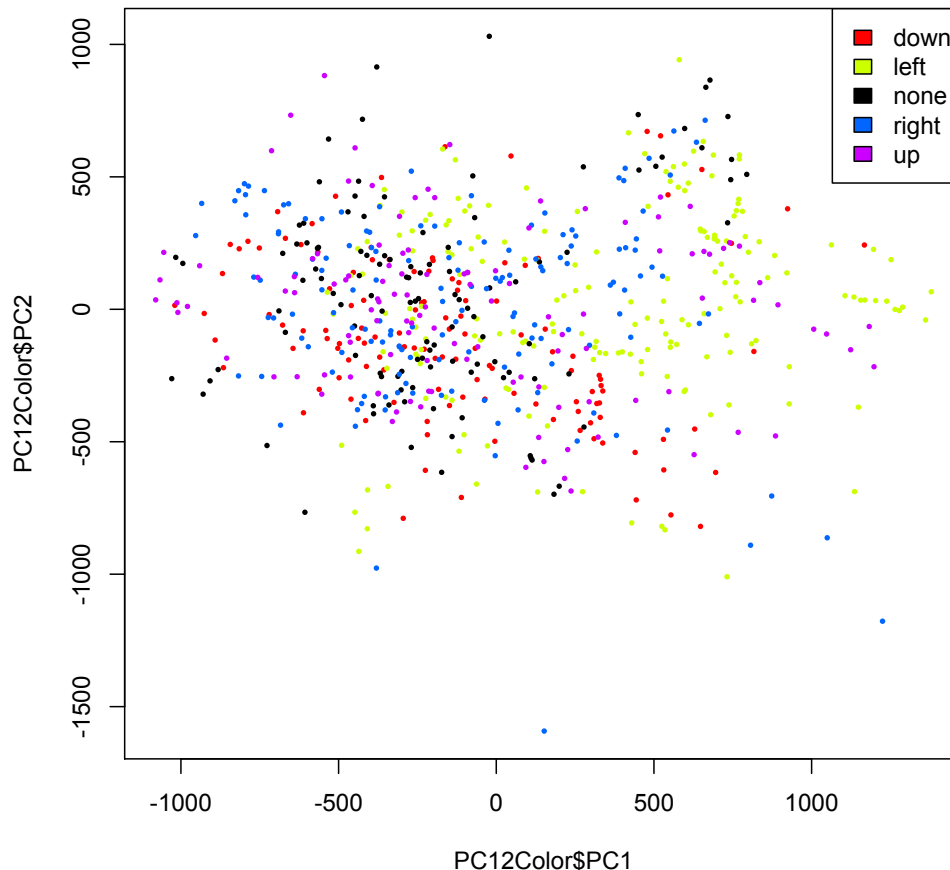## Data Exploration:

Used R to run PCA on the data we generated. The below is the sorted weights in PC1.

```
> source("src/PCA.R")
      X36        X14        X12        X46        X40        X8         X48
0.24024357 0.20823949 0.19452334 0.16893092 0.16309025 0.16227173 0.15972026
      X44        X1         X38        X10        X33        X5         X31
0.15824515 0.15688333 0.15631674 0.15520889 0.15269994 0.15104171 0.15083101
      X22        X3         X2         X6         X11        X24        X30
0.15029290 0.14942104 0.14863893 0.14768767 0.14768250 0.14618076 0.14457811
      X32        X16        X42        X4         X26        X28        X18
0.14395222 0.14362611 0.14361292 0.14257754 0.14249296 0.14188979 0.14126584
      X20        X7         X19        X17        X0         X25        X9
0.13867650 0.13858728 0.13829977 0.13645497 0.13598780 0.13462049 0.13234977
      X21        X27        X34        X29        X13        X23        X43
0.12903823 0.12448434 0.12427052 0.11594806 0.11471603 0.11352637 0.11304308
      X49        X15        X45        X35        X39        X41        X47
0.10337469 0.10126583 0.08961160 0.08876464 0.08616102 0.08017145 0.07688162
      X37
0.06821840
```

2D Visualization:

Data Normalization:

Corresponding keypoints:

https://github.com/CMU-Perceptual-Computing-Lab/openpose/blob/master/doc/output.md

```
// Result for BODY_25 (25 body parts consisting of COCO + foot)
// const std::map<unsigned int, std::string> POSE_BODY_25_BODY_PARTS {
//      {0,  "Nose"},
//      {1,  "Neck"},
//      {2,  "RShoulder"},
//      {3,  "RElbow"},
//      {4,  "RWrist"},
//      {5,  "LShoulder"},
//      {6,  "LElbow"},
//      {7,  "LWrist"},
//      {8,  "MidHip"},
//      {9,  "RHip"},
//      {10, "RKnee"},
//      {11, "RAnkle"},
//      {12, "LHip"},
//      {13, "LKnee"},
//      {14, "LAnkle"},
//      {15, "REye"},
//      {16, "LEye"},
//      {17, "REar"},
//      {18, "LEar"},
//      {19, "LBigToe"},
//      {20, "LSmallToe"},
//      {21, "LHeel"},
//      {22, "RBigToe"},
//      {23, "RSmallToe"},
//      {24, "RHeel"},
//      {25, "Background"}
// };
```
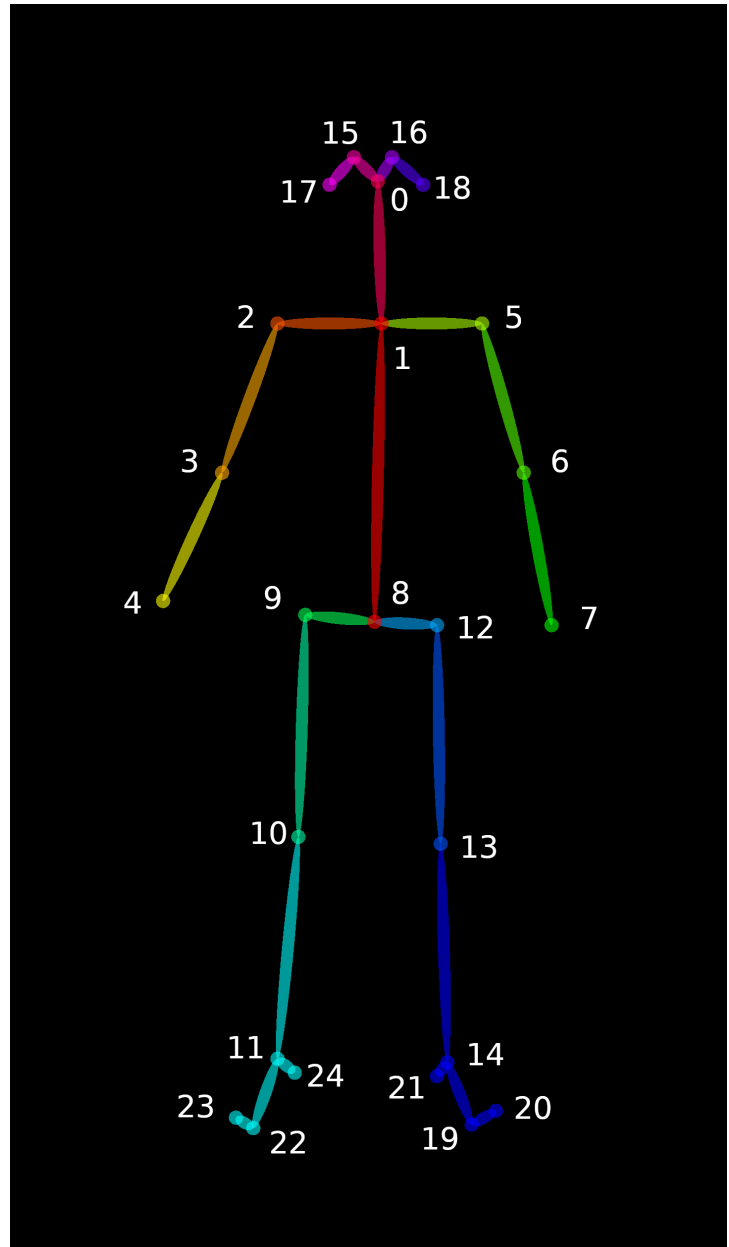
Vector Generating: Positions don't matter.
keypoints[2] - keypoints[3]
keypoints[3] - keypoints[4]
keypoints[5] - keypoints[6]
keypoints[6] - keypoints[7]
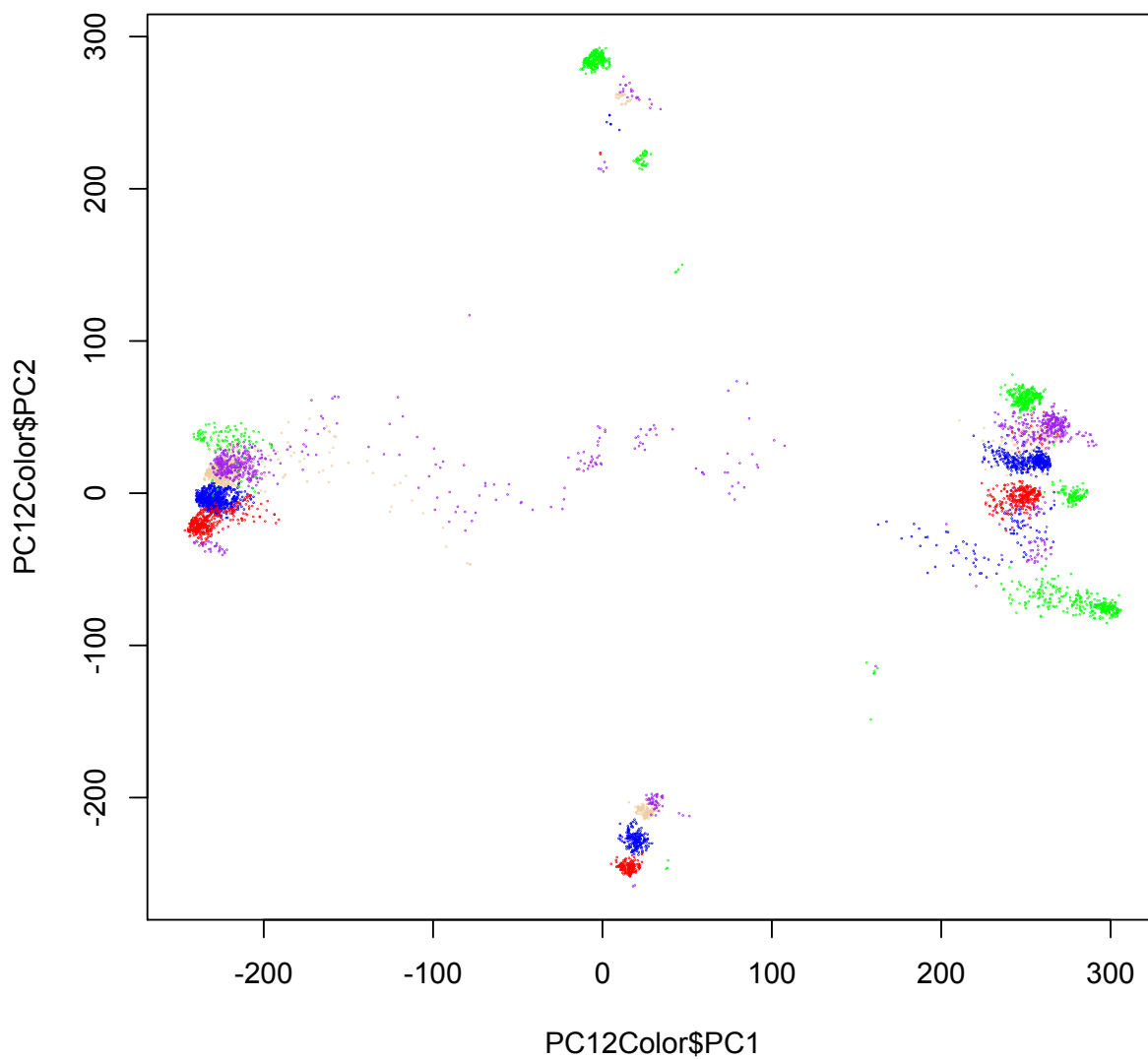keypoints[1] - keypoints[8]
…

Direction generating: Magnitudes don't matter.
tangent(keypoints[:,0] / keypoints[:,1])

Able to reduce the dimension to 25 columns (previous 50).

New Visualization: A lot better.

Preliminary Model Training: Testing Accuracy 0.9909.

Learning Curve

Legend: Training score, validation score, test score

Axis labels: loss (y-axis), epochs (x-axis)