

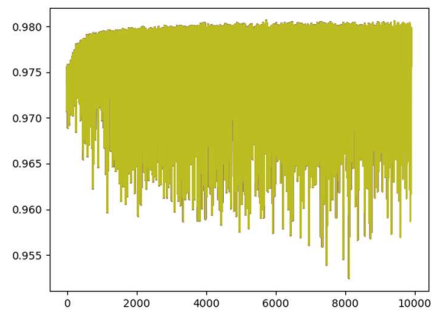
Challenge 0:

```
python3 perceptron.py --train_file data/challenge0.dat --plot True
```

Maximum vector norm: 1200.4052470355523

Iteration: 10000 Accuracy: 0.9743546765001676 Peak accuracy: 0.9806682310872723

Conclusion: Challenge0 is not linearly separable. I ran 10000 iterations with peak accuracy 0.98. From the plot it seems that it fluctuates a lot, growing from 0.97 to 0.98 and that is the farthest it can get to within 10000 iterations. The asymptote is about 0.99. The plot is shown below.



Challenge 1:

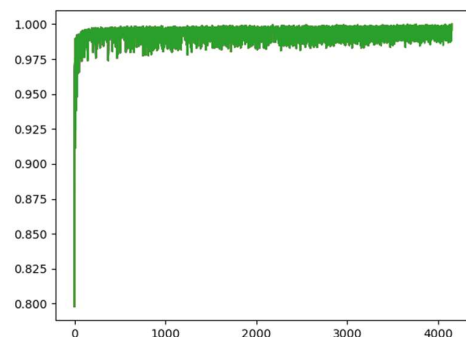
```
python3 perceptron.py --train_file data/challenge1.dat --plot True
```

Maximum vector norm: 4.143379680902967

Delta= 945.271144718107

Iteration: 4155 Accuracy: 1.0 Peak accuracy: 1.0

Conclusion: Challenge1 is linearly separable. It reached accuracy of 100% after 4155 iterations. The maximum vector norm is 4.143379680902967 and the lower bound for δ is 945.271144718107. The plot is shown below.



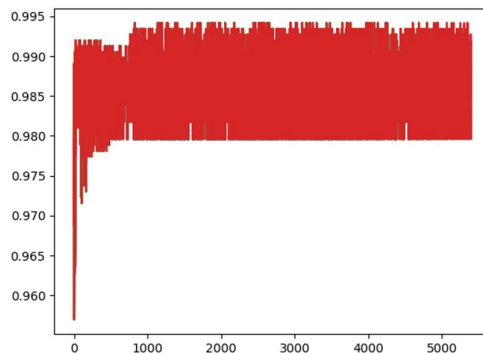
Challenge 2:

```
python3 perceptron.py --train_file data/challenge2.dat --plot True
```

Maximum vector norm: 22.97041284239358

Iteration: 5400 Accuracy: 0.9927113702623906 Peak accuracy: 0.9941690962099126

Conclusion: Challenge2 is not linearly separable. I ran 5400 iterations with peak accuracy 0.99. From the plot it seems that it fluctuates between 0.98 and 0.995, growing from 0.95 to 0.99 and that is the farthest it can get to within 5400 iterations. The asymptote is about 0.995. The plot is shown below.



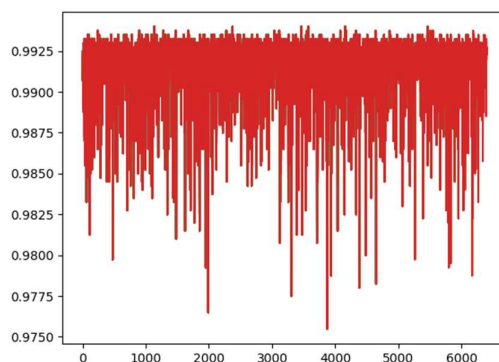
Challenge 3:

```
python3 perceptron.py --train_file data/challenge3.dat --plot True
```

Maximum vector norm: 4.12563955983977

Iteration: 6400 Accuracy: 0.992 Peak accuracy: 0.994

Conclusion: Challenge3 is not linearly separable. I ran 6400 iterations with peak accuracy 0.994. From the plot it seems that it fluctuates between 0.975 and 0.995. The asymptote is about 0.995. The plot is shown below.



Challenge 4:

```
python3 perceptron.py --train_file data/challenge4.dat --plot True
```

Maximum vector norm: 4.053470424216759

Delta= 321.9955475818094

Iteration: 136694 Accuracy: 1.0 Peak accuracy: 1.0

Conclusion: Challenge4 is linearly separable. It reached accuracy of 100% after 136694 iterations. The maximum vector norm is 4.053470424216759 and the lower bound for δ is

321.9955475818094. The plot is shown below.

