Fully Connected Autoencoder
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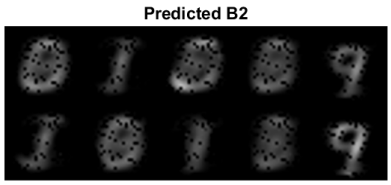
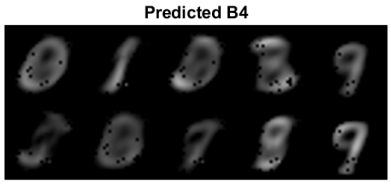
1 Methodology and Analysis

The networks are constructed based on the given architecture and trained for 1000 epochs. The I/O images were normalized i.e. $\in [0,1]$. From figure 1(a),(b),(c), it can be deduced that digits 0,1,9 are well produced in network 1, whereas, digits 0,1,8,9 are well reproduced for network 2.

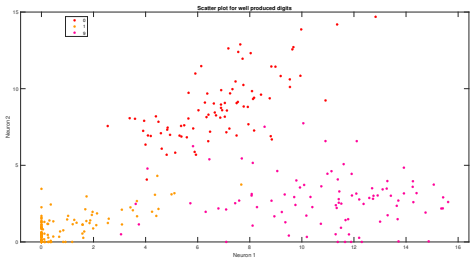
(a)



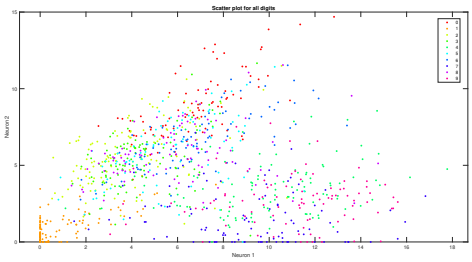
(b)



(c)



(d)



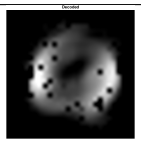
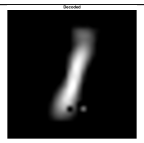
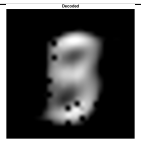
(e)

Figure 1: (a) is the input image montage, (b), (c) is the predicted output montage from autoencoder - 1 and 2 respectively.(d),(e) is the scatter plot for well-produced digits and all digits respectively in autoencoder - 1 with x and y label as bottleneck neuron 1 and 2 respectively.

The scatter plot in figure 1(d),(e) represents the information stored by bottleneck neurons. The images with similar structure formed overlapping clusters. The rule to decode an image can approximated to roughly the centroid of each individual clusters. By inspection the rules for digits 0,1,9 were found using plot 1(d) and decoded correctly.

The coding rule tested to decode the well reproduced digits is presented in table 1 for autoencoder 2. The rule is established by pairwise plotting of 4 bottleneck neuron. Digits 3,5 are poorly-reproduced whereas other digits have converged to other digits of high structural resemblance.E.g. $2 \rightarrow 0$, $4 \rightarrow 9$, $6 \rightarrow 0$, $7 \rightarrow 9$.

Table 1: Target digit, coding rule and output image for autoencoder 2

Digit	Rule	Output	Digit	Rule	Output
0	[2.5, 5.0, 3.0, 8.5]		1	[7.0, 1.5, 17.5, 2.0]	
8	[11.5, 18, 19, 19]		9	[9.0, 9.5, 5.0, 6.0]