

```
.data
train_data:
# Image 0 - Label 7
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# Image 1 - Label 3
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.byte 0, 5, 159, 206, 151, 21, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 2 - Label 8
.byte 8
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.byte 0, 0, 15, 183, 149, 220, 30, 0, 0, 0, 25, 197, 177, 89, 0, 0
.byte 0, 0, 6, 187, 178, 7, 0, 0, 0, 0, 130, 86, 179, 21, 0, 0
.byte 0, 0, 204, 168, 108, 0, 0, 0, 0, 0, 24, 16, 0, 0, 0, 0
# Image 3 - Label 9
.byte 9
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.byte 0, 0, 24, 177, 225, 137, 0, 0, 0, 0, 138, 126, 177, 119, 0, 0
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.byte 0, 0, 0, 167, 113, 0, 0, 0, 0, 0, 0, 88, 18, 0, 0, 0
# Image 4 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 22, 193, 217, 145, 4, 0
.byte 0, 0, 23, 65, 16, 218, 64, 0, 0, 0, 0, 44, 179, 234, 4, 0
.byte 0, 2, 0, 112, 136, 228, 20, 0, 0, 153, 45, 27, 152, 150, 0, 0
.byte 0, 100, 216, 193, 106, 6, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 5 - Label 9
.byte 9
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.byte 0, 0, 8, 126, 94, 148, 0, 0, 0, 0, 97, 51, 48, 182, 0, 0
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.byte 0, 0, 0, 23, 135, 0, 0, 0, 0, 0, 41, 24, 0, 0, 0
# Image 6 - Label 7
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```

```
# Image 7 - Label 7
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.byte 0, 0, 35, 1, 40, 95, 0, 0, 0, 0, 0, 136, 22, 0, 0
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# Image 8 - Label 5
.byte 5
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.byte 0, 39, 126, 126, 144, 84, 0, 0, 0, 0, 12, 33, 8, 0, 0, 0
# Image 9 - Label 4
.byte 4
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.byte 0, 0, 147, 54, 22, 164, 0, 0, 0, 0, 192, 18, 26, 198, 15, 0
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.byte 0, 0, 0, 0, 140, 64, 0, 0, 0, 0, 0, 0, 11, 4, 0, 0
# Image 10 - Label 2
.byte 2
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.byte 0, 0, 84, 51, 8, 126, 0, 0, 0, 0, 76, 32, 72, 97, 0, 0
.byte 0, 0, 104, 121, 162, 15, 93, 1, 0, 0, 171, 216, 132, 165, 77, 0
.byte 0, 0, 85, 26, 86, 30, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 11 - Label 5
.byte 5
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.byte 0, 0, 181, 113, 49, 72, 43, 0, 0, 32, 248, 142, 110, 54, 0, 0
.byte 0, 17, 142, 144, 146, 223, 14, 0, 0, 31, 150, 59, 85, 237, 23, 0
.byte 0, 36, 155, 200, 207, 88, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 12 - Label 6
.byte 6
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.byte 0, 0, 1, 173, 28, 1, 4, 0, 0, 0, 30, 153, 0, 0, 0, 0
.byte 0, 0, 54, 142, 168, 128, 0, 0, 0, 0, 15, 223, 188, 118, 0, 0
.byte 0, 0, 0, 92, 113, 15, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 13 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 27, 103, 106, 53, 0, 0
.byte 0, 0, 141, 54, 8, 112, 0, 0, 0, 0, 131, 0, 51, 79, 0, 0
.byte 0, 0, 86, 85, 120, 2, 0, 0, 0, 0, 1, 113, 111, 51, 0, 0
.byte 0, 0, 0, 98, 94, 116, 0, 0, 0, 0, 0, 4, 34, 5, 0, 0
# Image 14 - Label 1
.byte 1
```

```
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 36, 137, 0, 0, 0  
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.byte 0, 0, 0, 101, 137, 0, 0, 0, 0, 0, 138, 137, 0, 0, 0  
.byte 0, 0, 0, 115, 69, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 15 - Label 7  
.byte 7  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 32, 10, 0, 0, 0  
.byte 0, 0, 67, 175, 103, 0, 0, 0, 0, 0, 6, 66, 136, 1, 0, 0  
.byte 0, 0, 0, 9, 146, 1, 0, 0, 0, 0, 0, 1, 144, 0, 0, 0  
.byte 0, 0, 0, 17, 151, 0, 0, 0, 0, 0, 0, 5, 49, 0, 0, 0  
# Image 16 - Label 4  
.byte 4  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 89, 8, 73, 5, 0, 0  
.byte 0, 0, 211, 25, 135, 45, 0, 0, 0, 0, 199, 13, 81, 125, 0, 0  
.byte 0, 0, 197, 135, 187, 240, 71, 0, 0, 0, 36, 106, 94, 219, 5, 0  
.byte 0, 0, 0, 11, 180, 0, 0, 0, 0, 0, 1, 22, 0, 0  
# Image 17 - Label 8  
.byte 8  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
.byte 0, 2, 65, 127, 132, 127, 106, 9, 0, 106, 153, 28, 46, 141, 100, 6  
.byte 0, 4, 59, 206, 192, 16, 0, 0, 0, 107, 96, 127, 55, 0, 0  
.byte 0, 0, 11, 83, 62, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 18 - Label 0  
.byte 0  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 115, 191, 31, 0, 0  
.byte 0, 0, 72, 209, 79, 182, 22, 0, 0, 0, 184, 79, 0, 88, 140, 0  
.byte 0, 8, 242, 33, 0, 57, 157, 0, 0, 0, 202, 118, 50, 147, 112, 0  
.byte 0, 0, 40, 177, 181, 89, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 19 - Label 7  
.byte 7  
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.byte 0, 0, 2, 114, 200, 213, 23, 0, 0, 0, 65, 132, 74, 133, 0, 0  
.byte 0, 0, 12, 22, 168, 23, 0, 0, 0, 0, 1, 112, 99, 0, 0, 0  
.byte 0, 0, 45, 205, 12, 0, 0, 0, 0, 23, 51, 0, 0, 0, 0  
# Image 20 - Label 9  
.byte 9  
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.byte 0, 0, 45, 119, 62, 94, 0, 0, 0, 0, 111, 39, 129, 42, 0, 0  
.byte 0, 0, 34, 109, 121, 46, 0, 0, 0, 0, 0, 117, 31, 0, 0  
.byte 0, 0, 0, 147, 17, 0, 0, 0, 0, 0, 60, 6, 0, 0  
# Image 21 - Label 3  
.byte 3  
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.byte 0, 45, 36, 36, 92, 103, 0, 0, 0, 3, 79, 167, 40, 0, 0
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.byte 0, 0, 10, 101, 126, 145, 0, 0, 0, 0, 0, 0, 0, 145, 11, 0
.byte 0, 0, 13, 139, 132, 107, 0, 0, 0, 0, 0, 29, 26, 0, 0, 0
# Image 22 - Label 1
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.byte 0, 0, 7, 211, 107, 0, 0, 0, 0, 0, 152, 181, 0, 0, 0
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.byte 0, 0, 0, 8, 152, 0, 0, 0, 0, 0, 47, 0, 0, 0
# Image 23 - Label 7
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.byte 0, 0, 0, 8, 105, 3, 0, 0, 0, 0, 0, 3, 2, 0, 0, 0
# Image 24 - Label 6
.byte 6
.byte 0, 0, 0, 0, 16, 1, 0, 0, 0, 0, 0, 21, 149, 2, 0, 0
.byte 0, 0, 0, 140, 48, 0, 0, 0, 0, 0, 16, 198, 76, 33, 0, 0
.byte 0, 0, 61, 161, 93, 186, 0, 0, 0, 0, 83, 115, 150, 109, 0, 0
.byte 0, 0, 23, 127, 63, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 25 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 56, 6
.byte 0, 0, 0, 61, 172, 80, 6, 0, 0, 0, 12, 136, 11, 0, 0
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.byte 0, 0, 28, 77, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 26 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 114, 195, 135, 1, 0, 0
.byte 0, 0, 59, 21, 178, 15, 0, 0, 0, 24, 112, 190, 217, 138, 52, 0
.byte 0, 86, 120, 70, 46, 62, 198, 13, 0, 0, 66, 34, 35, 87, 170, 3
.byte 0, 0, 61, 152, 179, 122, 21, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 27 - Label 3
.byte 3
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.byte 0, 0, 76, 200, 170, 214, 0, 0, 0, 0, 2, 8, 75, 118, 0, 0
.byte 0, 0, 107, 187, 119, 15, 0, 0, 0, 0, 4, 8, 49, 77, 0, 0
.byte 0, 0, 78, 126, 62, 1, 0, 0, 0, 0, 74, 31, 0, 0, 0, 0
# Image 28 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 36, 139, 110, 8, 0, 0
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.byte 0, 0, 28, 95, 162, 15, 0, 0, 0, 0, 0, 0, 53, 122, 0, 0
.byte 0, 21, 128, 158, 192, 88, 0, 0, 0, 0, 20, 36, 15, 0, 0, 0
```

```
# Image 29 - Label 6
.byte 6
.byte 0, 0, 11, 10, 0, 0, 0, 0, 0, 0, 80, 55, 0, 0, 0, 0
.byte 0, 0, 124, 6, 0, 18, 4, 0, 0, 0, 119, 0, 81, 158, 134, 2
.byte 0, 0, 119, 7, 135, 0, 103, 5, 0, 0, 118, 107, 81, 85, 70, 0
.byte 0, 0, 3, 74, 99, 32, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 30 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 30, 49, 1, 0
.byte 0, 0, 25, 179, 234, 248, 96, 0, 0, 11, 195, 148, 17, 112, 205, 0
.byte 0, 145, 165, 6, 3, 94, 211, 0, 0, 179, 184, 153, 195, 188, 42, 0
.byte 0, 58, 149, 128, 57, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 31 - Label 8
.byte 8
.byte 0, 0, 0, 21, 0, 0, 0, 0, 0, 0, 9, 154, 107, 0, 0
.byte 0, 0, 0, 79, 49, 119, 79, 0, 0, 0, 0, 1, 146, 145, 52, 0
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.byte 0, 51, 138, 53, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 32 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 31, 0
.byte 4, 4, 0, 54, 124, 102, 43, 0, 0, 0, 59, 231, 141, 169, 34, 0
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.byte 0, 0, 84, 71, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0
# Image 33 - Label 9
.byte 9
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.byte 0, 0, 90, 120, 37, 149, 0, 0, 0, 0, 0, 0, 59, 123, 0, 0
.byte 0, 0, 1, 41, 149, 18, 0, 0, 0, 0, 10, 78, 13, 0, 0, 0
# Image 34 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 53, 0, 0, 0
.byte 0, 0, 0, 94, 87, 140, 179, 22, 0, 0, 19, 150, 48, 19, 7, 0
.byte 0, 0, 124, 52, 0, 0, 0, 0, 0, 0, 54, 190, 5, 0, 0, 0
.byte 0, 6, 123, 78, 0, 0, 0, 0, 0, 10, 35, 0, 0, 0, 0, 0, 0
# Image 35 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 104, 7, 0
.byte 0, 0, 0, 103, 202, 6, 0, 0, 0, 0, 14, 236, 78, 0, 0
.byte 0, 0, 1, 154, 175, 5, 0, 0, 0, 0, 52, 237, 38, 0, 0, 0
.byte 0, 0, 123, 140, 0, 0, 0, 0, 0, 0, 10, 14, 0, 0, 0, 0, 0
# Image 36 - Label 8
.byte 8
```

```
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 59, 56, 0
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.byte 0, 27, 180, 154, 41, 0, 0, 0, 0, 0, 4, 2, 0, 0, 0, 0
# Image 37 - Label 7
.byte 7
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.byte 0, 0, 102, 132, 149, 163, 0, 0, 0, 0, 13, 2, 96, 67, 0, 0
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.byte 0, 0, 14, 150, 0, 0, 0, 0, 0, 0, 49, 76, 0, 0, 0, 0
# Image 38 - Label 8
.byte 8
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.byte 0, 0, 0, 163, 42, 142, 17, 0, 0, 0, 0, 143, 8, 141, 6, 0
.byte 0, 0, 0, 118, 159, 39, 0, 0, 0, 0, 38, 135, 73, 0, 0, 0
.byte 0, 0, 134, 134, 41, 0, 0, 0, 0, 0, 20, 22, 0, 0, 0, 0
# Image 39 - Label 8
.byte 8
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.byte 0, 0, 19, 191, 180, 224, 138, 0, 0, 0, 76, 215, 128, 208, 31, 0
.byte 0, 0, 36, 238, 221, 21, 0, 0, 0, 0, 130, 184, 231, 17, 0, 0
.byte 0, 0, 52, 211, 228, 19, 0, 0, 0, 0, 0, 22, 32, 2, 0, 0
# Image 40 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 127, 214, 90, 0, 0
.byte 0, 1, 153, 152, 55, 210, 46, 0, 0, 58, 180, 6, 0, 25, 137, 0
.byte 0, 134, 69, 0, 0, 0, 141, 2, 0, 114, 116, 2, 24, 117, 172, 0
.byte 0, 12, 151, 214, 204, 136, 16, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 41 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 105, 64, 10, 0
.byte 0, 0, 0, 42, 90, 117, 0, 0, 0, 0, 0, 77, 149, 82, 7, 0
.byte 0, 0, 1, 149, 60, 4, 14, 0, 0, 0, 43, 164, 53, 0, 0, 0
.byte 0, 0, 65, 180, 9, 0, 0, 0, 0, 0, 4, 26, 0, 0, 0, 0, 0
# Image 42 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 122, 168, 150, 178, 117, 0, 0, 0, 4, 0, 10, 148, 61, 0, 0
.byte 0, 0, 8, 165, 59, 0, 0, 0, 0, 0, 24, 183, 67, 57, 30, 0
.byte 0, 0, 0, 51, 108, 108, 82, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 43 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 33, 32, 0, 0, 0, 0
.byte 0, 25, 239, 219, 174, 111, 4, 0, 0, 117, 179, 15, 14, 137, 108, 0
```

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.byte 0, 86, 218, 33, 0, 35, 215, 8, 0, 0, 116, 228, 198, 194, 199, 10
.byte 0, 0, 0, 30, 77, 70, 7, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 44 - Label 8
.byte 8
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.byte 0, 43, 152, 34, 1, 11, 53, 21, 0, 16, 104, 93, 64, 156, 71, 3
.byte 0, 0, 1, 101, 184, 108, 2, 0, 0, 0, 40, 221, 106, 188, 16, 0
.byte 0, 0, 4, 93, 80, 10, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 45 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 68, 132, 110, 14
.byte 0, 0, 5, 125, 123, 60, 38, 9, 0, 6, 174, 122, 3, 0, 0, 0
.byte 0, 19, 186, 145, 97, 4, 0, 0, 0, 4, 21, 122, 78, 0, 0
.byte 0, 0, 86, 156, 201, 51, 0, 0, 0, 0, 3, 27, 11, 0, 0, 0
# Image 46 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 62, 27, 43, 121, 16
.byte 0, 0, 40, 236, 252, 230, 134, 8, 0, 0, 166, 252, 252, 95, 0, 0
.byte 0, 0, 43, 77, 120, 172, 0, 0, 0, 95, 198, 36, 172, 130, 0, 0
.byte 0, 57, 226, 240, 158, 18, 0, 0, 0, 0, 16, 34, 1, 0, 0, 0
# Image 47 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 65, 100, 113, 74, 0, 0, 0, 0, 3, 0, 1, 120, 22, 0, 0
.byte 0, 0, 0, 0, 99, 63, 63, 6, 0, 0, 0, 22, 162, 64, 12, 0
.byte 0, 0, 0, 90, 66, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 48 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 1, 68, 93, 25, 0, 0, 0
.byte 0, 34, 77, 29, 123, 43, 0, 0, 0, 0, 0, 50, 91, 0, 0
.byte 0, 0, 2, 72, 161, 26, 6, 10, 0, 0, 90, 192, 111, 109, 79, 15
.byte 0, 0, 59, 36, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 49 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 44, 98, 21, 0, 0
.byte 0, 0, 30, 121, 115, 151, 48, 0, 0, 0, 131, 25, 4, 43, 92, 0
.byte 0, 0, 123, 0, 0, 123, 19, 0, 0, 7, 141, 0, 43, 95, 0, 0
.byte 0, 0, 142, 107, 135, 10, 0, 0, 0, 0, 10, 36, 4, 0, 0, 0
# Image 50 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 27, 80, 0, 0, 0
.byte 0, 0, 0, 36, 119, 0, 0, 0, 0, 0, 36, 124, 0, 0, 0
.byte 0, 0, 0, 18, 150, 0, 0, 0, 0, 0, 0, 5, 135, 0, 0, 0
.byte 0, 0, 0, 2, 115, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
```

```
# Image 51 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 42, 176, 167, 85, 0, 0, 0, 19, 222, 127, 11, 0, 0
.byte 15, 68, 6, 42, 79, 125, 0, 0, 4, 108, 129, 47, 124, 86, 0, 0
.byte 0, 0, 44, 104, 58, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 52 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 19, 55, 44, 0, 0
.byte 0, 0, 96, 196, 133, 150, 48, 0, 0, 0, 171, 71, 60, 91, 23, 0
.byte 0, 0, 27, 99, 191, 97, 0, 0, 0, 0, 0, 5, 204, 21, 0, 0
.byte 0, 0, 0, 95, 136, 0, 0, 0, 0, 0, 0, 71, 34, 0, 0, 0
# Image 53 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 75, 133, 19, 0, 0
.byte 0, 0, 108, 223, 215, 79, 0, 0, 0, 0, 20, 96, 165, 8, 0, 0
.byte 0, 0, 17, 176, 174, 121, 2, 0, 0, 0, 0, 0, 29, 199, 10, 0
.byte 0, 22, 90, 124, 147, 37, 0, 0, 0, 0, 16, 15, 0, 0, 0, 0
# Image 54 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 43, 99, 4, 0
.byte 0, 0, 16, 147, 217, 253, 99, 0, 0, 3, 182, 108, 39, 243, 86, 0
.byte 0, 111, 111, 0, 23, 214, 20, 3, 0, 133, 23, 44, 199, 87, 2, 2
.byte 0, 44, 180, 187, 54, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 55 - Label 6
.byte 6
.byte 0, 0, 0, 22, 5, 0, 0, 0, 0, 36, 146, 8, 0, 0, 0
.byte 0, 0, 141, 52, 3, 18, 0, 0, 0, 0, 168, 25, 150, 150, 79, 0
.byte 0, 0, 139, 156, 85, 0, 157, 0, 0, 0, 39, 219, 33, 42, 153, 0
.byte 0, 0, 0, 38, 138, 130, 16, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 56 - Label 2
.byte 2
.byte 0, 0, 1, 22, 25, 1, 0, 0, 0, 0, 38, 209, 169, 149, 8, 0
.byte 0, 0, 1, 3, 2, 173, 42, 0, 0, 0, 0, 99, 203, 5, 0
.byte 0, 0, 30, 144, 204, 29, 0, 0, 0, 54, 232, 249, 187, 161, 134, 2
.byte 0, 28, 142, 95, 59, 50, 21, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 57 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 47, 170, 201, 107, 0, 0
.byte 0, 39, 195, 38, 9, 188, 81, 0, 0, 31, 24, 0, 0, 135, 115, 0
.byte 0, 0, 67, 156, 180, 242, 122, 0, 0, 88, 126, 34, 170, 133, 93, 0
.byte 0, 103, 139, 180, 110, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 58 - Label 6
.byte 6
```

```
.byte 0, 0, 0, 0, 1, 55, 14, 0, 0, 0, 0, 0, 90, 109, 1, 0
.byte 0, 0, 0, 61, 109, 0, 0, 0, 0, 28, 148, 4, 0, 0, 0
.byte 0, 0, 121, 51, 87, 155, 37, 0, 0, 0, 155, 181, 96, 116, 6, 0
.byte 0, 0, 15, 64, 37, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 59 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 21, 2, 34, 1, 0
.byte 0, 0, 8, 196, 24, 180, 61, 0, 0, 0, 125, 226, 141, 223, 9, 0
.byte 0, 47, 237, 159, 175, 156, 0, 0, 0, 26, 49, 0, 189, 65, 0, 0
.byte 0, 0, 0, 15, 222, 13, 0, 0, 0, 0, 3, 65, 0, 0, 0
# Image 60 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 20, 65, 106, 67, 2
.byte 0, 8, 172, 141, 92, 188, 214, 32, 0, 87, 123, 3, 151, 84, 168, 18
.byte 0, 125, 84, 116, 143, 73, 109, 0, 0, 129, 162, 199, 107, 134, 5, 0
.byte 0, 21, 178, 193, 96, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 61 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 14, 177, 14, 0
.byte 0, 0, 0, 10, 189, 139, 0, 0, 0, 0, 0, 133, 175, 4, 0, 0
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.byte 0, 0, 57, 208, 18, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 62 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 31, 62, 138, 40, 0
.byte 0, 0, 0, 162, 216, 247, 86, 0, 0, 0, 0, 101, 162, 181, 6, 0
.byte 0, 0, 22, 150, 229, 41, 0, 0, 0, 16, 208, 152, 165, 0, 0, 0
.byte 0, 2, 170, 205, 96, 0, 0, 0, 0, 0, 7, 29, 0, 0, 0, 0, 0
# Image 63 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 56, 10, 0
.byte 0, 0, 2, 108, 1, 137, 0, 0, 0, 0, 90, 66, 29, 116, 0, 0
.byte 0, 0, 112, 141, 153, 70, 0, 0, 0, 0, 4, 33, 137, 11, 0, 0
.byte 0, 0, 0, 0, 145, 0, 0, 0, 0, 0, 0, 17, 0, 0, 0
# Image 64 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 51, 190, 80, 0, 0
.byte 0, 0, 0, 177, 47, 165, 0, 0, 0, 0, 28, 204, 15, 163, 0, 0
.byte 0, 0, 136, 65, 18, 169, 0, 0, 0, 0, 180, 27, 122, 69, 0, 0
.byte 0, 0, 74, 185, 72, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 65 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 127, 114, 0, 0
.byte 0, 0, 0, 69, 76, 97, 0, 0, 0, 0, 0, 94, 29, 0, 0
```

```
.byte 0, 0, 66, 142, 134, 0, 0, 0, 0, 21, 167, 115, 129, 19, 0, 0
.byte 0, 0, 0, 0, 97, 27, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 66 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 4, 92, 0, 0, 0, 17, 0
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.byte 0, 0, 0, 0, 0, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 67 - Label 7
.byte 7
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 36, 151, 140, 148, 0, 0, 0, 0, 55, 34, 23, 167, 0, 0
.byte 0, 0, 0, 0, 120, 52, 0, 0, 0, 0, 0, 21, 141, 0, 0, 0
.byte 0, 0, 3, 130, 26, 0, 0, 0, 0, 0, 50, 89, 0, 0, 0, 0
# Image 68 - Label 7
.byte 7
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 16, 50, 6, 0, 0
.byte 0, 0, 73, 99, 79, 73, 0, 0, 0, 0, 113, 1, 61, 68, 0, 0
.byte 0, 0, 12, 0, 123, 26, 0, 0, 0, 0, 0, 32, 183, 68, 0, 0
.byte 0, 0, 0, 5, 132, 0, 0, 0, 0, 0, 0, 9, 39, 0, 0, 0
# Image 69 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 32, 124, 0, 0, 0, 0, 0, 0
.byte 0, 190, 90, 0, 14, 66, 2, 0, 0, 217, 124, 63, 93, 238, 64, 0
.byte 0, 89, 210, 173, 129, 202, 97, 0, 0, 0, 0, 0, 0, 102, 175, 0
.byte 0, 0, 0, 0, 0, 37, 202, 0, 0, 0, 0, 0, 0, 0, 0, 18, 0
# Image 70 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 7, 80, 0
.byte 0, 0, 0, 23, 0, 100, 56, 0, 0, 0, 62, 91, 30, 129, 0, 0
.byte 0, 2, 195, 100, 171, 20, 0, 0, 0, 0, 45, 55, 120, 0, 0, 0
.byte 0, 0, 0, 128, 19, 0, 0, 0, 0, 0, 0, 20, 0, 0, 0, 0
# Image 71 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 68, 57, 0, 0, 0
.byte 0, 0, 88, 135, 148, 108, 1, 0, 0, 0, 153, 2, 0, 78, 66, 0
.byte 0, 0, 138, 0, 0, 11, 126, 0, 0, 0, 144, 6, 0, 21, 96, 0
.byte 0, 0, 59, 120, 104, 108, 5, 0, 0, 0, 5, 23, 3, 0, 0
# Image 72 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 16, 122, 21
.byte 0, 0, 0, 12, 175, 196, 12, 0, 0, 0, 8, 183, 173, 12, 0
.byte 0, 0, 22, 168, 168, 21, 0, 0, 0, 6, 166, 169, 5, 0, 0, 0
.byte 0, 130, 190, 12, 0, 0, 0, 0, 0, 21, 10, 0, 0, 0, 0, 0
```

```
# Image 73 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 53, 0, 0, 53, 2
.byte 0, 0, 29, 136, 0, 23, 194, 3, 0, 3, 160, 125, 83, 171, 125, 0
.byte 0, 94, 224, 171, 209, 159, 16, 0, 0, 23, 12, 10, 188, 13, 0, 0
.byte 0, 0, 0, 94, 77, 0, 0, 0, 0, 0, 0, 16, 4, 0, 0, 0
# Image 74 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 85, 39, 0, 49, 38
.byte 0, 0, 188, 185, 106, 127, 192, 75, 0, 0, 160, 134, 204, 100, 6, 0
.byte 0, 0, 110, 240, 30, 0, 0, 0, 0, 0, 53, 196, 183, 25, 0, 0
.byte 0, 0, 10, 180, 234, 129, 0, 0, 0, 0, 0, 3, 17, 7, 0, 0
# Image 75 - Label 6
.byte 6
.byte 0, 0, 0, 49, 8, 0, 0, 0, 0, 0, 26, 138, 3, 0, 0, 0
.byte 0, 0, 104, 99, 0, 0, 0, 0, 0, 0, 109, 94, 62, 42, 0, 0
.byte 0, 0, 36, 232, 107, 151, 62, 0, 0, 0, 0, 86, 180, 130, 104, 0
.byte 0, 0, 0, 0, 18, 60, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 76 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 85, 164, 23, 0, 0
.byte 0, 0, 45, 89, 104, 142, 0, 0, 0, 0, 108, 14, 123, 161, 0, 0
.byte 0, 0, 154, 0, 0, 142, 0, 0, 0, 0, 156, 1, 42, 125, 0, 0
.byte 0, 0, 95, 167, 144, 15, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 77 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 52, 178, 111, 0, 0
.byte 0, 0, 27, 228, 90, 220, 17, 0, 0, 0, 148, 138, 2, 212, 39, 0
.byte 0, 12, 210, 9, 44, 218, 7, 0, 0, 32, 189, 31, 200, 74, 0, 0
.byte 0, 1, 163, 205, 85, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 78 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 159, 122, 2, 0
.byte 0, 0, 0, 62, 177, 64, 105, 0, 0, 0, 10, 163, 38, 8, 156, 0
.byte 0, 0, 145, 109, 0, 108, 89, 0, 0, 15, 201, 16, 94, 152, 1, 0
.byte 0, 8, 172, 179, 95, 6, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 79 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 46, 23, 0, 0
.byte 0, 0, 0, 89, 214, 125, 0, 0, 0, 0, 38, 157, 191, 133, 0, 0
.byte 0, 0, 140, 86, 238, 42, 0, 0, 0, 0, 81, 177, 134, 0, 0, 0
.byte 0, 0, 1, 168, 38, 0, 0, 0, 0, 1, 63, 0, 0, 0, 0, 0
# Image 80 - Label 6
.byte 6
```

```
.byte 0, 0, 0, 1, 64, 1, 0, 0, 0, 0, 63, 73, 0, 0, 0
.byte 0, 0, 0, 115, 4, 0, 0, 0, 0, 1, 107, 0, 0, 0, 0
.byte 0, 0, 15, 131, 137, 69, 0, 0, 0, 9, 171, 158, 60, 0, 0
.byte 0, 0, 0, 35, 47, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 81 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 56, 139, 98, 8, 0, 0
.byte 0, 0, 61, 87, 139, 150, 0, 0, 0, 0, 18, 207, 228, 79, 0, 0
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.byte 0, 0, 29, 168, 213, 132, 0, 0, 0, 0, 0, 0, 20, 10, 0, 0
# Image 82 - Label 6
.byte 6
.byte 0, 0, 0, 4, 24, 0, 0, 0, 0, 0, 124, 92, 0, 0
.byte 0, 0, 0, 67, 90, 0, 0, 0, 0, 0, 8, 147, 2, 0, 0, 0
.byte 0, 0, 67, 159, 124, 124, 0, 0, 0, 0, 78, 97, 93, 97, 0, 0
.byte 0, 0, 23, 126, 60, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 83 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 88, 158, 85, 0, 0, 0, 0, 14, 171, 204, 54, 0, 0
.byte 0, 0, 0, 25, 154, 1, 0, 0, 0, 0, 0, 80, 82, 0, 0, 0
.byte 0, 0, 7, 146, 2, 0, 0, 0, 0, 0, 51, 59, 0, 0, 0, 0, 0
# Image 84 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 47, 135, 114, 58, 28, 0, 0, 0, 135, 71, 136, 116, 42, 0
.byte 0, 0, 9, 56, 155, 14, 31, 0, 0, 0, 0, 15, 136, 0, 0, 0
.byte 0, 0, 0, 119, 42, 0, 0, 0, 0, 0, 1, 111, 0, 0, 0, 0
# Image 85 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 36, 0, 0, 5, 0, 0
.byte 0, 0, 163, 3, 0, 152, 0, 0, 0, 7, 201, 53, 99, 194, 0, 0
.byte 0, 2, 103, 101, 115, 150, 0, 0, 0, 0, 0, 88, 120, 0, 0
.byte 0, 0, 0, 0, 76, 123, 0, 0, 0, 0, 0, 0, 20, 49, 0, 0
# Image 86 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 4, 96, 189, 26, 0, 0
.byte 0, 0, 77, 215, 152, 214, 30, 0, 0, 0, 41, 227, 211, 203, 34, 0
.byte 0, 0, 99, 229, 230, 120, 0, 0, 0, 0, 203, 182, 162, 157, 0, 0
.byte 0, 0, 48, 170, 182, 34, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 87 - Label 6
.byte 6
.byte 0, 0, 0, 0, 11, 50, 0, 0, 0, 0, 24, 157, 58, 0, 0
.byte 0, 0, 6, 190, 80, 0, 0, 0, 0, 0, 61, 190, 0, 0, 0, 0
```

```
.byte 0, 0, 133, 210, 203, 134, 6, 0, 0, 0, 76, 242, 231, 251, 105, 0
.byte 0, 0, 0, 39, 61, 29, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 88 - Label 6
.byte 6
.byte 0, 0, 0, 21, 64, 0, 0, 0, 0, 0, 109, 51, 0, 0
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.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 89 - Label 1
.byte 1
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.byte 0, 0, 0, 0, 165, 0, 0, 0, 0, 0, 0, 33, 147, 0, 0, 0
.byte 0, 0, 0, 75, 93, 0, 0, 0, 0, 0, 0, 94, 75, 0, 0, 0
.byte 0, 0, 0, 83, 32, 0, 0, 0, 0, 0, 0, 10, 3, 0, 0, 0
# Image 90 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 42, 123, 25, 0, 0
.byte 0, 0, 56, 177, 37, 164, 0, 0, 0, 0, 145, 43, 24, 158, 0, 0
.byte 0, 0, 147, 36, 112, 116, 0, 0, 0, 0, 24, 104, 148, 116, 0, 0
.byte 0, 0, 0, 0, 78, 106, 0, 0, 0, 0, 0, 0, 9, 14, 0, 0
# Image 91 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 67, 86, 93, 111, 37, 0, 0, 37, 197, 85, 47, 48, 9
.byte 0, 0, 68, 121, 166, 9, 0, 0, 0, 35, 23, 37, 158, 8, 0, 0
.byte 0, 23, 126, 108, 14, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 92 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 16, 128, 200, 159, 3, 0, 0
.byte 0, 63, 115, 31, 213, 26, 0, 0, 0, 0, 0, 10, 206, 8, 0, 0
.byte 0, 0, 0, 88, 141, 0, 0, 0, 0, 0, 26, 219, 185, 23, 0, 0
.byte 0, 0, 81, 148, 115, 213, 73, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 93 - Label 6
.byte 6
.byte 0, 0, 0, 6, 16, 0, 0, 0, 0, 0, 0, 131, 72, 0, 0
.byte 0, 0, 0, 63, 156, 0, 0, 0, 0, 0, 21, 207, 149, 152, 11, 0
.byte 0, 0, 136, 110, 36, 132, 43, 0, 0, 0, 170, 69, 93, 187, 40, 0
.byte 0, 0, 46, 119, 91, 13, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 94 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 19, 96, 98, 0, 0, 0
.byte 0, 0, 8, 4, 97, 0, 0, 0, 0, 0, 47, 117, 1, 0, 0
.byte 0, 0, 0, 0, 76, 35, 0, 0, 0, 0, 0, 72, 41, 0, 0
.byte 0, 0, 15, 89, 114, 7, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
```

```
# Image 95 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 15, 0, 65, 8, 0, 0
.byte 0, 0, 143, 0, 136, 33, 0, 0, 0, 0, 158, 49, 169, 137, 74, 0
.byte 0, 0, 151, 125, 216, 74, 4, 0, 0, 0, 0, 188, 2, 0, 0
.byte 0, 0, 0, 0, 186, 1, 0, 0, 0, 0, 0, 0, 25, 0, 0, 0
# Image 96 - Label 9
.byte 9
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 14, 43, 1, 0, 0
.byte 0, 0, 99, 120, 130, 71, 0, 0, 0, 20, 182, 58, 109, 91, 0, 0
.byte 0, 0, 80, 129, 182, 130, 0, 0, 0, 0, 0, 123, 72, 0, 0
.byte 0, 0, 0, 6, 222, 29, 0, 0, 0, 0, 0, 0, 65, 7, 0, 0
# Image 97 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 18, 112, 2, 0, 0
.byte 0, 0, 84, 223, 6, 0, 0, 0, 0, 0, 117, 203, 2, 0, 0
.byte 0, 0, 0, 187, 146, 0, 0, 0, 0, 0, 2, 202, 105, 0, 0, 0
.byte 0, 0, 5, 215, 53, 0, 0, 0, 0, 0, 0, 24, 1, 0, 0, 0
# Image 98 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 5, 125, 88, 0, 0
.byte 0, 0, 5, 148, 141, 169, 0, 0, 0, 0, 65, 109, 8, 172, 0, 0
.byte 0, 0, 109, 31, 16, 148, 0, 0, 0, 0, 128, 18, 128, 62, 0, 0
.byte 0, 0, 113, 144, 122, 0, 0, 0, 0, 0, 7, 33, 3, 0, 0, 0
# Image 99 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 14, 92, 0, 0, 0
.byte 0, 0, 1, 138, 25, 12, 0, 0, 0, 0, 47, 161, 95, 140, 0, 0
.byte 0, 0, 46, 197, 212, 87, 0, 0, 0, 0, 0, 167, 10, 0, 0
.byte 0, 0, 0, 15, 100, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 100 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 11, 11, 23, 127, 163, 14, 0
.byte 0, 38, 20, 129, 244, 194, 19, 0, 0, 0, 0, 67, 115, 135, 0, 0
.byte 0, 0, 32, 114, 226, 84, 0, 0, 0, 59, 176, 220, 119, 195, 42, 0
.byte 0, 151, 179, 55, 0, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 101 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 54, 110, 129, 105, 0
.byte 0, 0, 153, 133, 48, 81, 200, 1, 0, 0, 177, 99, 15, 158, 78, 0
.byte 0, 0, 31, 196, 232, 152, 0, 0, 0, 19, 177, 90, 77, 171, 0, 0
.byte 0, 64, 169, 126, 173, 36, 0, 0, 0, 1, 29, 33, 4, 0, 0, 0
# Image 102 - Label 5
.byte 5
```



```
.byte 0, 198, 127, 61, 100, 216, 115, 0, 0, 33, 0, 0, 28, 157, 7, 0
.byte 0, 0, 0, 0, 29, 136, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 110 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 29, 105, 176, 3, 0
.byte 0, 0, 54, 213, 78, 17, 0, 0, 0, 0, 98, 215, 98, 5, 0, 0
.byte 0, 0, 17, 62, 141, 109, 0, 0, 0, 0, 99, 28, 107, 131, 0, 0
.byte 0, 0, 26, 171, 151, 16, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 111 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 9, 5, 0, 29, 0, 0
.byte 0, 0, 136, 13, 70, 148, 0, 0, 0, 0, 159, 135, 207, 99, 0, 0
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.byte 0, 0, 0, 17, 169, 0, 0, 0, 0, 0, 0, 3, 67, 0, 0, 0
# Image 112 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 18, 136, 134, 20, 0, 0
.byte 0, 0, 3, 50, 152, 20, 0, 0, 0, 0, 143, 137, 138, 59, 0, 0
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.byte 0, 0, 24, 165, 161, 5, 0, 0, 0, 0, 0, 21, 13, 0, 0, 0
# Image 113 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 93, 9, 0, 0
.byte 0, 0, 0, 0, 157, 3, 0, 0, 0, 0, 10, 135, 0, 0, 0
.byte 0, 0, 0, 43, 129, 0, 0, 0, 0, 0, 82, 139, 5, 0, 0
.byte 0, 0, 0, 46, 78, 0, 0, 0, 0, 0, 0, 7, 18, 0, 0, 0
# Image 114 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 26, 41, 32, 0, 0, 0
.byte 0, 94, 99, 90, 144, 72, 0, 0, 0, 0, 56, 155, 112, 9, 0, 0
.byte 0, 4, 20, 86, 139, 73, 7, 0, 0, 14, 125, 70, 18, 58, 135, 0
.byte 0, 0, 1, 54, 121, 128, 59, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 115 - Label 5
.byte 5
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 71, 54, 137, 17, 0
.byte 0, 0, 6, 219, 212, 57, 0, 0, 0, 0, 0, 131, 123, 0, 0, 0
.byte 0, 0, 0, 0, 172, 52, 0, 0, 0, 0, 0, 127, 91, 0, 0
.byte 0, 0, 103, 145, 185, 16, 0, 0, 0, 0, 9, 34, 10, 0, 0, 0
# Image 116 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 59, 0, 0
.byte 0, 0, 0, 82, 70, 79, 0, 0, 0, 0, 19, 139, 108, 14, 0, 0
.byte 0, 0, 50, 176, 188, 2, 0, 0, 0, 0, 0, 3, 22, 117, 0, 0, 0
.byte 0, 0, 0, 25, 99, 0, 0, 0, 0, 0, 0, 2, 15, 0, 0, 0
```

```
# Image 117 - Label 2
.byte 2
.byte 0, 0, 0, 5, 69, 3, 0, 0, 0, 0, 0, 2, 136, 129, 0, 0
.byte 0, 0, 0, 0, 0, 133, 5, 0, 0, 0, 8, 28, 13, 145, 4, 0
.byte 0, 107, 148, 192, 230, 172, 5, 0, 0, 120, 129, 99, 17, 77, 86, 0
.byte 0, 0, 0, 0, 0, 32, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 118 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 159, 24, 0, 0
.byte 0, 0, 0, 0, 207, 64, 0, 0, 0, 0, 0, 38, 233, 24, 0, 0
.byte 0, 0, 0, 140, 164, 0, 0, 0, 0, 0, 24, 234, 45, 0, 0, 0
.byte 0, 0, 86, 115, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 119 - Label 1
.byte 1
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 117, 0, 0, 0
.byte 0, 0, 0, 155, 0, 0, 0, 0, 0, 0, 1, 157, 0, 0, 0
.byte 0, 0, 0, 28, 138, 0, 0, 0, 0, 0, 0, 32, 119, 0, 0, 0
.byte 0, 0, 0, 35, 95, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 120 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 9, 0, 0
.byte 0, 3, 95, 170, 203, 217, 0, 0, 0, 33, 154, 25, 167, 82, 0, 0
.byte 0, 0, 15, 150, 110, 0, 4, 7, 0, 0, 130, 174, 118, 129, 118, 40
.byte 0, 0, 90, 113, 72, 19, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 121 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 112, 140, 26, 0, 0, 0
.byte 0, 0, 28, 26, 119, 0, 0, 0, 0, 0, 0, 58, 120, 0, 0, 0
.byte 0, 0, 0, 78, 75, 0, 0, 0, 0, 0, 0, 127, 27, 32, 25, 0
.byte 0, 0, 0, 107, 145, 90, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 122 - Label 8
.byte 8
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 17, 122, 102, 29, 0
.byte 0, 0, 14, 164, 43, 144, 168, 0, 0, 0, 45, 154, 59, 163, 21, 0
.byte 0, 0, 8, 181, 225, 24, 0, 0, 0, 7, 163, 55, 162, 43, 0, 0
.byte 0, 32, 163, 140, 134, 2, 0, 0, 0, 0, 20, 30, 1, 0, 0, 0
# Image 123 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 56, 148, 214, 120, 0, 0
.byte 0, 10, 193, 61, 35, 219, 0, 0, 0, 1, 11, 0, 73, 178, 0, 0
.byte 0, 0, 0, 20, 206, 57, 0, 0, 0, 0, 76, 204, 158, 133, 75, 0
.byte 0, 12, 193, 151, 109, 67, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 124 - Label 7
.byte 7
```

```
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 37, 0, 0
.byte 0, 0, 27, 191, 182, 164, 0, 0, 0, 0, 149, 63, 178, 46, 0, 0
.byte 0, 0, 0, 23, 187, 2, 0, 0, 0, 0, 0, 125, 95, 0, 0, 0
.byte 0, 0, 28, 197, 7, 0, 0, 0, 0, 0, 27, 55, 0, 0, 0, 0
# Image 125 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 66, 208, 65, 0
.byte 0, 0, 0, 40, 188, 107, 113, 0, 0, 0, 47, 181, 28, 73, 99, 0
.byte 0, 22, 187, 22, 1, 129, 33, 0, 0, 108, 98, 15, 105, 113, 0, 0
.byte 0, 29, 168, 167, 65, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 126 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 91, 0, 0, 0
.byte 0, 0, 16, 61, 78, 0, 0, 0, 0, 0, 49, 66, 91, 0, 0, 0
.byte 0, 0, 30, 184, 209, 35, 0, 0, 0, 0, 0, 12, 136, 3, 0, 0
.byte 0, 0, 0, 0, 84, 18, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 127 - Label 0
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 26, 105, 102, 90, 6, 0
.byte 0, 11, 221, 253, 170, 214, 142, 0, 0, 113, 239, 75, 1, 108, 226, 12
.byte 0, 145, 172, 0, 14, 194, 212, 8, 0, 90, 230, 45, 150, 253, 104, 0
.byte 0, 1, 130, 240, 246, 139, 3, 0, 0, 0, 1, 24, 29, 1, 0, 0
# ===== TEST DATA: 1 image (label + 64 pixels) =====
test_data:
# Image 0 - Label 6
.byte 6
.byte 0, 0, 0, 0, 56, 0, 0, 0, 0, 0, 81, 111, 0, 0, 0
.byte 0, 0, 12, 173, 6, 0, 0, 0, 0, 0, 68, 119, 31, 125, 1, 0
.byte 0, 0, 119, 96, 188, 202, 9, 0, 0, 0, 33, 209, 243, 95, 0, 0
.byte 0, 0, 0, 6, 48, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 1 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 67, 165, 42, 0, 0
.byte 0, 0, 0, 48, 7, 118, 0, 0, 0, 0, 0, 2, 112, 0, 0
.byte 0, 0, 12, 95, 163, 93, 0, 0, 0, 0, 123, 128, 127, 44, 0, 0
.byte 0, 0, 120, 112, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 2 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 41, 154, 165, 155, 50, 0, 0
.byte 0, 6, 4, 0, 24, 200, 13, 0, 0, 0, 92, 186, 195, 72, 0, 0
.byte 0, 0, 8, 44, 136, 166, 9, 0, 0, 0, 94, 4, 0, 106, 82, 0
.byte 0, 0, 109, 156, 165, 149, 19, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 3 - Label 7
.byte 7
```

```
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
.byte 10, 88, 85, 92, 74, 10, 0, 0, 1, 8, 3, 15, 157, 53, 0, 0  
.byte 0, 0, 13, 76, 206, 109, 43, 0, 0, 0, 4, 14, 182, 11, 0, 0  
.byte 0, 0, 0, 0, 124, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 4 - Label 2  
.byte 2  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 20, 0, 0, 0, 0  
.byte 0, 58, 183, 197, 187, 35, 0, 0, 0, 42, 13, 0, 108, 76, 0, 0  
.byte 0, 0, 0, 25, 156, 56, 0, 0, 0, 0, 3, 142, 222, 161, 136, 16  
.byte 0, 0, 0, 0, 0, 10, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 5 - Label 2  
.byte 2  
.byte 0, 0, 0, 53, 64, 1, 0, 0, 0, 0, 0, 75, 186, 71, 0, 0  
.byte 0, 0, 0, 0, 20, 164, 0, 0, 0, 0, 0, 0, 5, 168, 0, 0  
.byte 0, 32, 180, 193, 178, 180, 2, 0, 0, 59, 225, 221, 183, 121, 132, 0  
.byte 0, 1, 60, 30, 0, 0, 30, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# Image 6 - Label 3  
.byte 3  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 72, 136, 86, 35, 0, 0  
.byte 0, 0, 41, 105, 236, 201, 0, 0, 0, 0, 3, 181, 143, 42, 0, 0  
.byte 0, 0, 2, 151, 197, 67, 0, 0, 0, 0, 0, 32, 162, 222, 0, 0  
.byte 0, 0, 191, 200, 138, 38, 0, 0, 0, 0, 16, 2, 0, 0, 0, 0  
# Image 7 - Label 4  
.byte 4  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 17, 7, 24, 82, 0, 0  
.byte 0, 0, 167, 26, 41, 172, 0, 0, 0, 18, 183, 0, 36, 167, 0, 0  
.byte 0, 24, 194, 134, 176, 164, 0, 0, 0, 0, 17, 79, 146, 128, 0, 0  
.byte 0, 0, 0, 0, 46, 144, 0, 0, 0, 0, 0, 2, 17, 0, 0  
# Image 8 - Label 7  
.byte 7  
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
.byte 0, 27, 157, 138, 140, 136, 0, 0, 0, 100, 165, 75, 81, 215, 0, 0  
.byte 0, 33, 20, 0, 34, 212, 0, 0, 0, 0, 0, 0, 114, 114, 0, 0  
.byte 0, 0, 0, 0, 196, 21, 0, 0, 0, 0, 32, 178, 2, 0, 0  
# Image 9 - Label 6  
.byte 6  
.byte 0, 0, 0, 0, 1, 22, 0, 0, 0, 0, 0, 111, 93, 0, 0  
.byte 0, 0, 0, 104, 69, 0, 0, 0, 0, 30, 200, 130, 28, 0, 0  
.byte 0, 0, 44, 97, 37, 108, 0, 0, 0, 0, 48, 100, 83, 68, 0, 0  
.byte 0, 0, 3, 99, 82, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0  
# ===== DISTANCE-LABEL PAIRS (2 words per image * 10) =====  
placeholder:  
.byte 0,0
```

```
dist_label_pairs:  
.word 0, 0 # 1  
.word 0, 0 # 2  
.word 0, 0 # 3  
.word 0, 0 # 4  
.word 0, 0 # 5  
.word 0, 0 # 6  
.word 0, 0 # 7  
.word 0, 0 # 8  
.word 0, 0 # 9  
.word 0, 0 # 10  
.word 0, 0 # 11  
.word 0, 0 # 12  
.word 0, 0 # 13  
.word 0, 0 # 14  
.word 0, 0 # 15  
.word 0, 0 # 16  
.word 0, 0 # 17  
.word 0, 0 # 18  
.word 0, 0 # 19  
.word 0, 0 # 20  
.word 0, 0 # 21  
.word 0, 0 # 22  
.word 0, 0 # 23  
.word 0, 0 # 24  
.word 0, 0 # 25  
.word 0, 0 # 26  
.word 0, 0 # 27  
.word 0, 0 # 28  
.word 0, 0 # 29  
.word 0, 0 # 30  
.word 0, 0 # 31  
.word 0, 0 # 32  
.word 0, 0 # 33  
.word 0, 0 # 34  
.word 0, 0 # 35  
.word 0, 0 # 36  
.word 0, 0 # 37  
.word 0, 0 # 38  
.word 0, 0 # 39  
.word 0, 0 # 40  
.word 0, 0 # 41  
.word 0, 0 # 42  
.word 0, 0 # 43
```

```
.word 0, 0 # 44
.word 0, 0 # 45
.word 0, 0 # 46
.word 0, 0 # 47
.word 0, 0 # 48
.word 0, 0 # 49
.word 0, 0 # 50
.word 0, 0 # 51
.word 0, 0 # 52
.word 0, 0 # 53
.word 0, 0 # 54
.word 0, 0 # 55
.word 0, 0 # 56
.word 0, 0 # 57
.word 0, 0 # 58
.word 0, 0 # 59
.word 0, 0 # 60
.word 0, 0 # 61
.word 0, 0 # 62
.word 0, 0 # 63
.word 0, 0 # 64
.word 0, 0 # 65
.word 0, 0 # 66
.word 0, 0 # 67
.word 0, 0 # 68
.word 0, 0 # 69
.word 0, 0 # 70
.word 0, 0 # 71
.word 0, 0 # 72
.word 0, 0 # 73
.word 0, 0 # 74
.word 0, 0 # 75
.word 0, 0 # 76
.word 0, 0 # 77
.word 0, 0 # 78
.word 0, 0 # 79
.word 0, 0 # 80
.word 0, 0 # 81
.word 0, 0 # 82
.word 0, 0 # 83
.word 0, 0 # 84
.word 0, 0 # 85
.word 0, 0 # 86
.word 0, 0 # 87
```

```
.word 0, 0 # 88
.word 0, 0 # 89
.word 0, 0 # 90
.word 0, 0 # 91
.word 0, 0 # 92
.word 0, 0 # 93
.word 0, 0 # 94
.word 0, 0 # 95
.word 0, 0 # 96
.word 0, 0 # 97
.word 0, 0 # 98
.word 0, 0 # 99
.word 0, 0 # 100
.word 0, 0 # 101
.word 0, 0 # 102
.word 0, 0 # 103
.word 0, 0 # 104
.word 0, 0 # 105
.word 0, 0 # 106
.word 0, 0 # 107
.word 0, 0 # 108
.word 0, 0 # 109
.word 0, 0 # 110
.word 0, 0 # 111
.word 0, 0 # 112
.word 0, 0 # 113
.word 0, 0 # 114
.word 0, 0 # 115
.word 0, 0 # 116
.word 0, 0 # 117
.word 0, 0 # 118
.word 0, 0 # 119
.word 0, 0 # 120
.word 0, 0 # 121
.word 0, 0 # 122
.word 0, 0 # 123
.word 0, 0 # 124
.word 0, 0 # 125
.word 0, 0 # 126
.word 0, 0 # 127
.word 0, 0 # 128
```

placeholder:

```
.byte 0,0,0,0
```



```

add x15, x15, x20
addi x13, x13, 1
addi x14, x14, 1
addi x16, x16, 1
j pix_loop
store_pair:
    slli x21, x8, 3
    add x22, x1, x21
    sw x15, 0(x22)
    sw x12, 4(x22)
    addi x4, x4, 65      # next train image
    addi x8, x8, 1
    j train_loop
# ----- Step 2: Selection Sort Top-K -----
step_sort:
    li x10, 0          # x10 = i
outer:
    bge x10, x28, vote_step
    add x11, x10, zero    # x11 = min_idx
    slli x12, x10, 3
    add x13, x1, x12
    lw x14, 0(x13)      # min_dist
    addi x15, x10, 1      # x15 = j
inner:
    bge x15, x7, swap_check
    slli x16, x15, 3
    add x17, x1, x16
    lw x18, 0(x17)      # dist[j]
    blt x18, x14, update_min
    addi x15, x15, 1
    j inner
update_min:
    add x11, x15, zero
    add x14, x18, zero
    addi x15, x15, 1
    j inner
swap_check:
    beq x11, x10, inc_outer
    slli x20, x11, 3
    add x21, x1, x20
    slli x22, x10, 3
    add x23, x1, x22
    lw x24, 0(x21)
    lw x25, 4(x21)

```

```

lw x26, 0(x23)
lw x27, 4(x23)
sw x24, 0(x23)
sw x25, 4(x23)
sw x26, 0(x21)
sw x27, 4(x21)

inc_outer:
    addi x10, x10, 1
    j outer

# ----- Step 3: Voting (No Label Clearing) -----
vote_step:
    li x9, 0          # loop index
    li x10, 0         # max_votes
    li x11, -1        # predicted_label
    li x12, 40         # 10 labels * 4 bytes
    mul x13, x30, x12
    la x14, label_counts
    add x2, x14, x13      # x2 = label_counts[test_idx * 40]

vote_loop:
    bge x9, x28, store_result
    slli x3, x9, 3
    add x4, x1, x3
    lw x5, 4(x4)        # label
    li x6, 9
    bgt x5, x6, next_vote
    slli x31, x5, 2
    add x8, x2, x31
    lw x15, 0(x8)
    addi x15, x15, 1
    sw x15, 0(x8)
    blt x10, x15, update_label
    j next_vote

update_label:
    add x10, x15, zero
    add x11, x5, zero

next_vote:
    addi x9, x9, 1
    j vote_loop

# ----- Step 4: Store Prediction & Loop -----
store_result:
    la x16, Predicted_label
    slli x17, x30, 2
    add x16, x16, x17
    sw x11, 0(x16)

```

```
addi x30, x30, 1
j    test_loop
end:
nop
```

0x10002330	6	6	0	0	0
0x1000232c	99340	12	132	1	0
0x10002328	9	9	0	0	0
0x10002324	98737	177	129	1	0
0x10002320	6	6	0	0	0
0x1000231c	81608	200	62	1	0
0x10002318	6	6	0	0	0
0x10002314	74396	156	34	1	0
0x10002310	6	6	0	0	0
0x1000230c	70290	146	18	1	0

Memory Initialisation

Address	Symbol
0x00000000	main
0x00000010	test_loop
0x0000003c	train_loop
0x00000054	pix_loop
0x00000080	store_pair
0x0000009c	step_sort
0x000000a0	outer
0x000000b8	inner
0x000000d4	update_min
0x000000e4	swap_check
0x00000118	inc_outer
0x00000120	vote_step
0x00000140	vote_loop
0x00000174	update_label
0x0000017c	next_vote
0x00000184	store_result
0x000001a0	end
0x10000000	train_data
0x10002080	test_data
0x1000230a	placeholder_t
0x1000230c	dist_label_pairs
0x1000270c	placeholder
0x10002710	output_dists
0x10002910	label_counts
0x10002938	Predicted_label

File Edit Format View Window Help

Ripes

try viewer

Address	Word	Byte 0	Byte 1
0x1000296c	5	5	0
0x10002968	x	x	x
0x10002964	x	x	x
0x10002960	0	0	0
0x1000295c	6	6	0
0x10002958	7	7	0
0x10002954	4	4	0
0x10002950	3	3	0
0x1000294c	2	2	0
0x10002948	2	2	0
0x10002944	2	2	0
0x10002940	3	3	0
0x1000293c	8	8	0
0x10002938	6	6	0
0x10002934	1	1	0
0x10002930	0	0	0
0x1000292c	0	0	0
0x10002928	4	4	0
0x10002924	0	0	0
0x10002920	0	0	0
0x1000291c	0	0	0
0x10002918	0	0	0
0x10002914	0	0	0
0x10002910	0	0	0

```

mnist_dataset.s
testing_data:
# Image 0 - Label 6
.byte 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 26, 105, 102, 90, 6, 0
.byte 0, 11, 221, 253, 170, 214, 142, 0, 0, 113, 239, 75, 1, 108, 226, 12
.byte 0, 145, 172, 0, 14, 194, 212, 8, 0, 90, 230, 45, 150, 253, 104, 0
.byte 0, 1, 136, 240, 246, 139, 3, 0, 0, 0, 1, 24, 29, 1, 0, 0
# Image 1 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 67, 165, 42, 0, 0
.byte 0, 0, 0, 48, 7, 118, 0, 0, 0, 0, 0, 2, 112, 0, 0
.byte 0, 0, 12, 173, 6, 0, 0, 0, 0, 68, 119, 31, 125, 1, 0
.byte 0, 0, 119, 96, 188, 202, 9, 0, 0, 0, 33, 209, 243, 95, 0, 0
.byte 0, 0, 6, 48, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 2 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 41, 154, 165, 155, 50, 0, 0
.byte 0, 6, 4, 0, 24, 200, 13, 0, 0, 92, 186, 195, 72, 0, 0
.byte 0, 0, 12, 95, 163, 93, 0, 0, 0, 123, 128, 127, 44, 0, 0
.byte 0, 0, 120, 112, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 3 - Label 7
.byte 7
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 16, 88, 95, 92, 74, 10, 0, 0, 1, 8, 3, 15, 157, 53, 0, 0
.byte 0, 0, 13, 76, 206, 109, 43, 0, 0, 0, 4, 14, 182, 11, 0, 0
.byte 0, 0, 0, 124, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 4 - Label 2
.byte 2
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 5 - Label 2
.byte 2
.byte 0, 0, 0, 53, 64, 1, 0, 0, 0, 0, 0, 75, 186, 71, 0, 0
.byte 0, 0, 0, 0, 0, 20, 164, 0, 0, 0, 0, 0, 5, 168, 0, 0
.byte 0, 0, 32, 180, 193, 178, 180, 2, 0, 0, 59, 225, 221, 183, 121, 132, 0
.byte 0, 1, 60, 30, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 6 - Label 3
.byte 3
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 7 - Label 4
.byte 4
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 8 - Label 7
.byte 7
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
# Image 9 - Label 6
.byte 6
.byte 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.byte 0, 0, 0, 104, 69, 0, 0, 0, 0, 0, 30, 200, 130, 28, 0, 0
.byte 0, 0, 44, 97, 37, 108, 0, 0, 0, 0, 48, 100, 83, 68, 0, 0
.byte 0, 0, 3, 99, 82, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

```

Play type: Signed Go to register: Go to section:

Final Memory Location of Predicted Labels

Execution info	
Cycles:	966657
Intrs.retired:	966657
CPI:	1
IPC:	1
Clock rate:	24.10 KHz

Difference?

Reduction of about 3000 cycles

SS of code running : on the 93rd train image. Distance calculation

The screenshot shows the Ripes debugger interface with the following details:

- Processor:** Single-cycle processor (RV32IM).
- Memory:** Cache, Processor, I/O.
- Registers:** GPR (General Purpose Registers) pane showing values for x0 to x22.
- Assembly View:** Shows the source code with annotations for loops and steps. The code includes operations like addi, slli, sw, bge, add, and blt, along with comments for pix_loop, store_pair, train_loop, and vote_step.
- Disassembly View:** Shows the executable code in assembly language, corresponding to the assembly code in the left pane.
- Registers (GPR):**

Name	Alias	Value
x0	zero	0
x1	ra	268444428
x2	sp	2147483632
x3	gp	268435456
x4	tp	268441581
x5	t0	268443376
x6	t1	65
x7	t2	128
x8	s0	93
x9	s1	0
x10	a0	0
x11	a1	0
x12	a2	6
x13	a3	368441527
x14	a4	268443802
x15	a5	49645
x16	a6	25
x17	a7	64
x18	s2	0
x19	s3	0
x20	s4	0
x21	s5	736
x22	s6	268445164
- Display type:** Signed.

SS of code running : on the 112th train image. Distance calculation

The screenshot shows the Ripes debugger interface. On the left, there's a sidebar with icons for Processor, Cache, Memory, and I/O. The main window has tabs for Source code, Input type (Assembly/C), Executable code, View mode (Binary/Disassembled), and GPR. The assembly code is as follows:

```

1016 addi x16, x16, 1
1017 j inner
1018 store_pair
1019 slli x21, x8, 3
1020 add x22, x1, x21
1021 sw x15, 0(x22)
1022 sw x12, 4(x22)
1023 addi x16, x8, 65      # next train image
1024 addi x8, x8, 1
1025 j train_loop
1026 # ----- Step 2: Selection Sort Top-K -----
1027 step_sort:
1028 li x10, 0            # x10 = i
1029 out:
1030 bge x10, x28, vote_step
1031 addi x11, x10, zero  # x11 = min_idx
1032 slli x12, x10, 3
1033 addi x13, x1, x12
1034 lw x14, 0(x13)      # min_dist
1035 addi x15, x10, 1      # x15 = j
1036 inner:
1037 bge x15, x7, swap_check
1038 slli x15, x15, 3
1039 addi x16, x1, x16
1040 lw x17, 0(x17)        # dist[j]
1041 blt x16, x17, update_min
1042 addi x15, x15, 1
1043 j inner
1044 update_min:
1045 addi x11, x15, zero
1046 addi x14, x15, zero
1047 addi x15, x15, 1
1048 j inner
1049 swap_check:
1050 addi x11, x10, inc_outer
1051 slli x20, x11, 3
1052 add x21, x1, x20
1053 slli x22, x10, 3
1054 add x23, x1, x22
1055 lw x24, 0(x21)
1056 lw x25, 4(x20)
1057 lw x26, 8(x23)
1058 lw x27, 12(x23)
1059 sw x24, 0(x23)
1060 sw x25, 4(x23)
1061 sw x26, 8(x21)
1062 sw x27, 12(x21)
1063 inc_outer:
1064 addi x10, x10, 1
1065 j outer
1066 # ----- Step 3: Voting (No Label Clearing) -----
1067 vote_step:
1068 li x10, 0            # loop index
1069 li x10, 0            # max_votes
1070 ...

```

The disassembly table on the right shows the assembly code mapped to memory addresses. The GPR register table on the far right lists registers x0 through x22 with their current values.

Name	Alias	Value
x0	zero	0
x1	ra	268444428
x2	sp	2147483632
x3	gp	268435456
x4	tp	268442736
x5	t0	268443776
x6	t1	65
x7	t2	128
x8	s0	112
x9	s1	0
x10	a0	0
x11	a1	0
x12	a2	3
x13	a3	268442708
x14	a4	268443790
x15	a5	7014
x16	a6	13
x17	a7	64
x18	s2	20
x19	s3	111
x20	s4	529
x21	s5	888
x22	s6	268445316

127th train image, all 64 pixel squared differences is calculated

Source code	Input type:	Assembly	Executable code	View mode:	Binary	Disassembled	GPR
990 # Setup test image pointer 991 la x4, train_data 992 la x5, test_data 993 li x6, 65 # offset per image = 1 label + 64 p: 994 mul x31, x30, x6 995 add x5, x5, x31 # x5 = pointer to current test image 996 la x1, dist_label_pairs # x1 = base of dist-label pairs (rel 997 li x8, 0 # training image index = 0 998 # ----- Step 1: Distance Calculation ----- 999 train_loop: 1000 bge x17, x7, step_sort 1001 lb x12, 0(x4) # x12 = label of train image 1002 addi x13, x4, 1 # x13 = train pixels 1003 addi x14, x5, 1 # x14 = test pixels 1004 li x15, 0 # x15 = dist accumulator 1005 li x16, 0 # pixel index 1006 pix_loop: 1007 addi x17, 64 1008 bge x17, x17, store_pair 1009 lbu x18, 0(x13) 1010 lbu x19, 0(x14) 1011 sub x20, x18, x19 1012 mul x20, x20, x20 1013 addi x15, x15, x20 1014 addi x13, x13, 1 1015 addi x14, x14, 1 1016 addi x16, x16, 1 1017 1018 store_pair: 1019 sll x21, x8, 3 1020 add x22, x1, x21 1021 sw x15, 0(x22) 1022 sw x12, 4(x22) 1023 addi x4, x4, 65 # next train image 1024 addi x8, x8, 1 1025 j train_loop 1026 # ----- Step 2: Selection Sort Top-K ----- 1027 step_sort: 1028 addi x10, 0 # x10 = i 1029 outer: 1030 bge x10, x28, vote_step 1031 add x11, x10, zero # x11 = min_idx 1032 slli x12, x10, 3 1033 add x13, x1, x12 1034 lw x14, 0(x13) # min_dist 1035 addi x15, x10, 1 # x15 = j 1036 inner: 1037 bge x15, x7, swap_check 1038 slli x16, x15, 3 1039 add x17, x1, x16 1040 lw x18, 0(x14) # dist[j] 1041 blt x18, x14, update_min 1042 addi x15, x15, 1 1043	Assembly	Executable code	View mode:	Binary	Disassembled	GPR	
00000000 <main>: 0: 00000033 addi x7 0x128 4: 00050013 addi x28 x8 5 8: 00060093 addi x29 x8 10 c: 00000f13 addi x30 x8 0 00000010 <test_1_loop>: 10: 19df5863 bge x30 x29 400 <end> 14: 10000217 auipc x4 0x10000 18: fec20213 addi x4 -20 1c: 00000073 auipc x4 0x10002 20: 00428293 addi x5 x5 100 24: 04100313 addi x6 x6 65 28: 02670fb3 mul x31 x30 x6 2c: 00000033 addi x31 x31 1 38: 10000297 auipc x1 0x10002 34: 2dc08993 addi x1 x31 732 38: 00000413 addi x8 x8 0 0000003c <train_loop>: 3c: 06745063 bge x8 x7 96 <step_sort> 40: 00020603 lb x10 x4 44: 00120653 addi x13 x4 1 48: 00000033 addi x13 x1 1 4c: 00000793 addi x15 x8 0 50: 00000013 addi x16 x8 0 00000054 <pix_loop>: 54: 00000093 addi x17 x8 64 58: 03150463 bge x18 x17 40 <store_pair> 5c: 0006c903 lbu x18 x8 13 60: 00074983 lbu x19 x8 14 64: 00000033 addi x19 x18 39 68: 03400a33 mul x28 x28 x20 6c: 01478763 addi x15 x15 x20 70: 00160653 addi x13 x13 1 74: 00000033 addi x13 x1 1 78: 00180813 addi x16 x16 1 7c: fd9f00f jal x8 -92 <pix_loop> 00000000 <store_pair>: 80: 00341a93 slli x21 x8 3 84: 01508833 add x22 x1 x21 88: 00fb2023 sw x15 0 x22 8c: 00cb2223 sw x12 4 x22 90: 00000033 addi x12 x12 65 94: 00140413 addi x8 x8 1 98: fa5f00f jal x8 -92 <train_loop> 0000009c <step_sort>: 9c: 00000513 addi x10 x8 0 00000000 <outer>: a0: 00000003 bge x10 x29 128 <vote_step> a4: 00000003 add x11 x1 x29 a8: 00351613 slli x12 x10 3 ac: 00c08663 add x13 x1 x12 b0: 00060763 lw x14 0 x13 b4: 00000003 addi x15 x10 1 x0 zero 0 x1 ra 268444428 x2 sp 2147483632 x3 gp 26843456 x4 tp 268443711 x5 t0 268443776 x6 t1 65 x7 t2 128 x8 s0 127 x9 s1 0 x10 a0 0 x11 a1 0 x12 a2 0 x13 a3 268443776 x14 a4 268443841 x15 a5 606874 x16 a6 64 x17 a7 64 x18 s2 0 x19 s3 0 x20 s4 0 x21 s5 1088 x22 s6 268445436							

Source code Input type: Assembly C Executable code View mode: Binary Disassembled GPR

Name	Alias	Value
x0	zero	0
x1	ra	268444428
x2	sp	2147483632
x3	gp	268435456
x4	tp	268443711
x5	t0	268443776
x6	t1	65
x7	t2	128
x8	s0	127
x9	s1	0
x10	a0	0
x11	a1	0
x12	a2	0
x13	a3	268443776
x14	a4	268443841
x15	a5	606674
x16	a6	64
x17	a7	64
x18	s2	0
x19	s3	0
x20	s4	0
x21	s5	1888
x22	s6	268445436

Display type: Signed

```
998 # Setup test image pointer
999 la x4, train_data
999 la x5, test_data
999 li x6, 65
999 mul x3!, x30, x6
999 add x5, x5, x31
999 lw x1!, dist_label_pairs
999 li x1, 0
999 # training image index = 0
999
999 # ----- Step 1: Distance Calculation -----
999 train_loop:
1000 bge x8, x7, sort_start
1001 lb x12, 0(x4)
1002 addi x13, x4, 1
1003 addi x14, x5, 1
1004 li x15, 0
1005 li x16, 0
1006 pix_loop:
1007 li x17, 64
1008 bge x16, x17, store_pair
1009 lbu x19, 0(x13)
1010 lbu x19, 0(x14)
1011 sub x20, x18, x19
1012 mul x20, x20, x20
1013 add x15, x15, x20
1014 addi x13, x13, 1
1015 addi x14, x14, 1
1016 addi x16, x16, 1
1017 j pix_loop
1018 store_pair:
1019 slli x21, x8, 3
1020 add x22, x21, x21
1021 sw x22, 0(x22)
1022 sw x12, 4(x22)
1023 addi x4, x4, 65
1024 addi x8, x8, 1
1025 j train_loop
1026 # ----- Step 2: Selection Sort Top-K -----
1027 step_sort:
1028 li x10, 0
1029 outer:
1030 bge x10, x28, vote_step
1031 add x11, x10, zero
1032 slli x12, x10, 3
1033 add x13, x11, x12
1034 lw x14, 0(x13)
1035 addi x15, x10, 1
1036 inner:
1037 bge x15, x7, swap_check
1038 slli x16, x15, 3
1039 add x17, x1, x16
1040 lw x18, 0(x17)
1041 blt x18, x14, update_min
1042 addi x15, x15, 1
1043 j inner
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```

Counter reaches 128 and then jumps to sorting loop

Source code Input type: Assembly Executable code View mode: Binary Disassembled GPR

```

990 # Setup test image pointer
991 la x4, train_data
992 la x5, test_data
993 li x1, 128
994 mul x31, x30, x6
995 addi x5, x5, x31
996 la x1, dist_label_pairs
997 li x8, 0
998 # ----- Step 1: Distance Calculation -----
999 train_loop:
1000 bge x8, x7, step_sort
1001 lb x12, 0(x4)
1002 addi x13, x4, 1
1003 addi x14, x5, 1
1004 li x15, 0
1005 li x16, 0
1006 # pixel index
1007 bge x17, 64
1008 bge x18, x17, store_pair
1009 lbu x18, 0(x13)
1010 lbu x19, 0(x14)
1011 sub x20, x18, x19
1012 mul x20, x20, x20
1013 addi x15, x15, x20
1014 addi x13, x13, 1
1015 addi x14, x14, 1
1016 addi x16, x16, 1
1017 j pix_loop
1018 store_pair:
1019 slli x21, x8, 3
1020 add x22, x1, x21
1021 sw x15, 0(x22)
1022 sw x12, 4(x22)
1023 addi x4, x4, 65
1024 addi x8, x8, 1
1025 j train_loop
1026 # ----- Step 2: Selection Sort Top-K -----
1027 step_sort:
1028 li x10, 0
1029 outer:
1030 bge x10, x28, vote_step
1031 add x11, x10, zero
1032 slli x12, x10, 3
1033 add x13, x1, x12
1034 lw x14, 0(x13)
1035 addi x15, x10, 1
1036 inner:
1037 bge x15, x7, swap_check
1038 slli x16, x15, 3
1039 add x17, x1, x16
1040 lw x18, 0(x17)
1041 bit x18, x14, update_min
1042 addi x15, x15, 1
1043 j inner
1044 inc_outer
1045 j outer
1046 update_min:
1047 add x11, x15, zero
1048 add x14, x18, zero
1049 addi x15, x15, 1
1050 j inner
1051 swap_check:
1052 beq x11, x10, inc_outer
1053 slli x20, x11, 3
1054 add x21, x1, x20
1055 slli x22, x10, 3
1056 add x23, x1, x22
1057 lw x24, 0(x21)
1058 lw x25, 4(x21)
1059 lw x26, 0(x23)
1060 lw x27, 4(x23)
1061 eiu x28, 0(x23)

```

00000000 <main>:
0: 08000393 addi x7 x0 128
4: 08000393 addi x28 x0 128
8: 08000093 addi x10 x0 10
c: 08000013 addi x10 x0 0

00000010 <test_loop>:
10: 19df5863 bge x0 x29 400 <end>
14: 10000217 auipc x4 0x10000
18: fe20213 addi x4 x -20
1c: 08000293 addi x5 x0 10002
20: 08000426 addi x6 x0 65
24: 04100313 addi x6 x0 65
28: 02f6fb33 mul x31 x30 x6
32: 01f22b23 add x5 x5 x3
36: 10000002 addi x1 x0 0
34: 2d090933 addi x1 x1 732
38: 00000413 addi x8 x0 0

00000030 <train_loop>:
30: 08740963 bge x8 x7 96 <step_sort>
40: 08020603 lb x12 x0 x4
44: 00020693 addi x13 x4 1
48: 08000093 addi x10 x0 1
4c: 08000793 addi x15 x0 0
50: 00000013 addi x16 x0 0

00000054 <pix_loop>:
54: 04000093 addi x17 x0 64
58: 03185463 bge x16 x17 40 <store_pair>
60: 00000093 lbu x18 x0 x13
64: 41390aa33 sub x20 x18 x19
68: 0340a033 mul x20 x20 x20
6c: 014787b33 add x15 x15 x20
70: 00000093 addi x16 x0 1
74: 00170713 addi x14 x14 1
78: 00188013 addi x16 x16 1
7c: fd9ff0ef jal x0 -40 <pix_loop>

00000080 <store_pair>:
80: 03041a93 slli x21 x8 3
84: 01508033 add x22 x1 x21
88: 00fb2023 sw x15 0 x22
92: 00000093 addi x16 x0 1
96: 04120213 addi x4 x4 65
94: 00140413 addi x8 x8 1
98: fa5ff0ef jal x0 -92 <train_loop>

0000009c <step_sort>:
9c: 00000513 addi x10 x0 0

000000a0 <outer>:
a0: 09c55063 bge x10 x28 128 <vote_step>
a4: 00050953 add x11 x10 x0
a8: 00000013 slli x12 x10 3
ac: 00000093 addi x13 x10 1
b0: 00065703 lw x14 0 x13
b4: 00150793 addi x15 x10 1

00000082 <inner>:
b8: 02770663 bge x15 x7 44 <swap_check>
b9: 00000013 addi x16 x16 1

Display type: Signed

Name	Alias	Value
x0	zero	0
x1	ra	268444428
x2	sp	2147483632
x3	gp	268435456
x4	tp	268443776
x5	t0	268443776
x6	t1	65
x7	t2	128
x8	s0	128
x9	s1	0
x10	a0	0
x11	a1	0
x12	a2	0
x13	a3	268443776
x14	a4	268443841
x15	a5	666874
x16	a6	64
x17	a7	64
x18	s2	0
x19	s3	0
x20	s4	0
x21	s5	1016
x22	s6	268454444

Selection sort

```

15 j train_loop
16 # ----- Step 2: Selection Sort Top-K -----
17 step_sort:
18 li x10, 0
19 outer:
20 bge x10, x28, vote_step
21 add x11, x10, zero
22 slli x12, x10, 3
23 add x13, x1, x12
24 lw x14, 0(x13)
25 addi x15, x10, 1
26 inner:
27 bge x15, x7, swap_check
28 slli x16, x15, 3
29 add x17, x1, x16
30 lw x18, 0(x17)
31 bit x18, x14, update_min
32 addi x15, x15, 1
33 j inner
34 update_min:
35 add x11, x15, zero
36 add x14, x18, zero
37 addi x15, x15, 1
38 j inner
39 swap_check:
40 beq x11, x10, inc_outer
41 slli x20, x11, 3
42 add x21, x1, x20
43 slli x22, x10, 3
44 add x23, x1, x22
45 lw x24, 0(x21)
46 lw x25, 4(x21)
47 lw x26, 0(x23)
48 lw x27, 4(x23)
49 eiu x28, 0(x23)

sc: 0b7450bd nge x8 x / 9b <step_sort>
40: 00020603 lb x12 x0 x4
44: 00120213 addi x11 x4 1
48: 00000373 addi x14 x5 1
4c: 00000793 addi x15 x0 0
50: 00000013 addi x16 x0 0

00000054 <pix_loop>:
54: 04000093 addi x17 x0 64
58: 03185463 bge x16 x17 40 <store_pair>
5c: 00000093 lbu x18 x0 x13
60: 00000093 lbu x19 x0 x12
64: 41390aa33 sub x20 x18 x19
68: 0340a033 mul x20 x20 x20
6c: 014787b33 add x15 x15 x20
70: 00168693 addi x16 x16 1
74: 00170713 addi x14 x14 1
78: 00188013 addi x16 x16 1
7c: fd9ff0ef jal x0 -40 <pix_loop>

00000080 <store_pair>:
80: 03041a93 slli x21 x8 3
84: 01508033 add x22 x1 x21
88: 00fb2023 sw x15 0 x22
92: 00000093 addi x16 x0 1
96: 04120213 addi x4 x4 65
94: 00140413 addi x8 x8 1
98: fa5ff0ef jal x0 -92 <train_loop>

0000009c <step_sort>:
9c: 00000513 addi x10 x0 0

000000a0 <outer>:
a0: 09c55063 bge x10 x28 128 <vote_step>
a4: 00050953 add x11 x10 x0
a8: 00000013 slli x12 x10 3
ac: 00000093 addi x13 x10 1
b0: 00065703 lw x14 0 x13
b4: 00150793 addi x15 x10 1

00000082 <inner>:
b8: 02770663 bge x15 x7 44 <swap_check>
b9: 00000013 addi x16 x16 1

Display type:  Signed



| Name | Alias | Value     |
|------|-------|-----------|
| x4   | tp    | 268443776 |
| x5   | t0    | 268443776 |
| x6   | t1    | 65        |
| x7   | t2    | 128       |
| x8   | s0    | 128       |
| x9   | s1    | 0         |
| x10  | a0    | 0         |
| x11  | a1    | 0         |
| x12  | a2    | 0         |
| x13  | a3    | 268444428 |
| x14  | a4    | 246689    |
| x15  | a5    | 1         |
| x16  | a6    | 8         |
| x17  | a7    | 268444436 |
| x18  | s2    | 284960    |
| x19  | s3    | 0         |
| x20  | e4    | 0         |


```

Initialises the 0th index, distance as the minimum and then compares rest to update the 1st index distance

After finding the minimum out of all of 128 distance label pairs, it

notes the index of the pair where least dist was found in x11. Here it is x11 = 80
notes the least distance memory address in the x21 that is 0x1000258c
And the starting of distance, label pair in x23 that is 0x1000230c

Name	Alias	Value
x9	s1	0x00000000
x10	a0	0x00000000
x11	a1	0x00000050
x12	a2	0x00000000
x13	a3	0x10002320c
x14	a4	0x00011292
x15	a5	0x00000088
x16	a6	0x00000378
x17	a7	0x10002704
x18	s2	0x00003f7a
x19	s3	0x00000000
x20	s4	0x00000280
x21	s5	0x1000258c
x22	s6	0x00000000
x23	s7	0x1000230c
x24	s8	0x00011292
x25	s9	0x00000006
x26	s10	0x0003c3a1
x27	s11	0x00000087
x28	t3	0x00000005
x29	t4	0x0000000a
x30	t5	0xaaaaaaaa

Dist, label pair in X21 and X23 is then swapped , registers x24,x25,x26,x27 hold the min dist, min dist label, starting dist, starting dist label.

Name	Alias	Value
x12	a2	0
x13	a3	268444428
x14	a4	76290
x15	a5	128
x16	a6	1016
x17	a7	268445444
x18	s2	666074
x19	s3	0
x20	s4	640
x21	s5	268445968
x22	s6	0
x23	s7	268444428
x24	s8	76290
x25	s9	6
x26	s10	246689
x27	s11	7
x28	t3	5
x29	t4	10
x30	t5	0
x31	t6	0

As per x21 the memory location is having the least dist-label

0x10002590	6
0x1000258c	70290

This has to be sent to the start of list of K=5 nearest neighbours.

0x10002310	7
0x1000230c	246689
0x10002310	6
0x1000230c	70290

Source code Input type: Assembly C Executable code View mode: Binary Disassembled GPR

```

1020 add x22, x1, x21
1021 sw x15, 0(x22)
1022 sw x12, 4(x22)
1023 addi x4, x4, 65      # next train image
1024 addi x8, x8, 1
1025 j train_loop
1026 # ----- Step 2: Selection Sort Top-K -----
1027 step_sort:
1028    sll x10, 0           # x10 = i
1029 outer:
1030    bge x10, x28, vote_step
1031    add x11, x10, zero   # x11 = min_idx
1032    slli x12, x10, 3
1033    add x13, x1, x12
1034    lw x14, 0(x13)      # min_dist
1035    addi x15, x10, 1     # x15 = j
1036 inner:
1037    bge x15, x7, swap_check
1038    slli x16, x15, 3
1039    add x17, x1, x16
1040    lw x18, 0(x17)      # dist[j]
1041    blt x18, x14, update_min
1042    addi x15, x15, 1
1043    j inner
1044 update_min:
1045    add x11, x15, zero
1046    add x14, x18, zero
1047    addi x15, x15, 1
1048    j inner
1049 swap_check:
1050    beq x11, x10, inc_outer
1051    slli x20, x11, 3
1052    add x21, x1, x20
1053    slli x22, x10, 3
1054    add x23, x22, 2
1055    lw x24, 0(x23)
1056    sw x25, 4(x23)
1057    lw x26, 0(x23)
1058    lw x27, 4(x23)
1059    sw x24, 0(x23)
1060    sw x25, 4(x23)
1061    sw x26, 0(x23)
1062    sw x27, 4(x23)
1063 inc_outer:
1064    addi x10, x10, 1
1065    j outer
1066 # ----- Step 3: Voting (No Label Clearing) -----
1067 vote_step:
1068    li x9, 0              # loop index
1069    li x10, 0             # max_votes
1070    li x11, -1            # predicted_label
1071    li x12, 40             # 10 labels * 4 bytes
1072    mwl v17 <= x10, v12

```

Name	Alias	Value
x9	s1	0
x10	a0	0
x11	a1	80
x12	a2	0
x13	a3	268444428
x14	a4	70298
x15	a5	128
x16	a6	1016
x17	a7	268445444
x18	s2	606874
x19	s3	0
x20	s4	640
x21	s5	268445068
x22	s6	0
x23	s7	268444428
x24	s8	70298
x25	s9	6
x26	s10	246689
x27	s11	7
x28	t3	5
x29	t4	10
x30	t5	0
x31	t6	0

X10 is incremented that means the first nearest neighbour is found.

For the 2nd nearest neighbour, again all 128 pairs is scanned and the least dist's index is stored in x11

That is 12th index in our case

Which is at the memory location specified by register x21 = 0x1000236c

The 1st index location is 0x1000230C + 8 = 0x10002314 that is stored in register x23

Load the above in x24,x25,x26,x27 registers and swap

```

18 store_pair:
19   slli x21, x8, 3
20   add x22, x1, x21
21   sw x22, 0(x22)
22   sw x12, 4(x22)
23   addi x4, x4, 65
24   addi x8, x8, 1
25   j train_loop
26 # ----- Step 2: Selection Sort Top-K -----
27 step_sort:
28   li x10, 0           # x10 = i
29 outer:
30   bge x10, x28, vote_step
31   add x11, x10, zero      # x11 = min_idx
32   slli x12, x10, 3
33   add x13, x11, x12
34   lw x14, 0(x13)          # min_dist
35   addi x15, x10, 1        # x15 = j
36 inner:
37   bge x15, x7, swap_check
38   slli x16, x15, 3
39   add x17, x1, x16
40   lw x18, 0(x17)          # dist[j]
41   blt x18, x14, update_min
42   addi x15, x15, 1
43   j inner
44 update_min:
45   add x11, x15, zero
46   add x14, x18, zero
47   addi x15, x15, 1
48   j inner
49 swap_check:
50   beq x11, x10, inc_outer
51   slli x20, x11, 3
52   add x21, x1, x20
53   slli x22, x10, 3
54   add x23, x21, x22
55   lw x24, 0(x21)
56   lw x25, 4(x21)
57   lw x26, 0(x23)
58   lw x27, 4(x23)
59   sw x24, 0(x23)
60   sw x25, 4(x23)
61   sw x26, 0(x21)
62   sw x27, 4(x21)
63 inc_outer:
64   addi x10, x10, 1
65   slli x24, x1, x24
66   sw x15, 0(x22)
67   sw x12, 4(x22)
68   addi x4, x4, 65           # next train image
69   addi x8, x8, 1
70   j train_loop
71 # ----- Step 2: Selection Sort Top-K -----
72 step_sort:
73   li x10, 0           # x10 = i
74 outer:
75   bge x10, x28, vote_step
76   add x11, x10, zero      # x11 = min_idx
77   slli x12, x10, 3
78   add x13, x11, x12
79   lw x14, 0(x13)          # min_dist
80   addi x15, x10, 1        # x15 = j
81 inner:
82   bge x15, x7, swap_check
83   slli x16, x15, 3
84   add x17, x1, x16
85   add x18, x17, x17      # dist[j]
86   blt x18, x14, update_min
87   addi x15, x15, 1
88   j inner
89 update_min:
90   add x11, x15, zero
91   add x14, x18, zero
92   addi x15, x15, 1
93   j inner
94 swap_check:
95   beq x11, x10, inc_outer
96   slli x20, x11, 3
97   add x21, x1, x20
98   slli x22, x10, 3
99   add x23, x21, x22
100  lw x24, 0(x21)
101  lw x25, 4(x21)
102  lw x26, 0(x23)
103  lw x27, 4(x23)
104  sw x24, 0(x23)
105  sw x25, 4(x23)
106  sw x26, 0(x21)
107  sw x27, 4(x21)
108 inc_outer:
109  addi x10, x10, 1
110  j outer
111 # ----- Step 3: Voting (No Label Clearing) -----
112 vote_step:           # loop index

```

name	alias	value
x9	s1	0
x10	a0	1
x11	a1	12
x12	a2	8
x13	a3	268444436
x14	a4	74396
x15	a5	128
x16	a6	1016
x17	a7	268445444
x18	s2	686074
x19	s3	0
x20	s4	96
x21	s5	268444524
x22	s6	8
x23	s7	268444436
x24	s8	70290
x25	s9	6
x26	s10	246689
x27	s11	7
x28	t3	5
x29	t4	10
x30	t5	0
x10	a0	0x00000001
x11	a1	0x0000000c
x12	a2	0x00000008
x13	a3	0x10002314
x14	a4	0x0001229c
x15	a5	0x00000080
x16	a6	0x000003f8
x17	a7	0x10002704
x18	s2	0x00003f7a
x19	s3	0x00000000
x20	s4	0x00000060
x21	s5	0x1000236c
x22	s6	0x00000008
x23	s7	0x10002314
x24	s8	0x0001229c
x25	s9	0x00000006
x26	s10	0x00045920
x27	s11	0x00000003
x28	t3	0x00000005
x29	t4	0x0000000a
x30	t5	0x00000000
x31	t6	0x00000000

0x10002330	3
0x1000232c	336919
0x10002328	9
0x10002324	223645
0x10002320	8
0x1000231c	289543
0x10002318	3
0x10002314	284960
0x10002310	6
0x1000230c	70290

After

0x10002330	3
0x1000232c	336919
0x10002328	9
0x10002324	223645
0x10002320	8
0x1000231c	289543
0x10002318	6
0x10002314	74396
0x10002310	6
0x1000230c	70290

3rd Swap:

0x10002330	3
0x1000232c	336919
0x10002328	9
0x10002324	223645
0x10002320	6
0x1000231c	81608
0x10002318	6
0x10002314	74396
0x10002310	6
0x1000230c	70290

4th Swap:

0x10002330	3
0x1000232c	336919
0x10002328	9
0x10002324	98737
0x10002320	6
0x1000231c	81608
0x10002318	6
0x10002314	74396
0x10002310	6
0x1000230c	70290

5th Swap:

0x10002330	6
0x1000232c	99340
0x10002328	9
0x10002324	98737
0x10002320	6
0x1000231c	81608
0x10002318	6
0x10002314	74396
0x10002310	6
0x1000230c	70290

0x10002910 is the 0th vote count and so on till **0x10002934**
First predicted label is in **0x10002938**.

Clearly majority voting gives 6 .

0x10002944	0
0x10002940	0
0x1000293c	0
0x10002938	6
0x10002934	1
0x10002930	0
0x1000292c	0
0x10002928	4
0x10002924	0
0x10002920	0
0x1000291c	0
0x10002918	0
0x10002914	0
0x10002910	0

After writing the predicted label , the x30 counter is incremented meaning it has completed prediction of 1st image and moves to the next image.