 | 97.0 | 0 | 0 | 0 |
| Down Arrow | 1.0 | 1.0 | 0 | 95.0 | 0 | 2.0 |
| Left Arrow | 0 | 0 | 0 | 0 | 96.0 | 0 |
| Right Arrow | 1.0 | 2.0 | 1.0 | 2.0 | 0 | 94.0 |