Assignment 3
Hopfield network

BE19B009 - Shobhan Karthick

1 Data Visualization

The 3 files **ball.txt**, **cat.txt**, **mona.txt** were read using the `Pandas`,a Python module and the data was stored in 2D-arrays and visualized in Figures 74, 76, 77 using the `matplotlib` module.

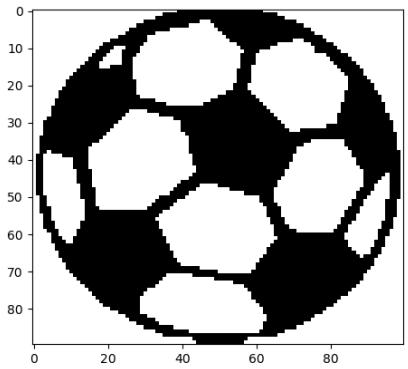

Figure 1: Image visualization of the ball

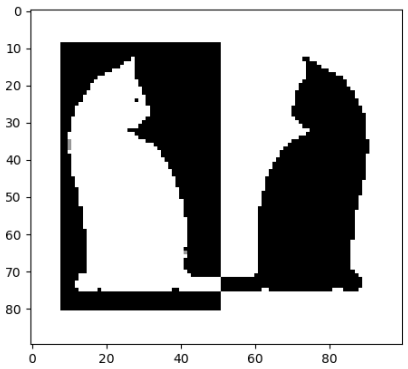

Figure 2: Image visualization of the cat

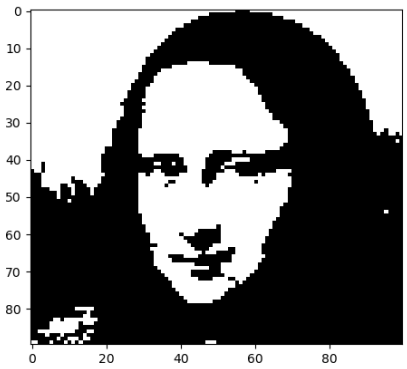

Figure 3: Image visualization of the Mona Lisa

2 Input images

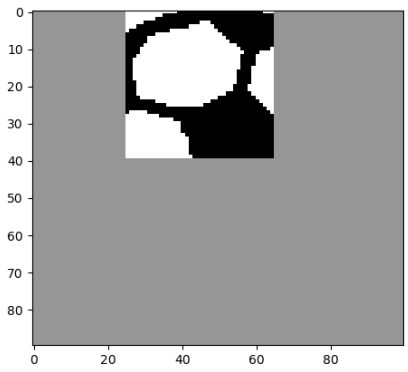

Figure 4: Cut image of the ball

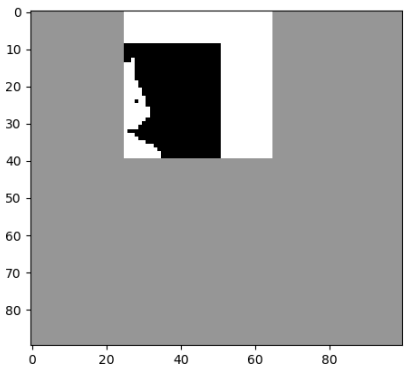

Figure 5: Cut image of the cat

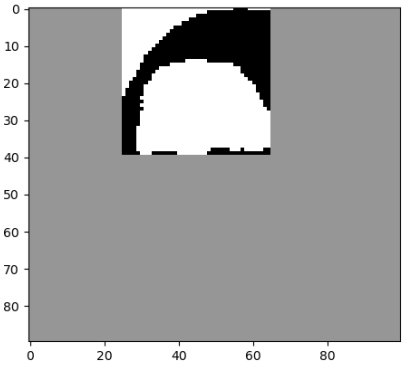

Figure 6: Cut image of the Mona Lisa

3 0% Weightage for Ball

3.1 Simulation

Figure 7: At 0 iterations

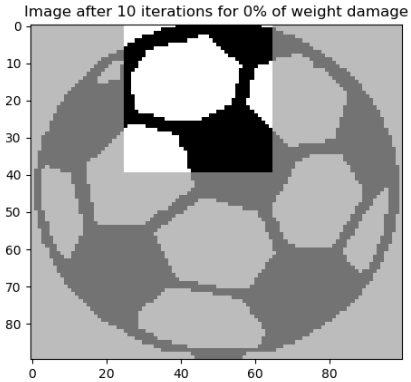

Figure 8: At 10 iterations

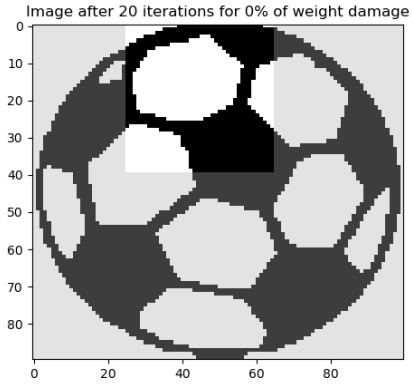

Figure 9: At 20 iterations

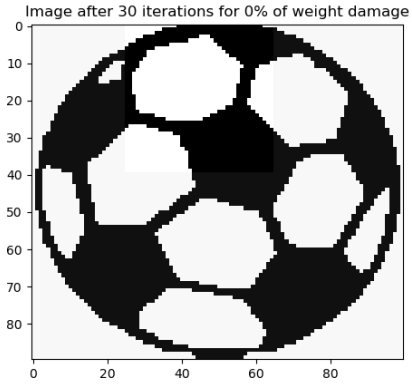

Figure 10: At 30 iterations

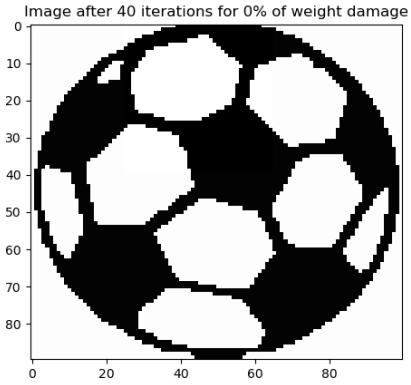

Figure 11: At 40 iterations

3.2 Root mean squared error

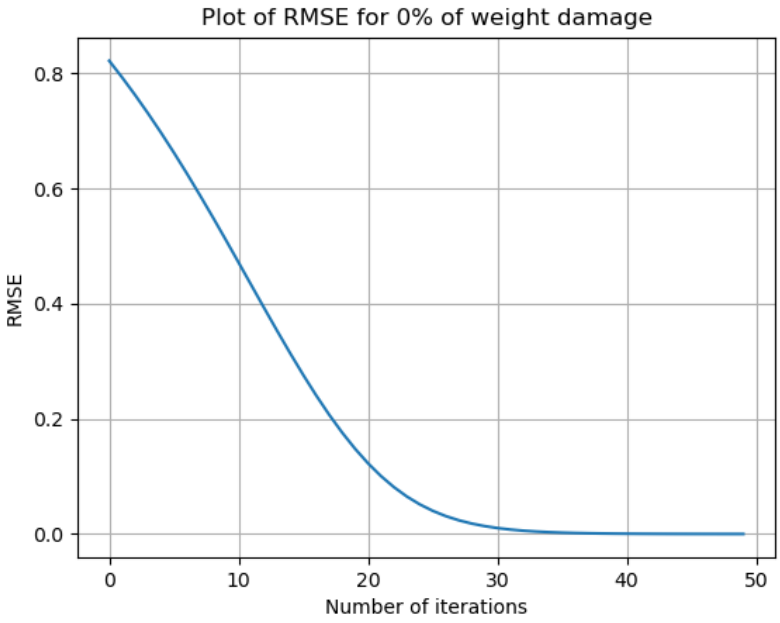

Figure 12: RMSE for 50 iteration at 0% weightage

4 25% Weightage for Ball

4.1 Simulation

Figure 13: At 0 iterations

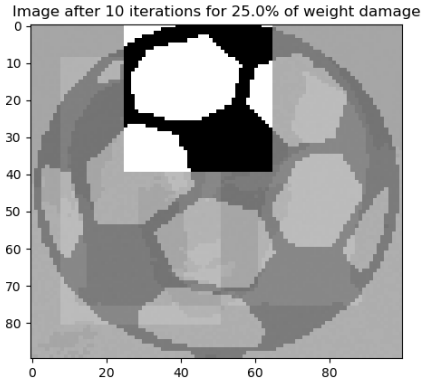

Figure 14: At 10 iterations

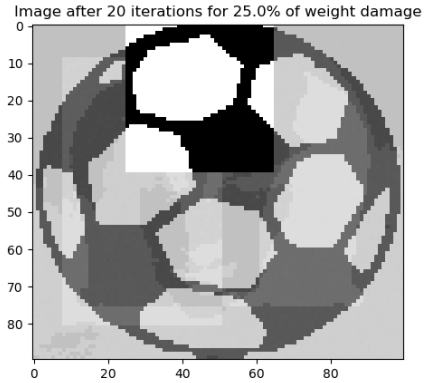

Figure 15: At 20 iterations

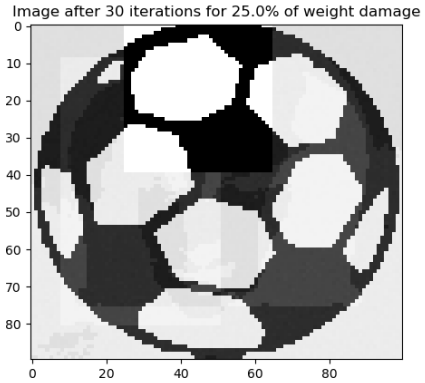

Figure 16: At 30 iterations

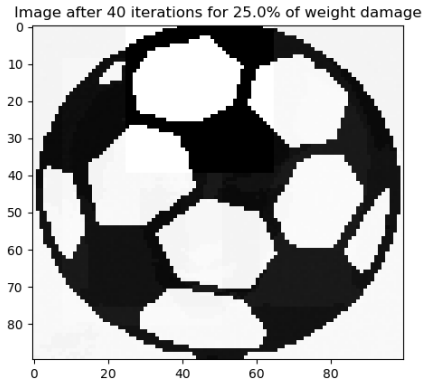

Figure 17: At 40 iterations

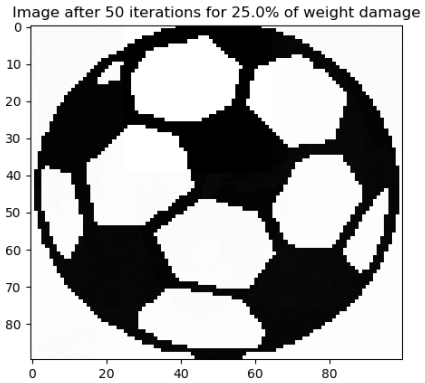

Figure 18: At 50 iterations

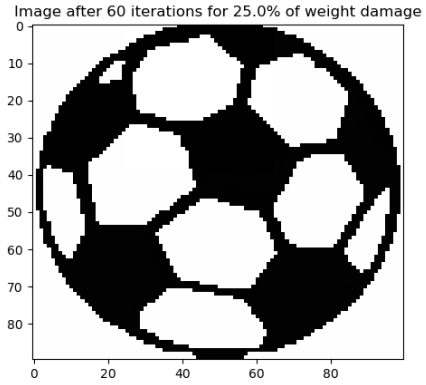

Figure 19: At 60 iterations

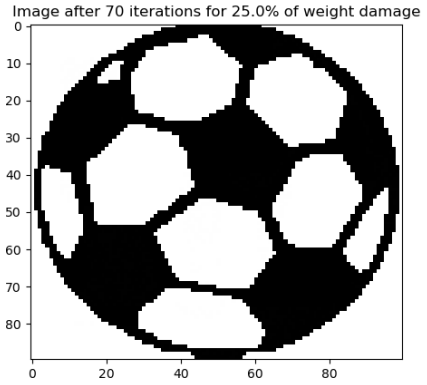

Figure 20: At 70 iterations

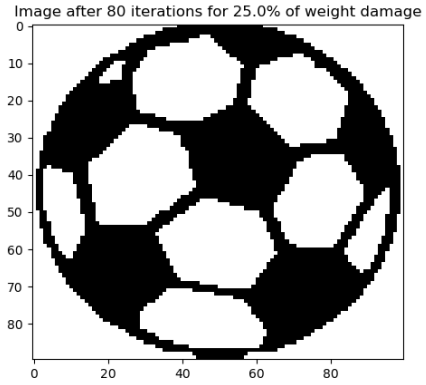

Figure 21: At 80 iterations

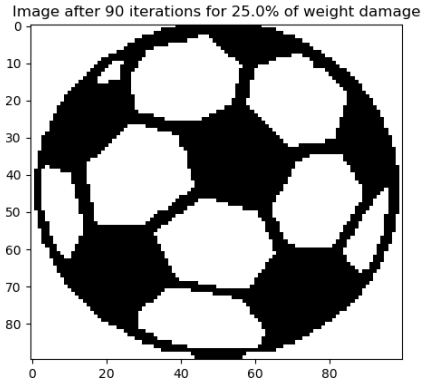

Figure 22: At 90 iterations

4.2 Root mean squared error

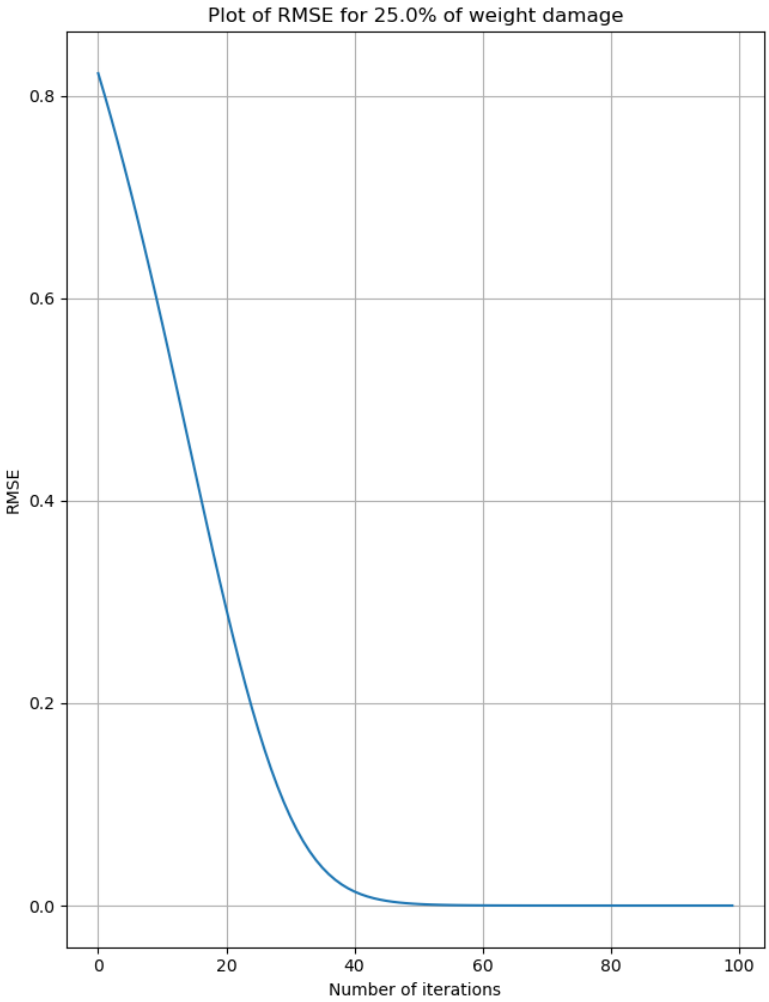

Figure 23: RMSE for 100 iteration at 25% weightage

5 50% Weightage for Ball

5.1 Simulation

Figure 24: At 0 iterations

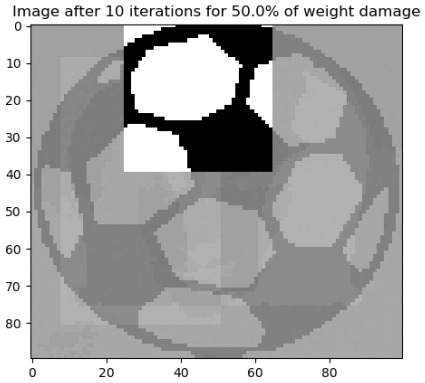

Figure 25: At 10 iterations

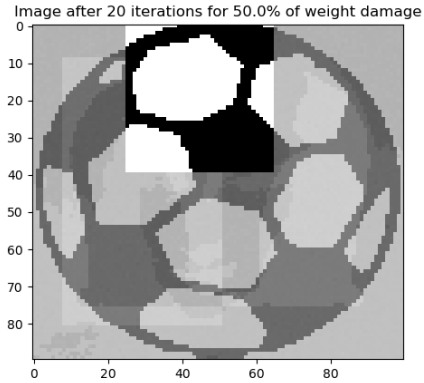

Figure 26: At 20 iterations

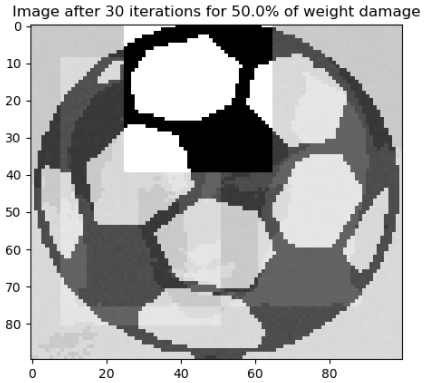

Figure 27: At 30 iterations

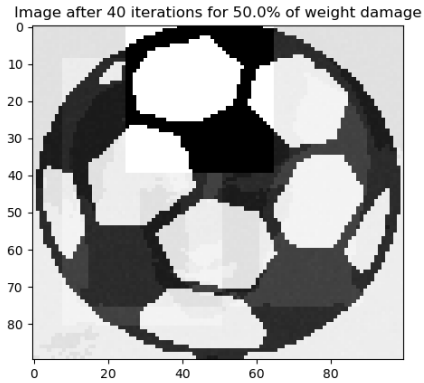

Figure 28: At 40 iterations

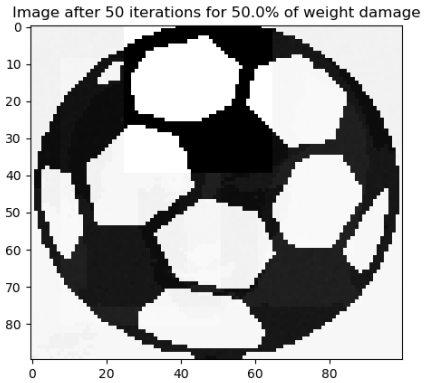

Figure 29: At 50 iterations

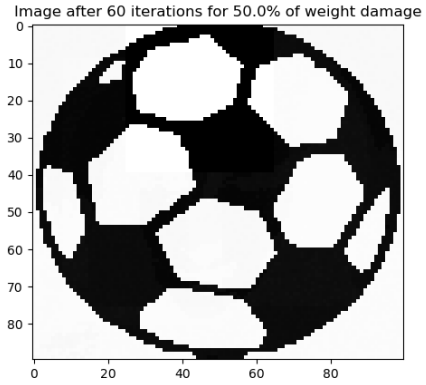

Figure 30: At 60 iterations

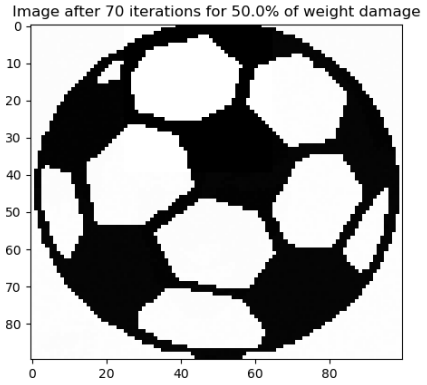

Figure 31: At 70 iterations

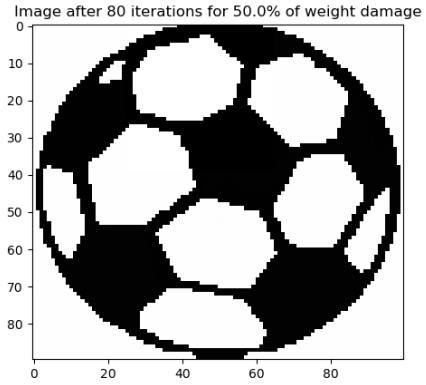

Figure 32: At 80 iterations

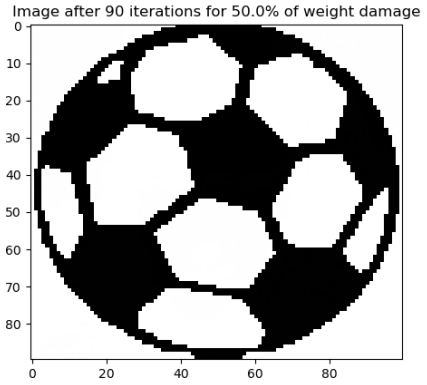

Figure 33: At 90 iterations

5.2 Root mean squared error

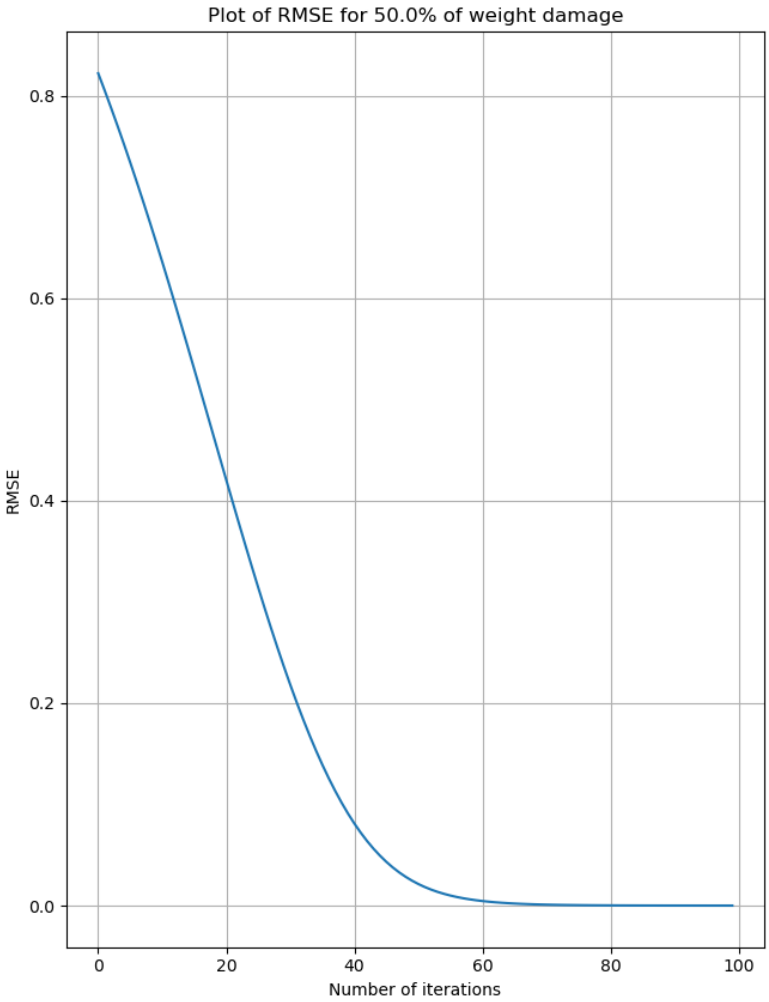

Figure 34: RMSE for 100 iteration at 50% weightage

6 80% Weightage for Ball

6.1 Simulation

Figure 35: At 0 iterations

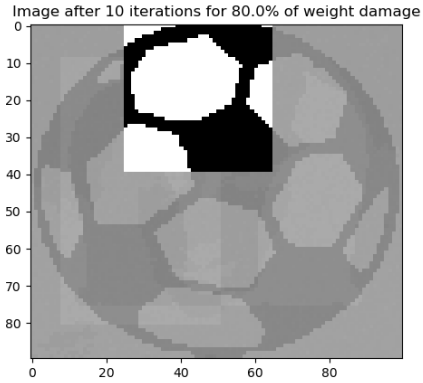

Figure 36: At 10 iterations

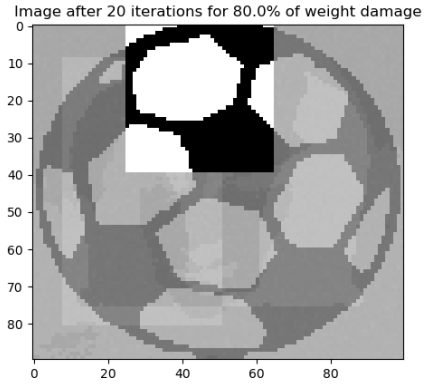

Figure 37: At 20 iterations

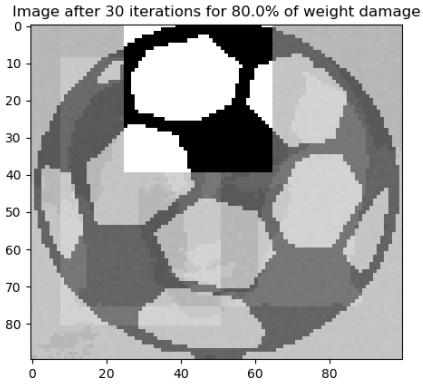

Figure 38: At 30 iterations

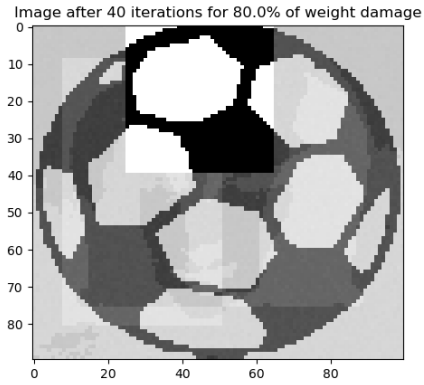

Figure 39: At 40 iterations

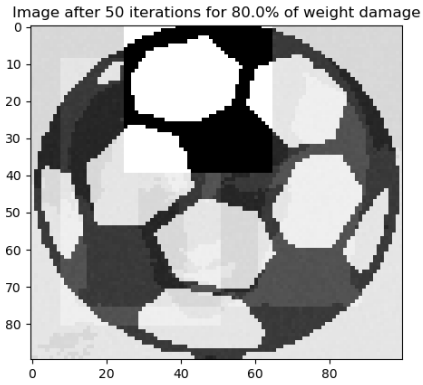

Figure 40: At 50 iterations

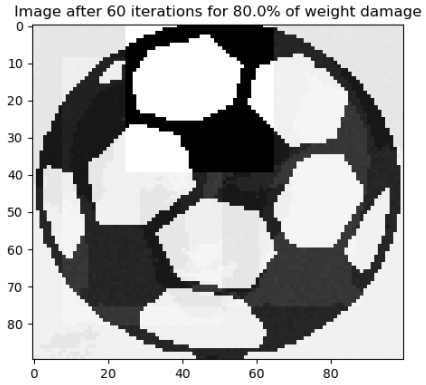

Figure 41: At 60 iterations

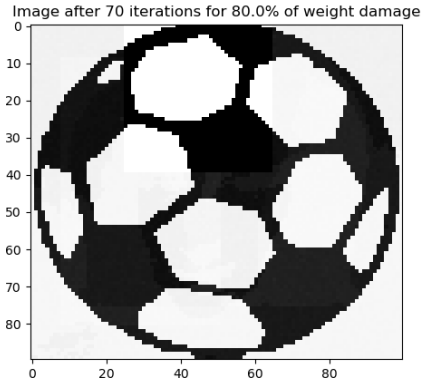

Figure 42: At 70 iterations

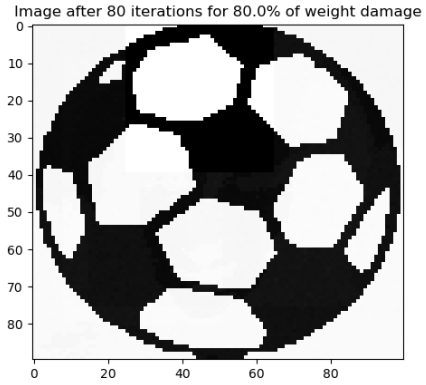

Figure 43: At 80 iterations

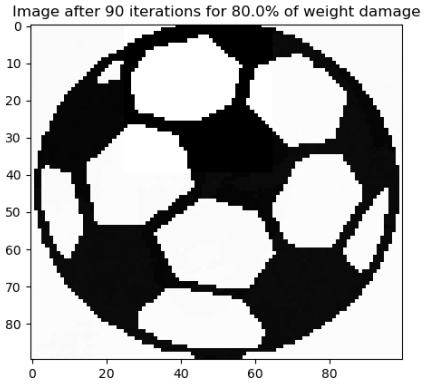

Figure 44: At 90 iterations

6.2 Root mean squared error

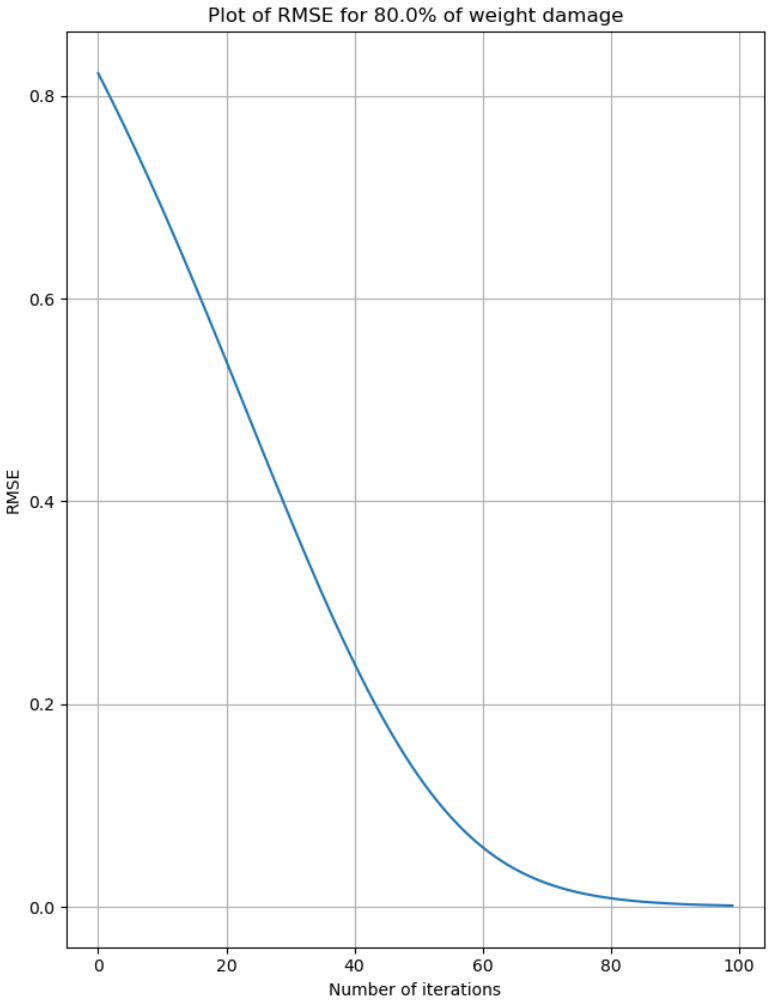

Figure 45: RMSE for 100 iteration at 50% weightage

7 0% Weightage for Cat image

7.1 Simulation

Figure 46: At 0 iterations

Figure 47: At 20 iterations

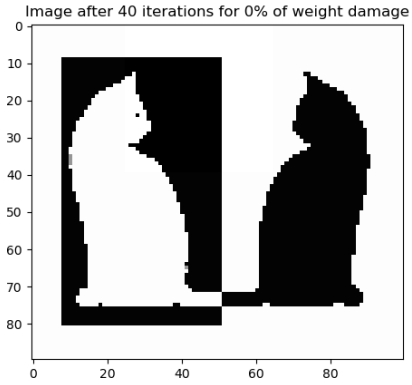

Figure 48: At 40 iterations

7.2 Root mean squared error

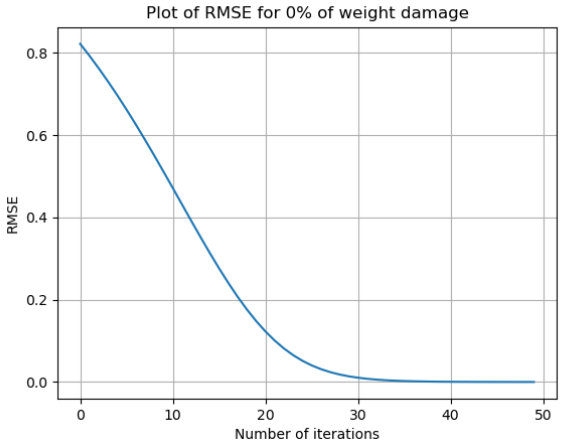

Figure 49: RMSE for 100 iteration at 0% weightage

8 25% Weightage for Cat image

8.1 Simulation

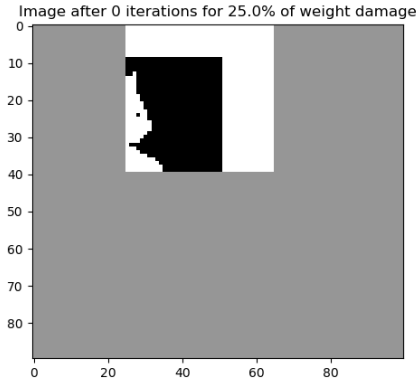

Figure 50: At 0 iterations

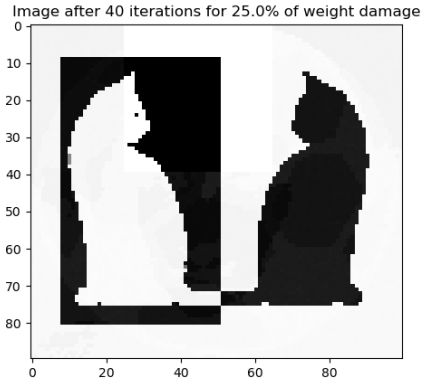

Figure 51: At 40 iterations

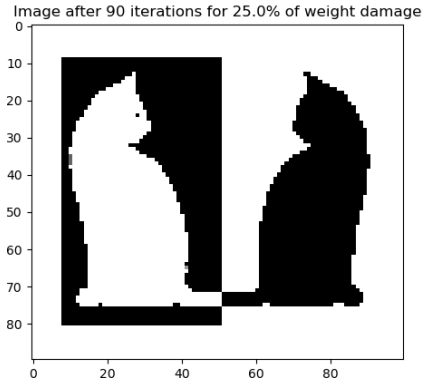

Figure 52: At 90 iterations

8.2 Root mean squared error

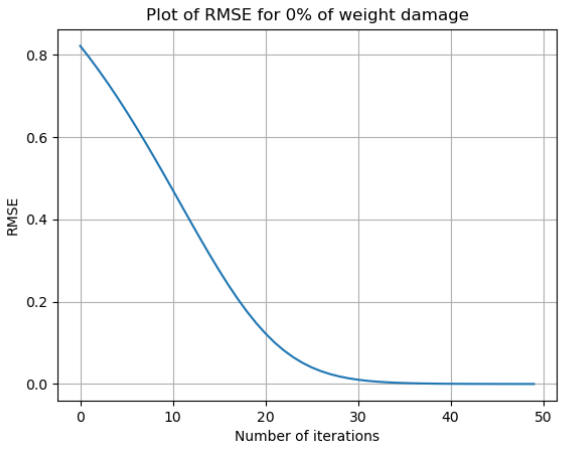

Figure 53: RMSE for 100 iteration at 25% weightage

9 50% Weightage for Cat image

9.1 Simulation

Figure 54: At 0 iterations

Figure 55: At 40 iterations

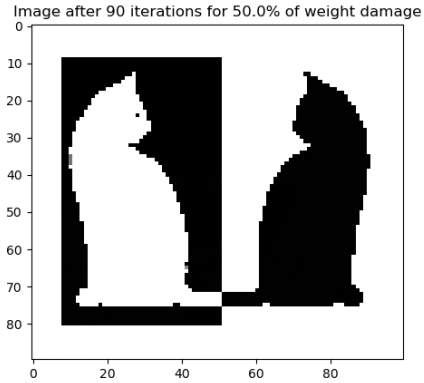

Figure 56: At 90 iterations

9.2 Root mean squared error

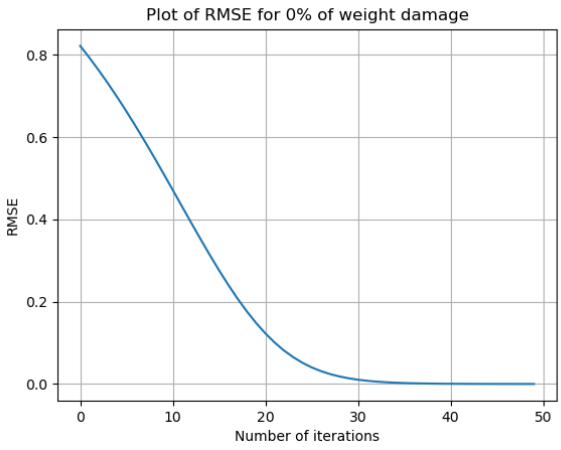

Figure 57: RMSE for 100 iteration at 50% weightage

10 80% Weightage for Cat image

10.1 Simulation

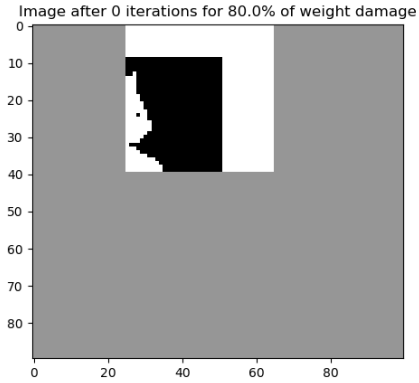

Figure 58: At 0 iterations

Figure 59: At 40 iterations

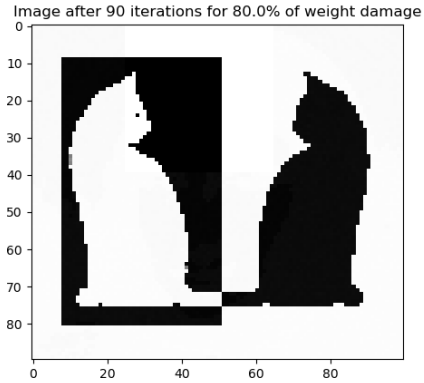

Figure 60: At 90 iterations

10.2 Root mean squared error

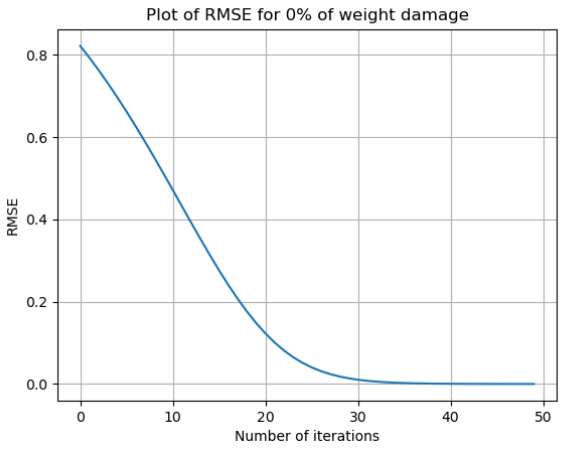

Figure 61: RMSE for 100 iteration at 80% weightage

11 0% Weightage for Mona Lisa image

11.1 Simulation

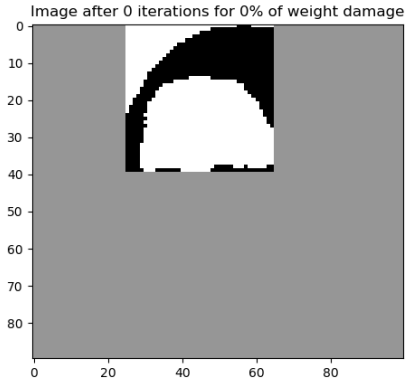

Figure 62: At 0 iterations

Figure 63: At 20 iterations

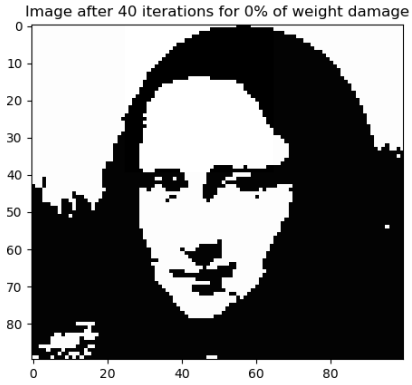

Figure 64: At 40 iterations

11.2 Root mean squared error

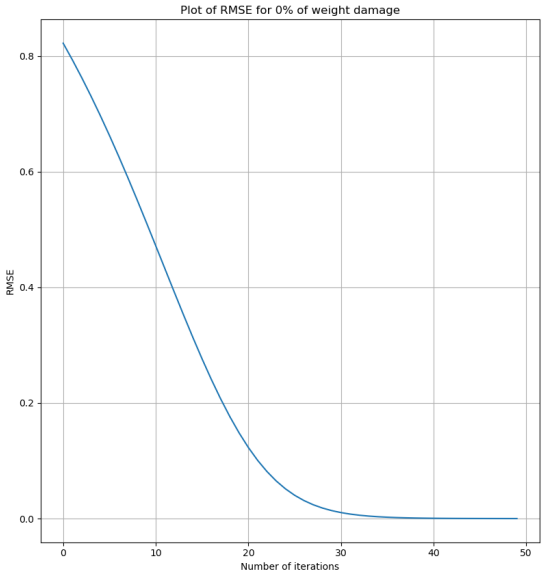

Figure 65: RMSE for 100 iteration at 0% weightage

12 25% Weightage for Mona Lisa image

12.1 Simulation

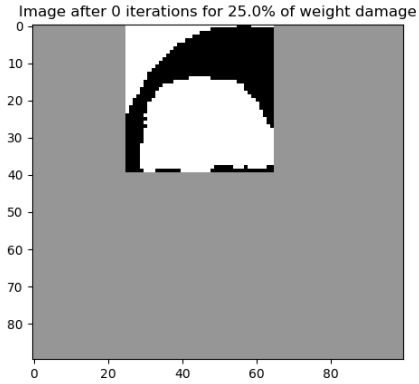

Figure 66: At 0 iterations

Figure 67: At 40 iterations

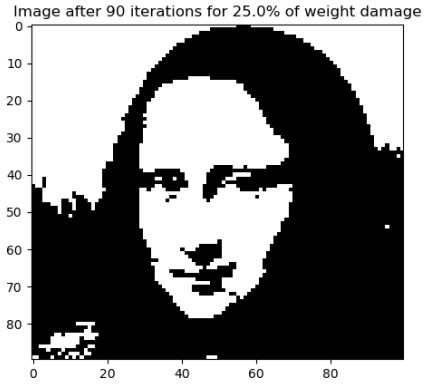

Figure 68: At 90 iterations

12.2 Root mean squared error

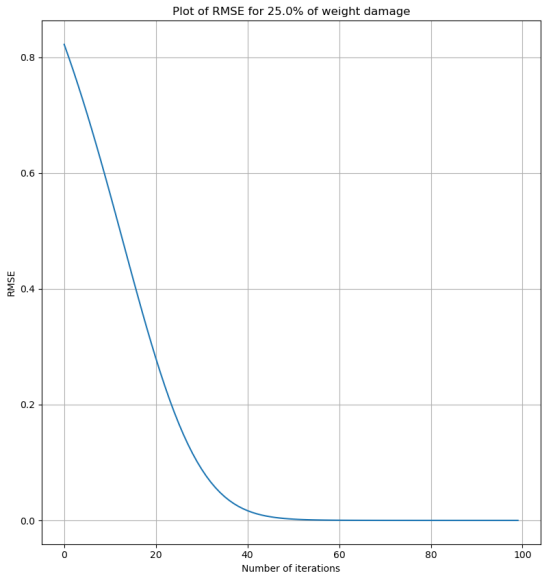

Figure 69: RMSE for 100 iteration at 25% weightage

13 50% Weightage for Mona Lisa image

13.1 Simulation

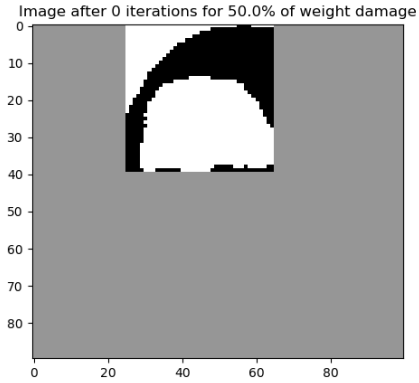

Figure 70: At 0 iterations

Figure 71: At 40 iterations

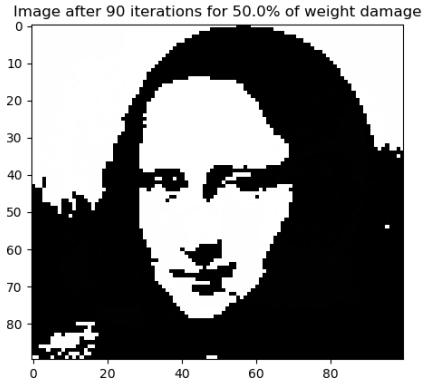

Figure 72: At 90 iterations

13.2 Root mean squared error

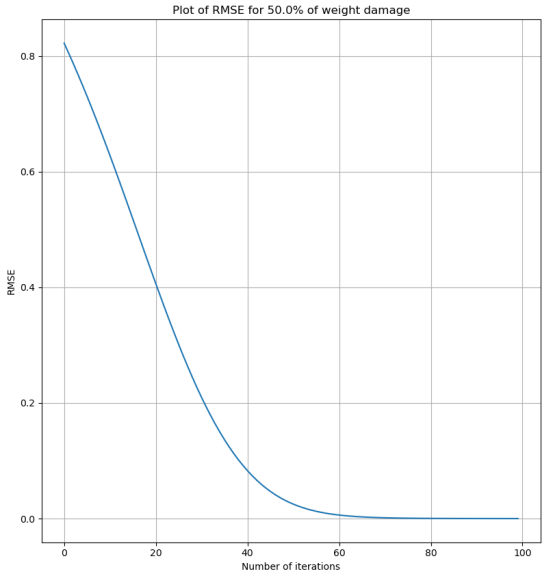

Figure 73: RMSE for 100 iteration at 50% weightage

14 80% Weightage for Mona Lisa image

14.1 Simulation

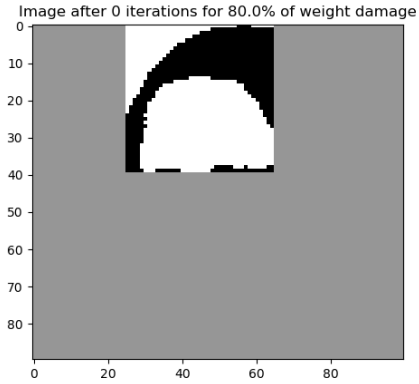

Figure 74: At 0 iterations

Figure 75: At 40 iterations

Figure 76: At 90 iterations

14.2 Root mean squared error

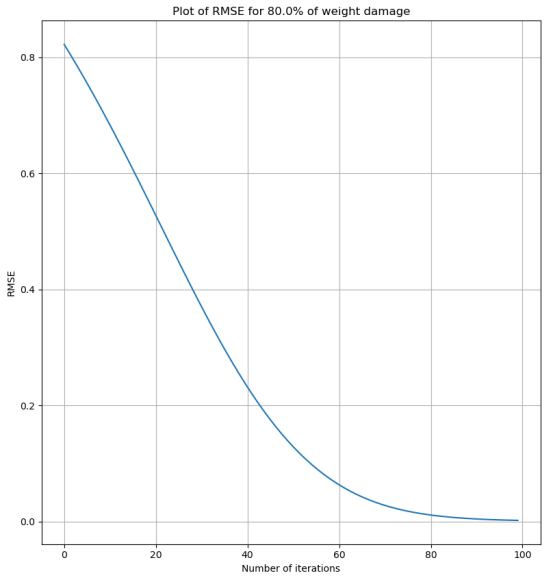

Figure 77: RMSE for 100 iteration at 80% weightage

15 Conclusion

Although the images are damaged, the retrieval is good and the original images are retrieved in about 100 iterations. This shows how good the model of Hopfield network is.