INTELLIGENT RAPID VOICE RECOGNITION

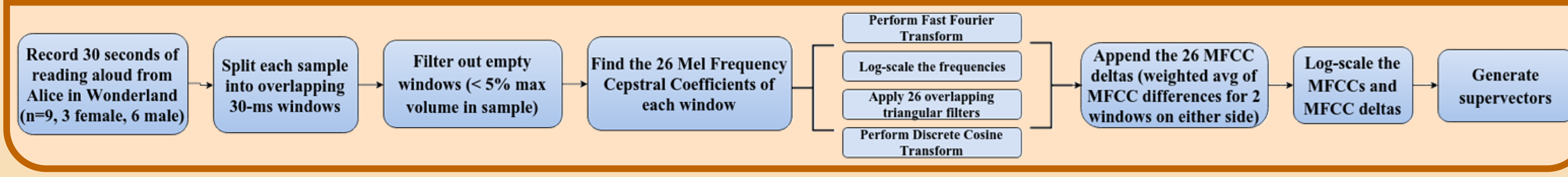
Using Neural Tensor Network, SVM and Reinforcement Learning

Davis Wertheimer, Aashna Garg, James Cranston

QUESTION:

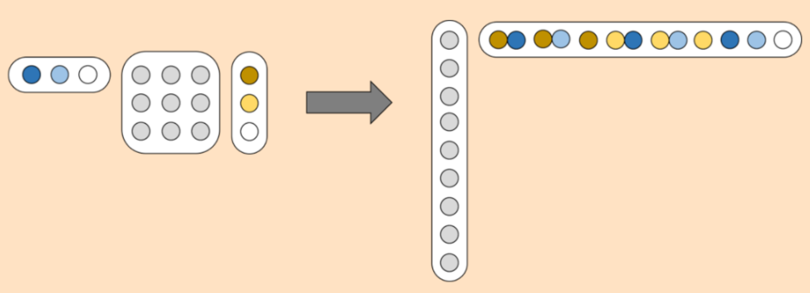
Can we build a voice-recognition system that avoids overfitting by explicitly defining small supervectors, instead of implicitly defining large ones?

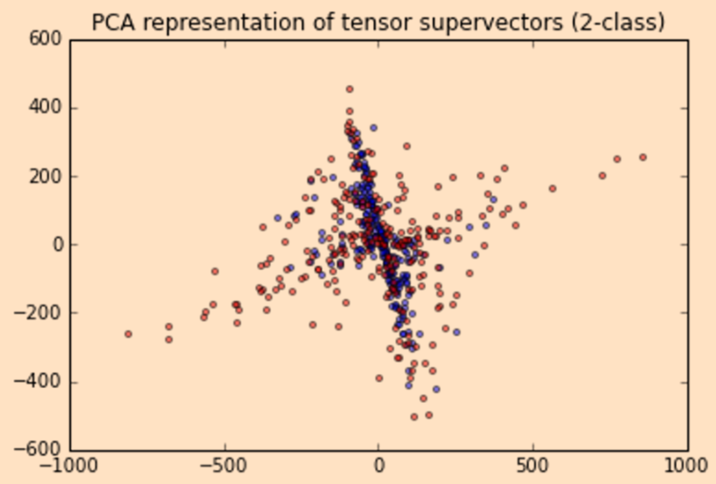
METHODS:



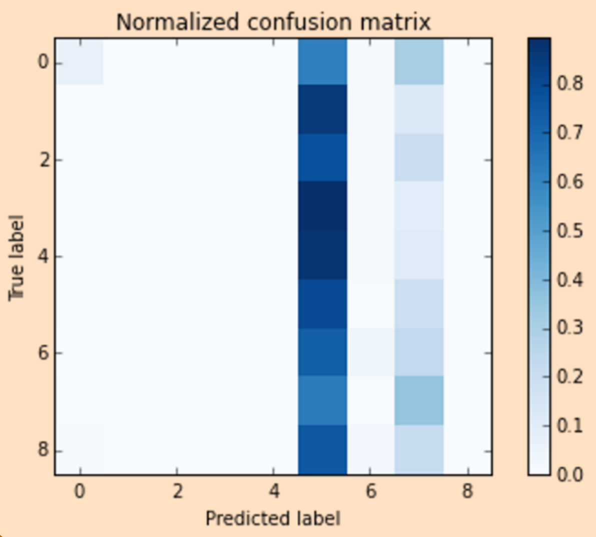
Neural Tensor Network (n=729)

Format:





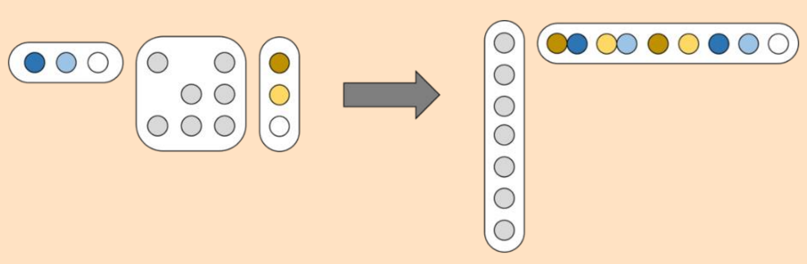
Output:

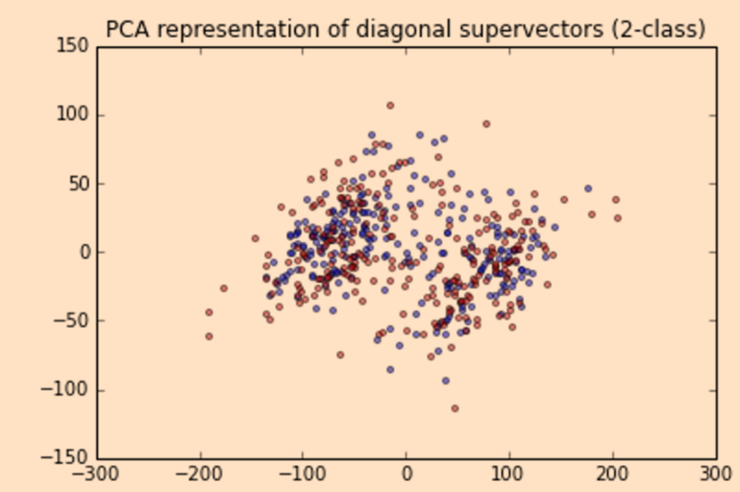



```
[[ 29   0   0   0   0 279   6 139   0]
 [  0   1   0   0   0 397   6  58   0]
 [  2   2   3   0   0 464   5 118   0]
 [  0   0   0   0   0 483   6  51   0]
 [  0   0   0   0   0 502   9  62   0]
 [  2   0   0   0   0 455   3 109   0]
 [  2   1   0   0   0 595  30 189   0]
 [  4   1   0   0   0 398   3 224   0]
 [  5   2   0   0   0 498  14 141   0]]
```

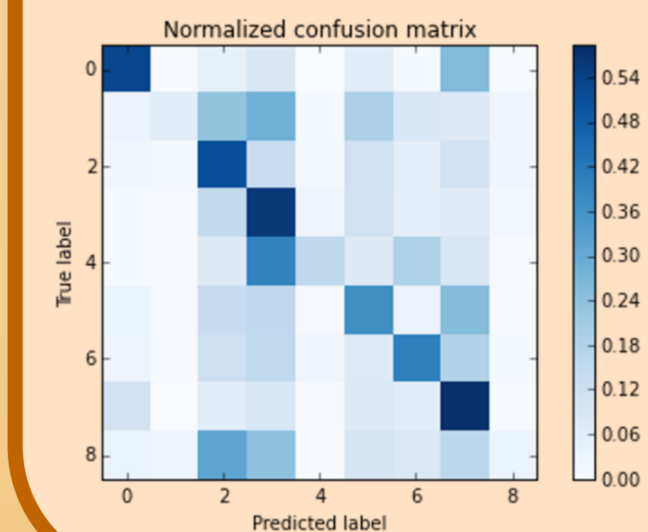
Softmax Neural Network (n=79)

Format:





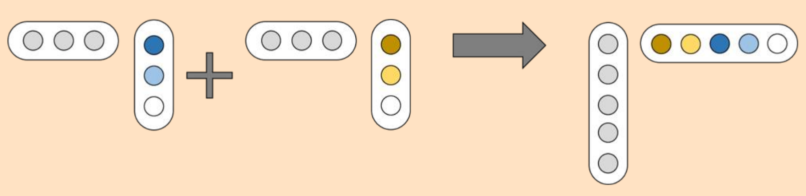
Output:

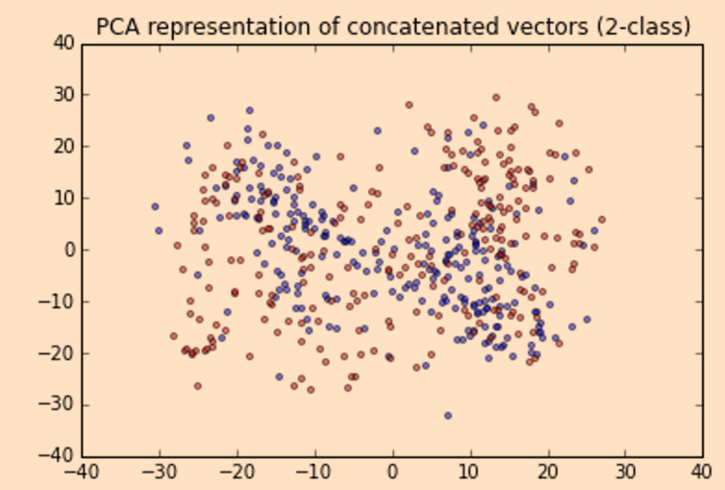



```
[[240   2  21  40   0  28   4 116   2]
 [ 15  28 108 131   4  88  42  35  11]
 [ 12   7 303  81   7  70  35  65  14]
 [  4   3  81 302  15  61  28  37   9]
 [  5   2  43 226  91  42 108  54   2]
 [ 17   3  79  89   3 211  19 145   3]
 [ 24   3  99 126  19  59 330 149   8]
 [ 67   1  39  57   4  50  43 367   2]
 [ 25  16 207 158   3  65  55 108  23]]
```

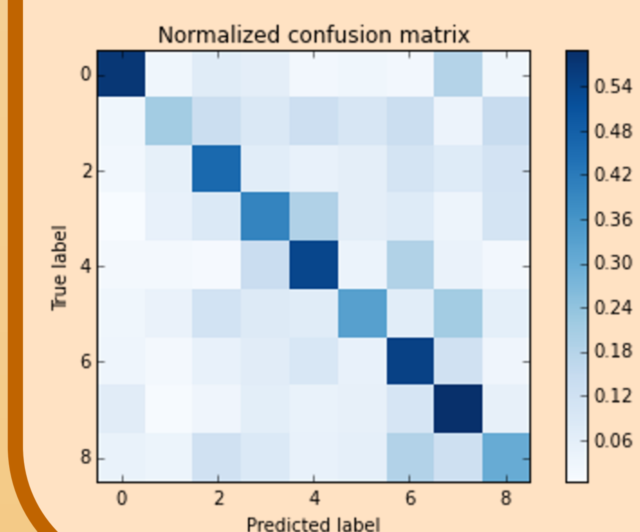
Support Vector Machine (n=53)

Format:



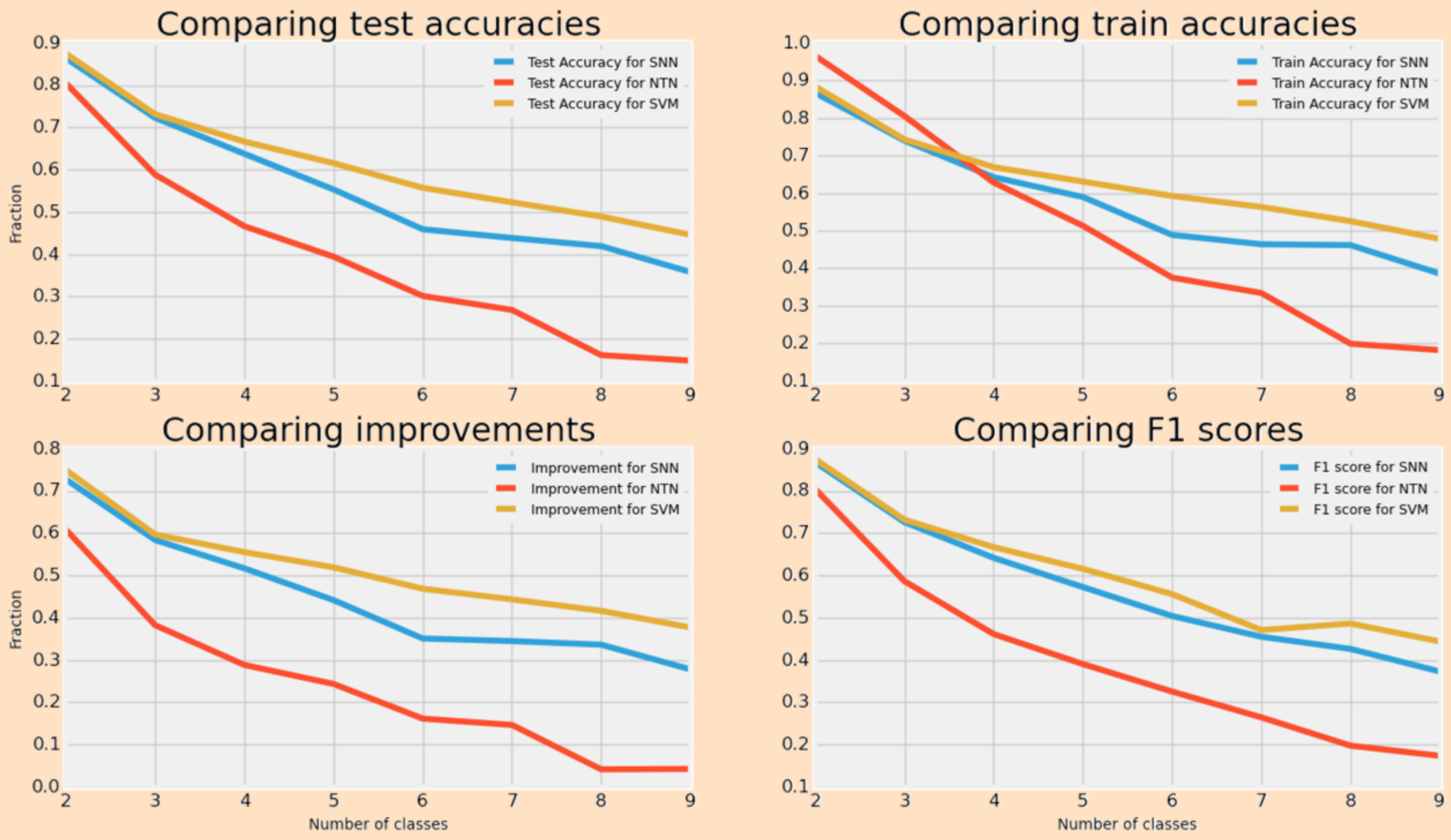


Output:




```
[[259  12  32  27   8  12   8  83  12]
 [ 12  98  61  41  59  46  62  17  66]
 [ 13  31 273  40  27  35  64  45  66]
 [  2  25  46 215 103  32  41  18  58]
 [  9   8   6  79 308  22 107  24  10]
 [ 15  23  64  45  41 189  38 121  33]
 [ 24  14  37  57  77  39 449  98  22]
 [ 43   4  18  39  28  32  63 371  32]
 [ 29  23  79  56  31  36 123  83 200]]
```

RESULTS:



9-Class Statistics:`	NTN	SNN	SVM
Train Accuracy	18.2%	38.6%	47.8%
Test Accuracy	14.8%	35.8%	44.6%
F1	17.3%	37.2%	44.4%
% improvement	4.2%	27.8%	37.7%

CONCLUSION:

Explicitly defined supervectors create highly non-convex objectives, which are too difficult to optimize using Stochastic Gradient Descent.