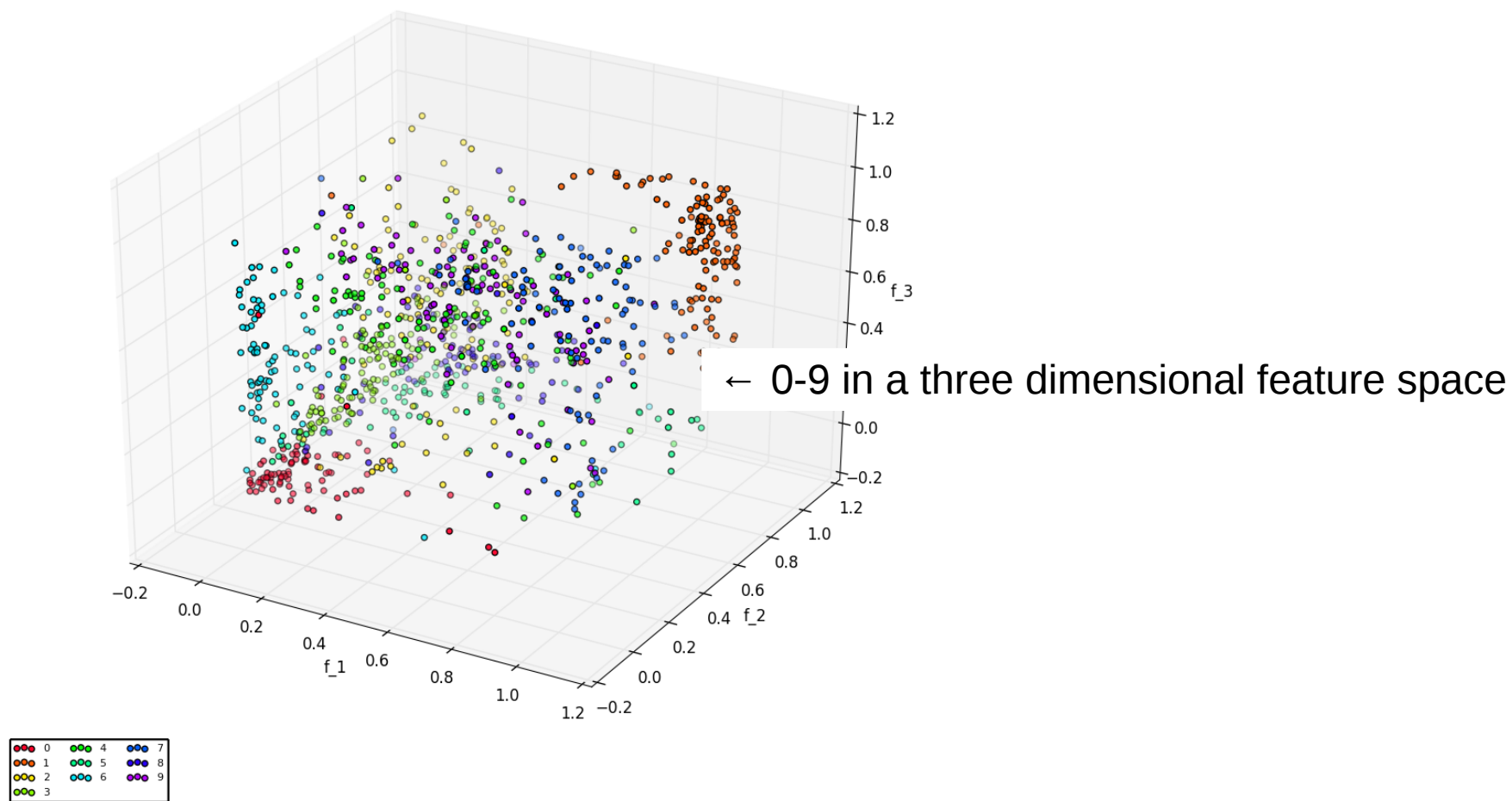


# Gabriel, Autoencoder on MNIST



# Approach

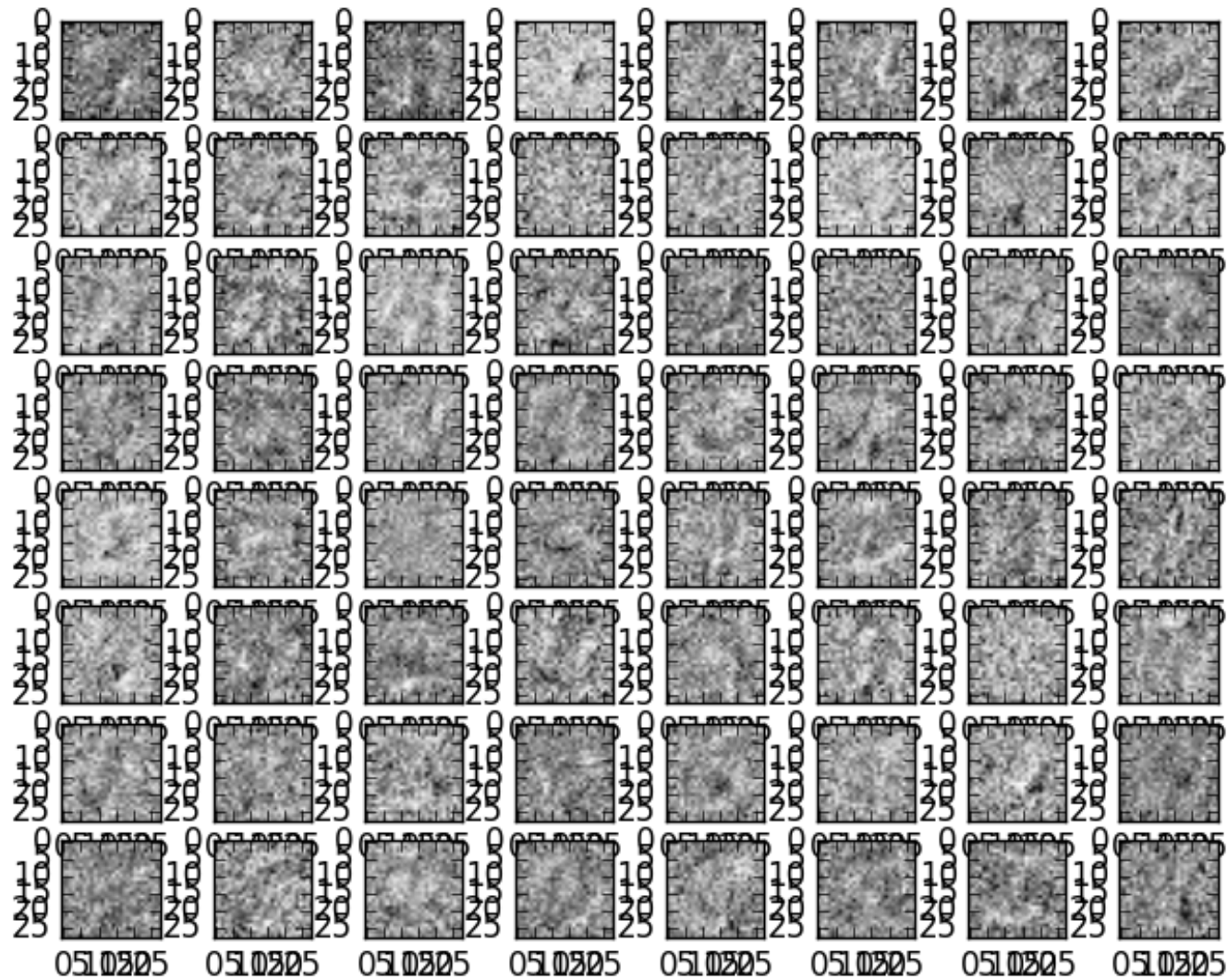
- I wanted to visually investigate how a “deep” auto encoder could separate different numbers in the MNIST dataset in a 3-d feature space.
- This means that my layer before the decoder had 3 nodes.
- Autoencoder performance would not be very great (better with more intermediate nodes) but it was easier to visualize the data this way.

# Approach

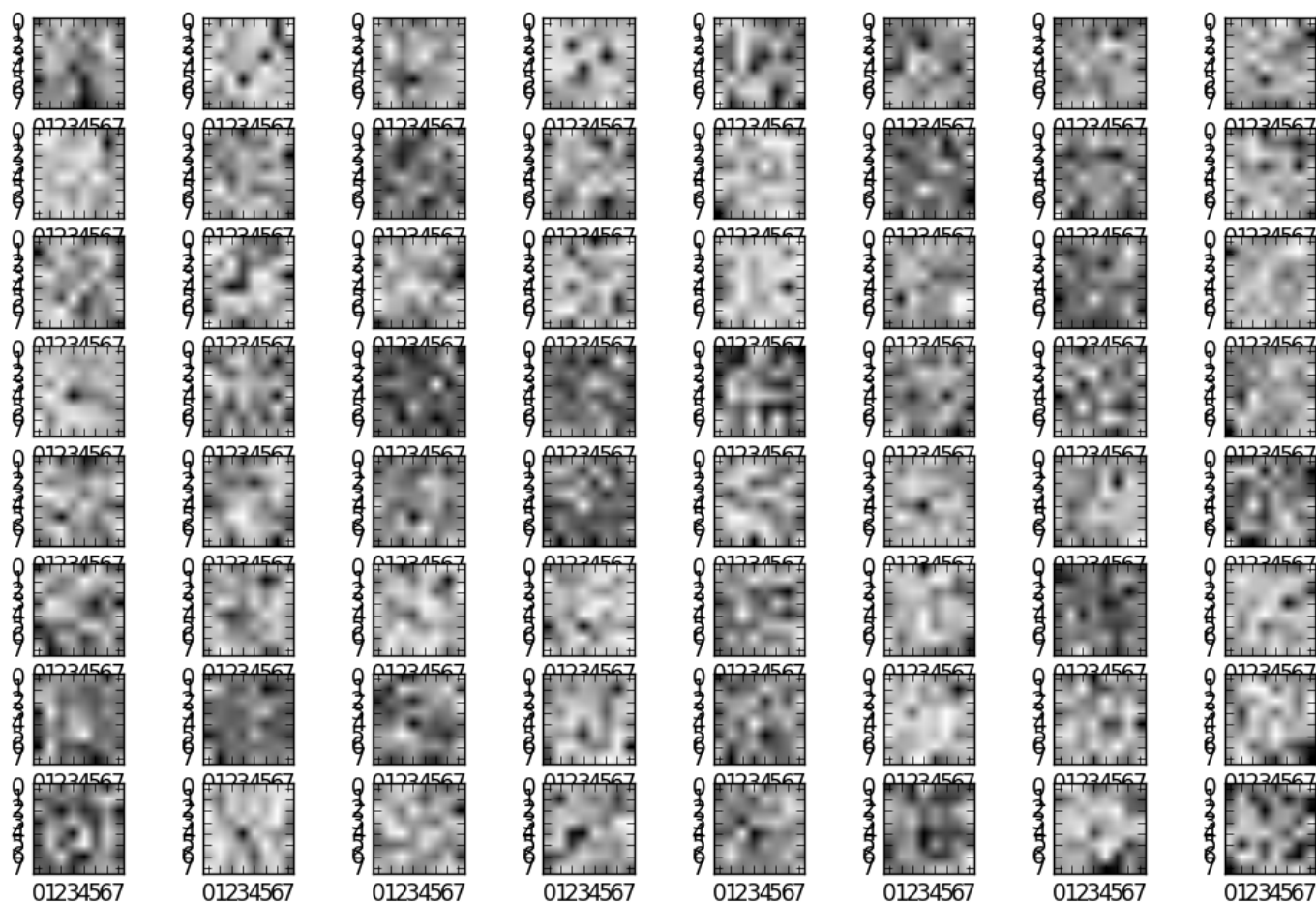
- I chose by a 64x64x36x3 autoencoder structure with sigmoid nonlinearities.
- A learning rate of 0.1 (was found optimal on a smaller network) with  $\sim 150$  epochs (1-2 hrs).

Question: How should learning rate scale with network size?

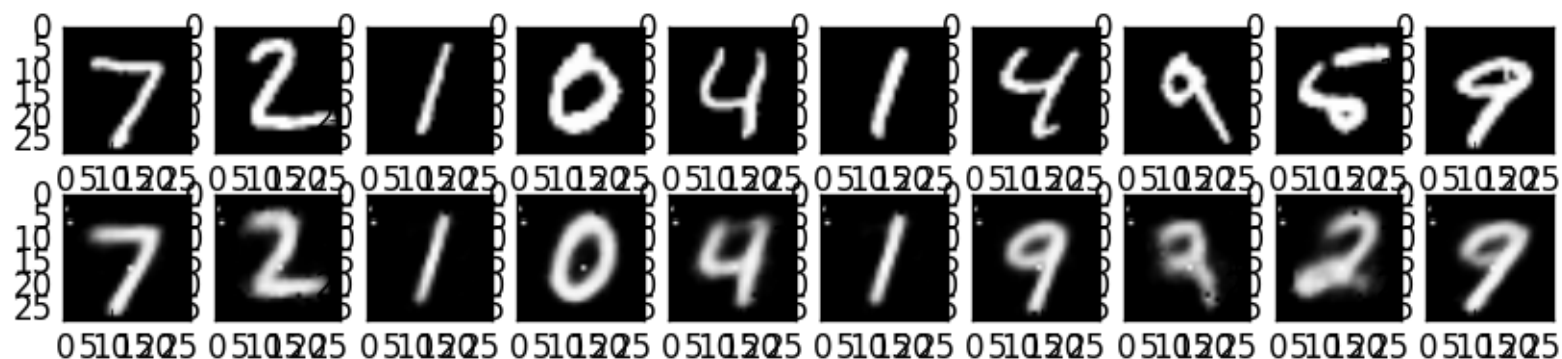
# Weights in the first layer



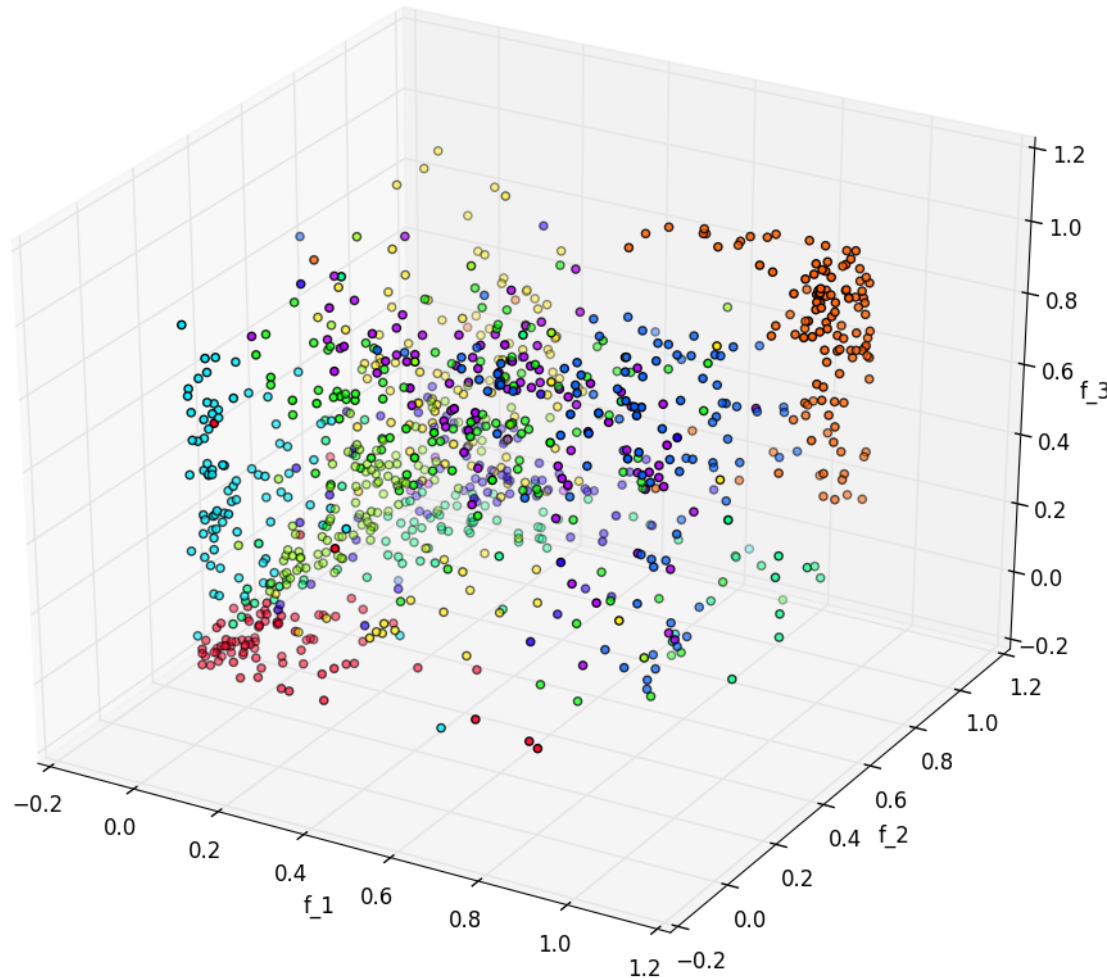
# Weights in the second layer



# Test-Data Performance



# Different Numbers in Feature Space



I plotted this in real time as the network was trained.

In order to see how numbers were separated gradually.

1s was quite easily separated, while some where not.

Note: the autoencoder does not know the labels, just trains to reconstruct the numbers.