

Introduction to Machine Learning, Fall 2015 - Exercise session VI

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December 11, 2015

Intro

The only material I used are the slides. Did not discuss in a group, except mailed Amin about possible “typo” which wasn’t one. I omitted the pen and paper exercises.

1 Problem 4 (Programming task)

1.1 k-means

1.1.1 Uset first 10 images as the initial cluster means

So when I run the k -means algorithm using **10 first images** as the initial means, I get the following means: And the classified digits follow:

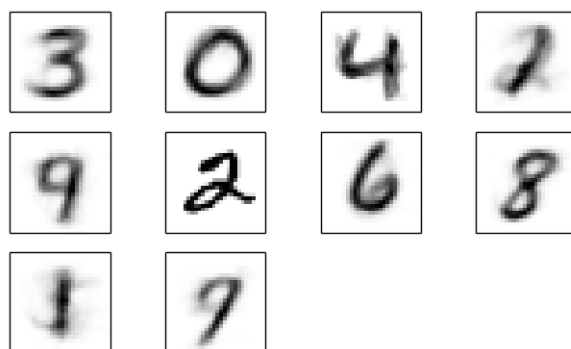


Figure 1: First iteration cluster means

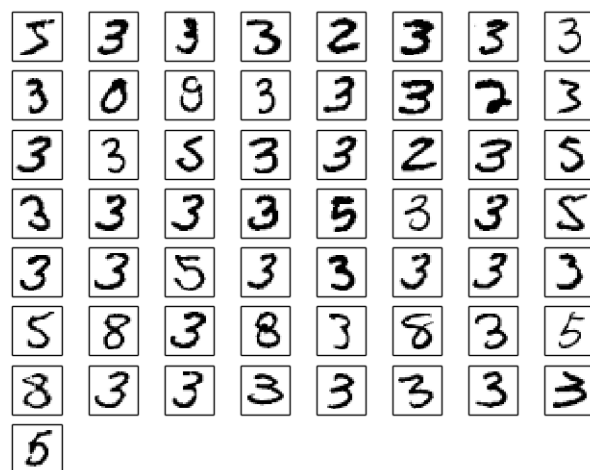


Figure 2: Digits 0

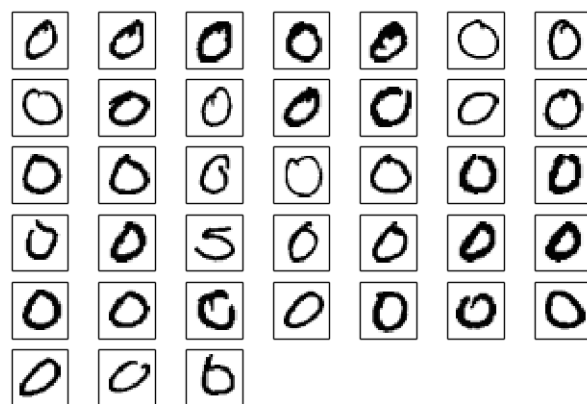


Figure 3: Digits 1

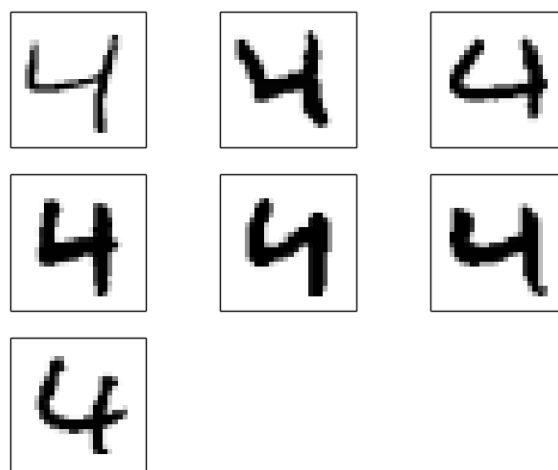


Figure 4: Digits 2

1	2	1	7	1	4	1	1	1
1	1	2	2	7	2	2	4	7
2	1	0	2	2	1	1	2	2
2	2	2	2	1	1	2	2	2
2	1	2	1	1	1	2	2	2
2	2	2	2	1	2	1	2	1
1	2	1	2	1	2	7	1	1
2	7							

Figure 5: Digits 3

9	4	7	9	8	7	9	4	7
4	9	9	4	9	7	9	9	9
9	8	4	7	0	7	4	9	4
3	9	9	4	4	9	7	4	9
8	4	9	7	9	4	4	9	4
9	9	4	9	9	4	7	4	9
7	4	9	7	9	9	7	4	4
7	3	9	5	2	7	5	9	

Figure 6: Digits 4

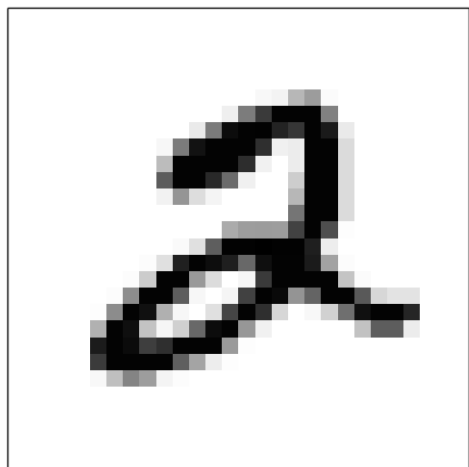


Figure 7: Digits 5

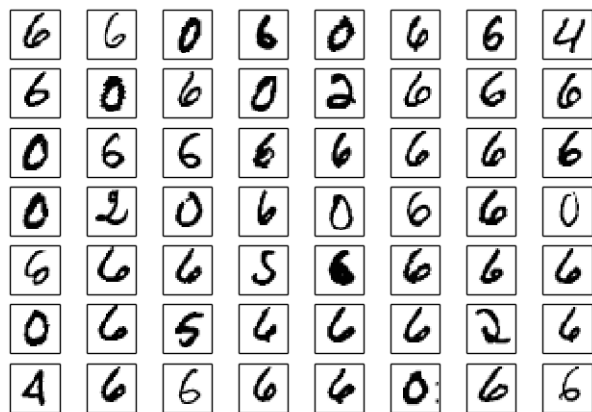


Figure 8: Digits 6

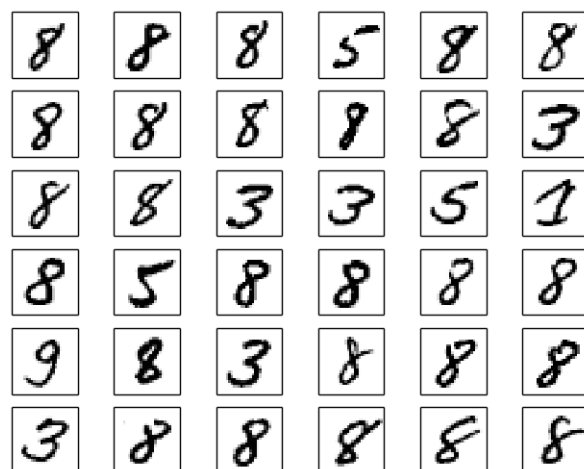


Figure 9: Digits 7

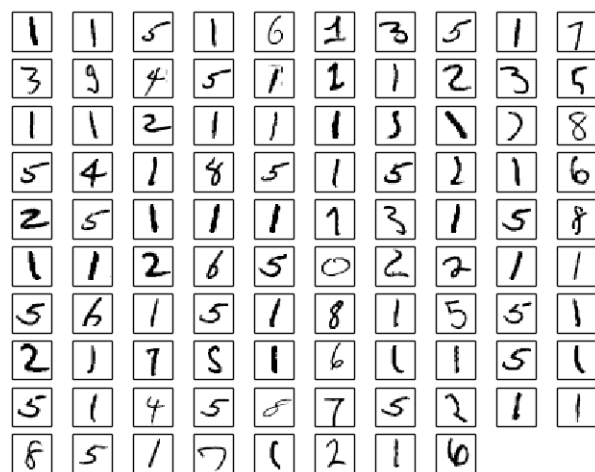


Figure 10: Digits 8

4	7	9	9	2	9	9	9	7
7	9	4	7	7	7	7	4	7
4	4	9	4	9	9	4	9	9
7	7	9	7	9	7	7	9	4
7	7	4	9	9	4	4	7	7
7	9	9	4	7	7	7	4	4
7	4	9	7	9	9	7	4	9
5	9	9	4	7	9	4	9	

Figure 11: Digits 9

1.1.2 Use the first images with distinct digits

Here, we used the first 10 **unique** digits as the initial cluster means.

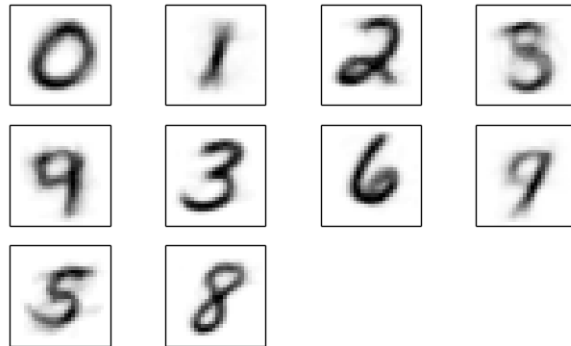


Figure 12: Second iteration cluster means

The classified digits follow:

Obviously, the first iteration with non-unique digits as the initial cluster means perform rather poorly. The second iteration that uses distinct digit clusters improves on the latter, yet it is far from perfect.

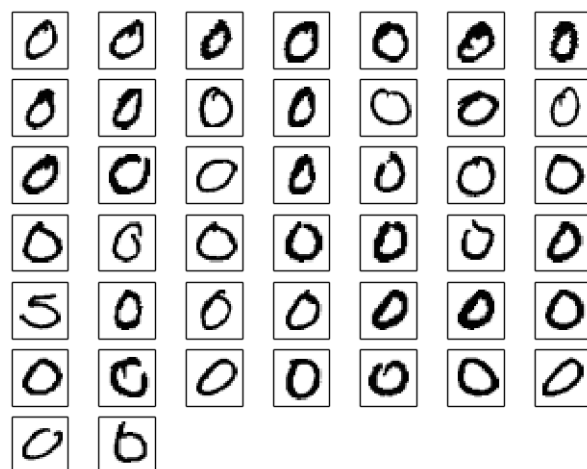


Figure 13: Digits 0

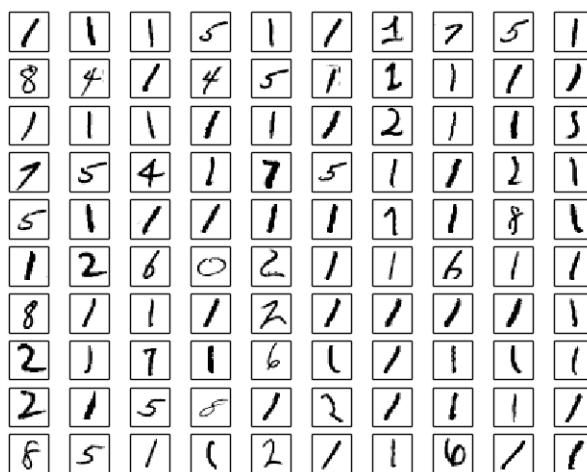


Figure 14: Digits 1

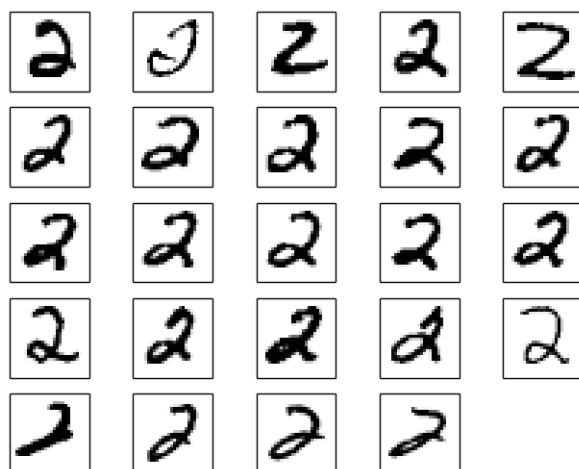


Figure 15: Digits 2

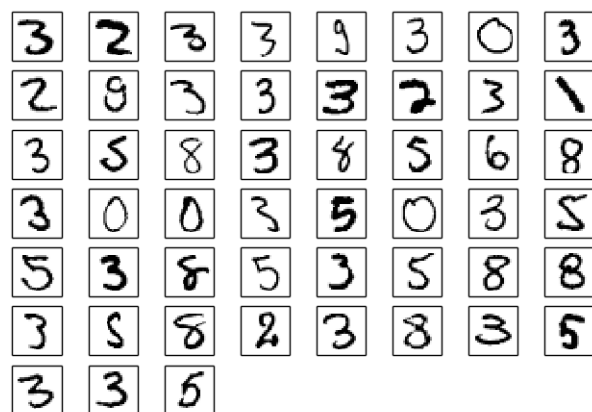


Figure 16: Digits 3



Figure 17: Digits 4

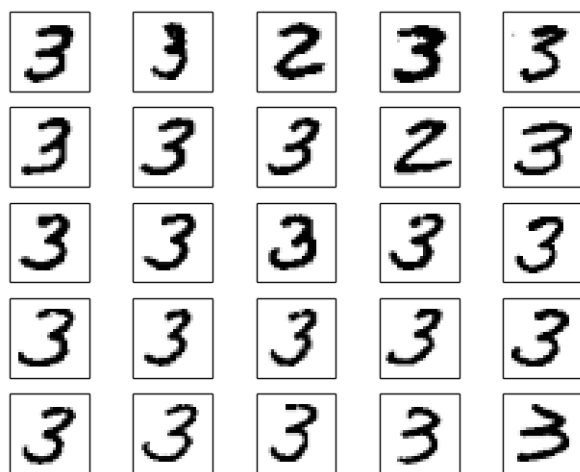


Figure 18: Digits 5

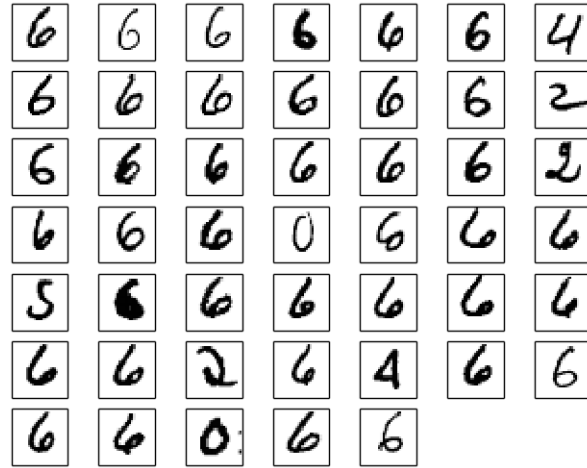


Figure 19: Digits 6

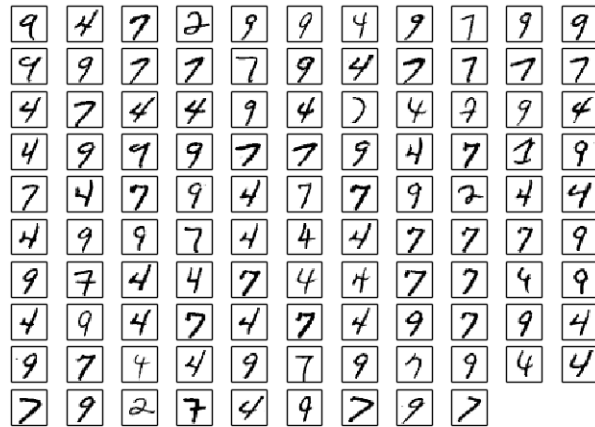


Figure 20: Digits 7

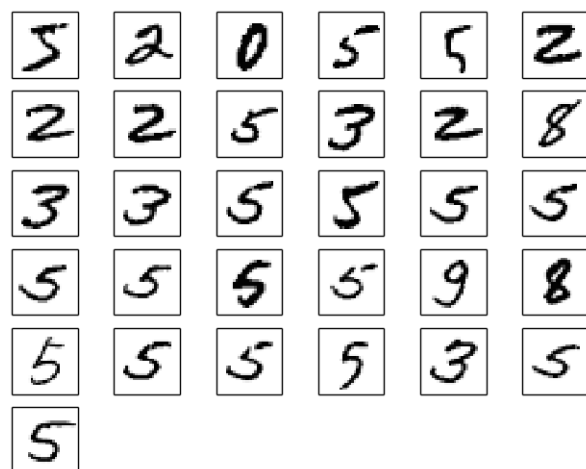


Figure 21: Digits 8

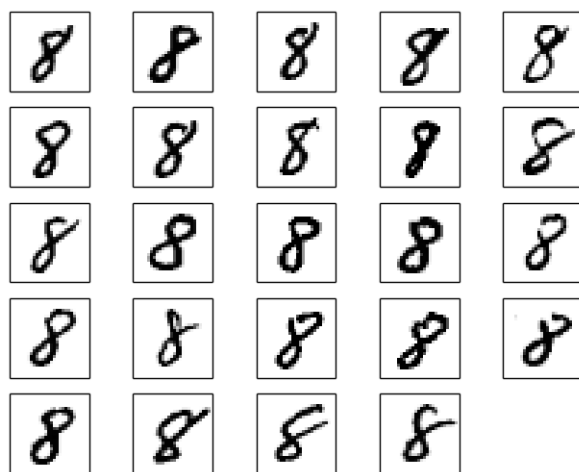


Figure 22: Digits 9

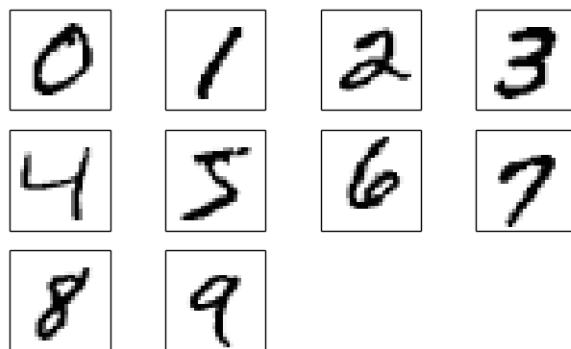


Figure 23: First iteration cluster means

1.2 k-medoids

After the first iteration with 10 first data images as starting point, I get the following: And the classified digits follow:

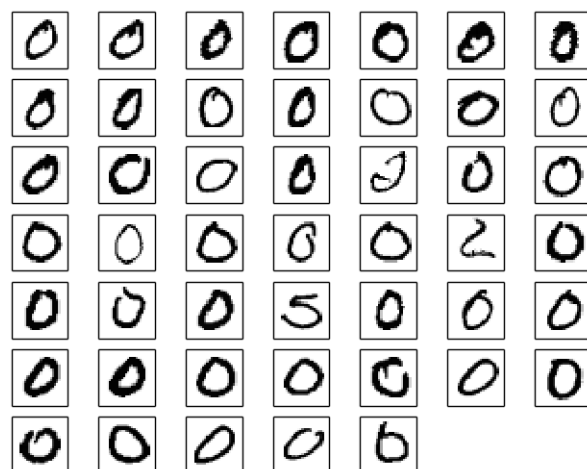


Figure 24: Digits 0

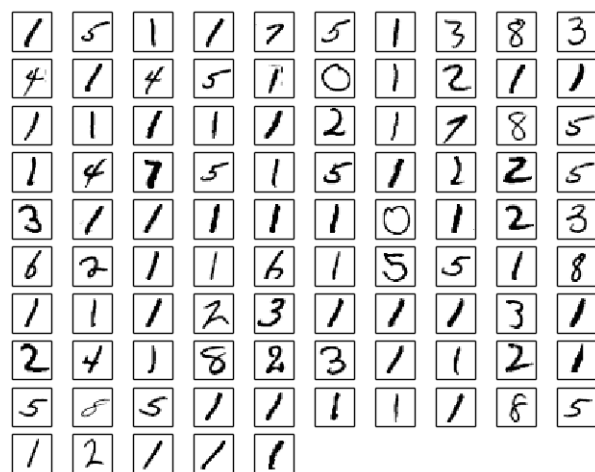


Figure 25: Digits 1

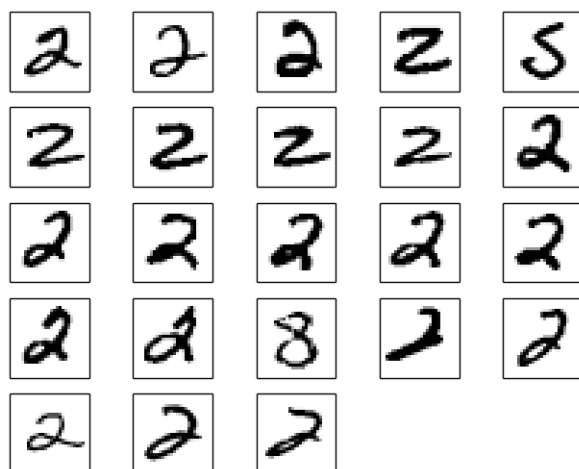


Figure 26: Digits 2

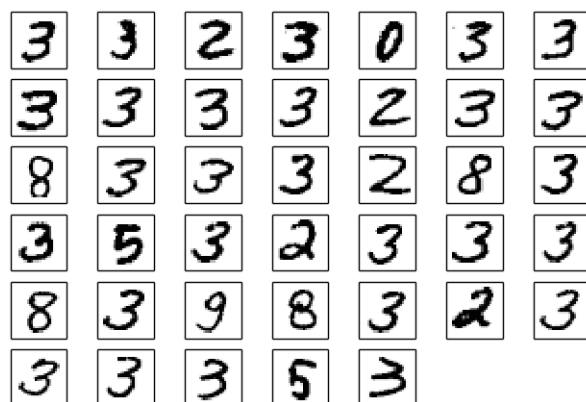


Figure 27: Digits 3

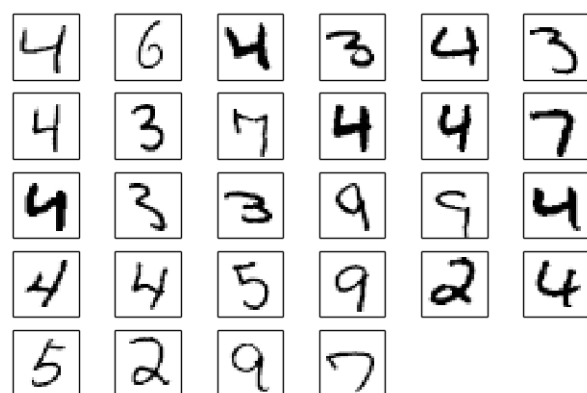


Figure 28: Digits 4

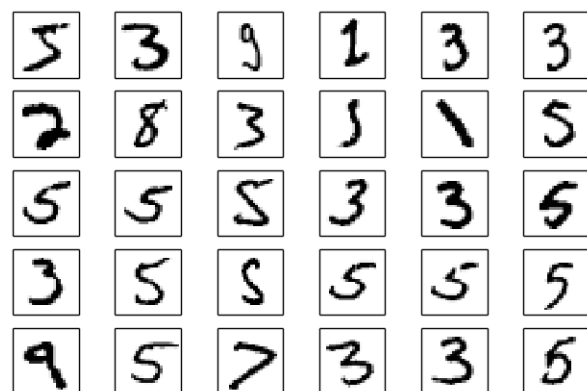


Figure 29: Digits 5

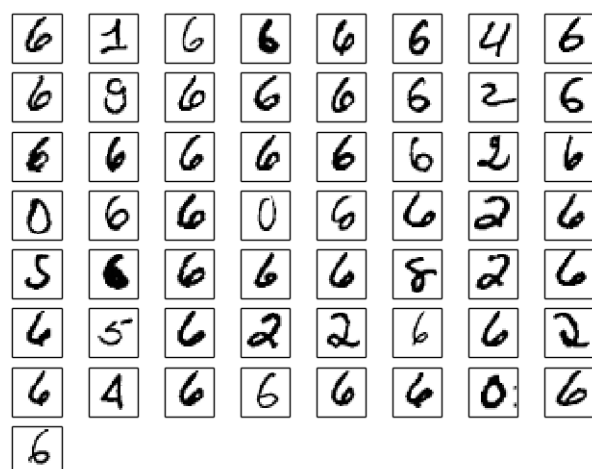


Figure 30: Digits 6

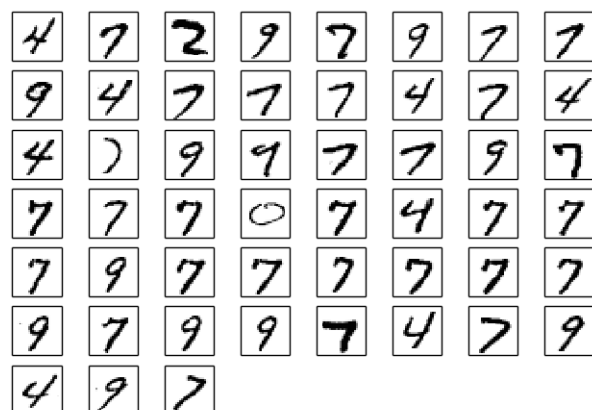


Figure 31: Digits 7

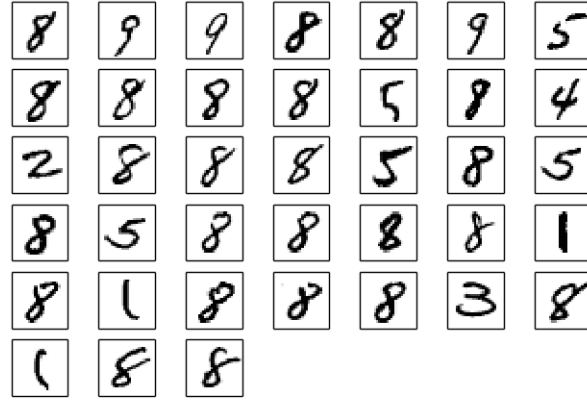


Figure 32: Digits 8

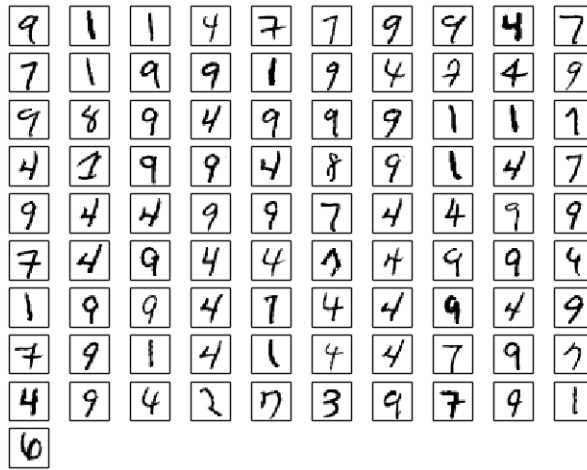


Figure 33: Digits 9