

# Machine Learning

## Neural Networks (part 2 of the lecture)

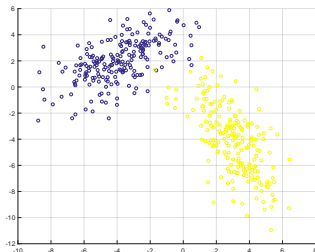
S. Nõmm

<sup>1</sup>Department of Software Science, Tallinn University of Technology

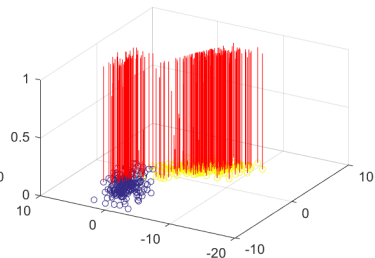
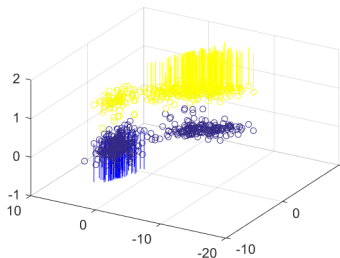
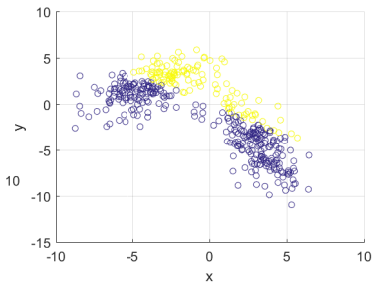
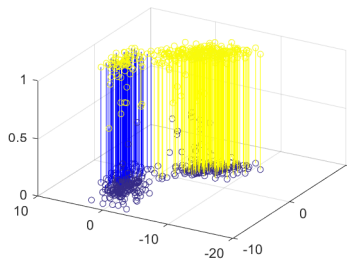
03.04.2018

# Classification

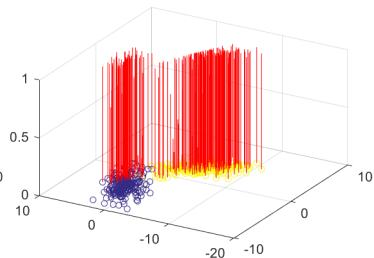
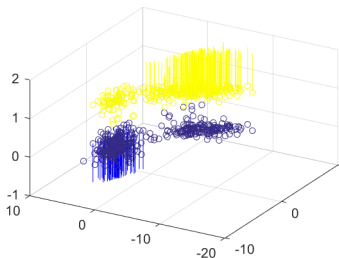
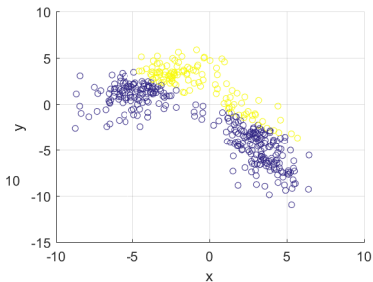
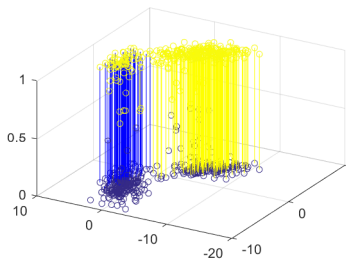
- The goal is to train neural network to classify elements based on their properties.
- Consider example of two sets where the properties of the elements are given by their coordinates.
- Attempt to build a classifier based on a single neuron with two inputs.
- Target (desired output) values are 0 and 1 depending on the class label.



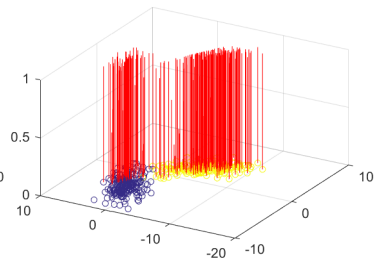
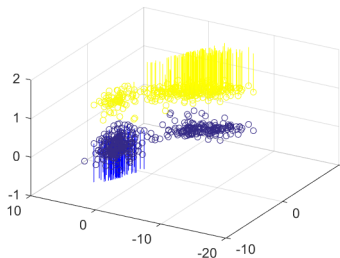
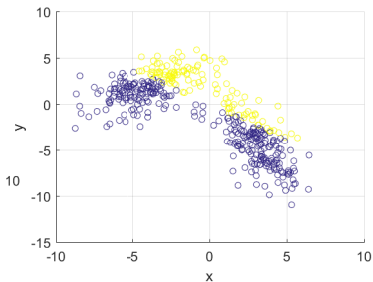
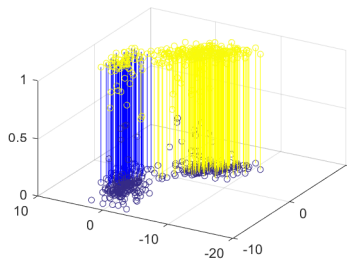
# Initial guess, SSR = 247.45



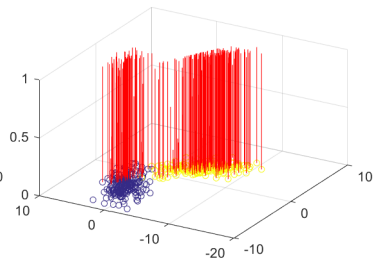
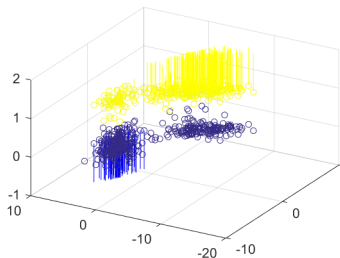
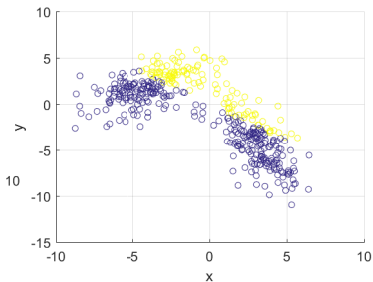
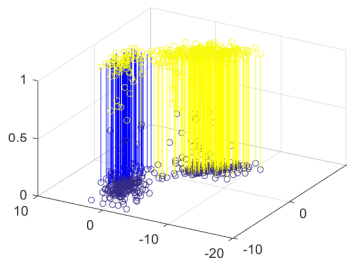
# Epoch 2, SSR = 244.47



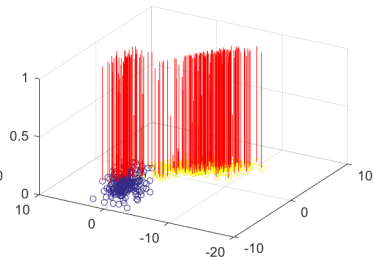
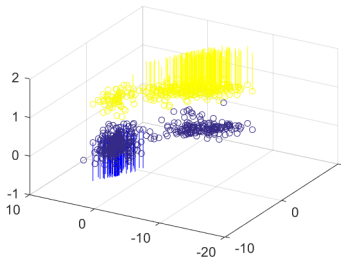
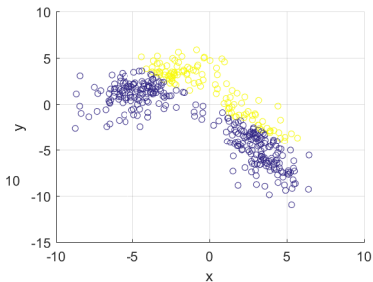
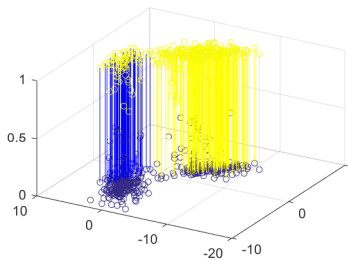
# Epoch 4, SSR = 238.82



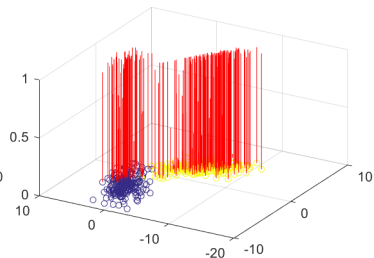
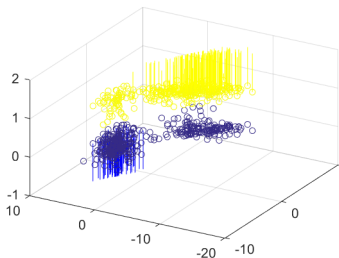
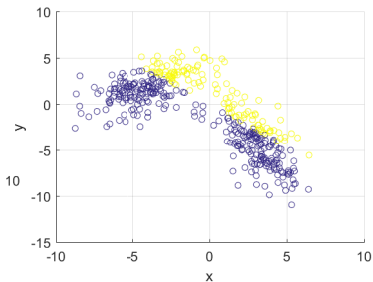
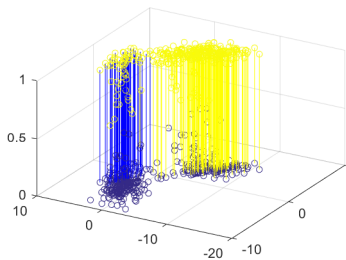
# Epoch 6, SSR = 231.98



# Epoch 8, SSR = 221.03

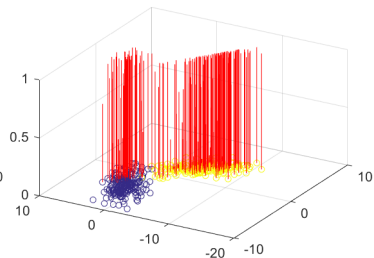
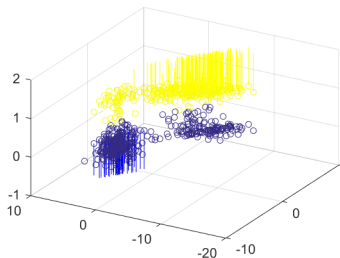
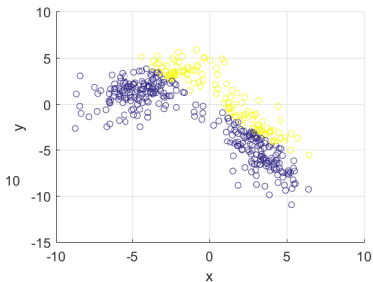
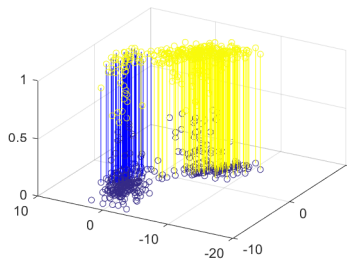


# Epoch 10, SSR = 205.61

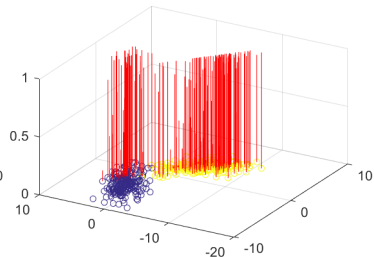
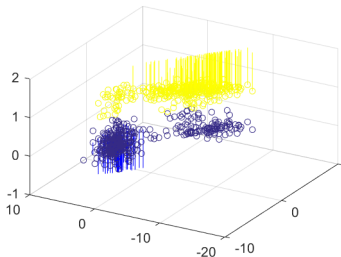
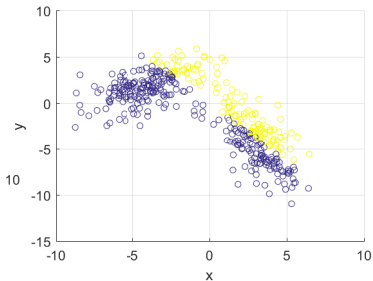
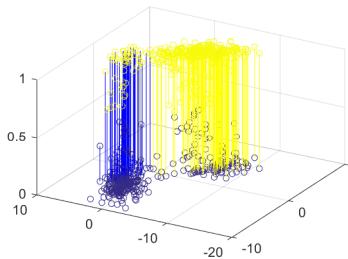




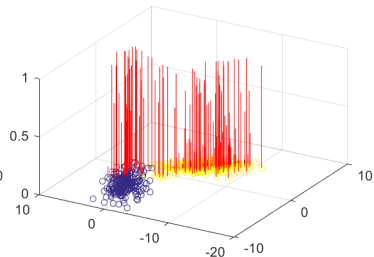
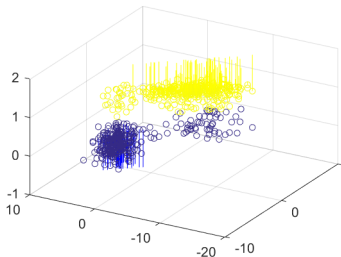
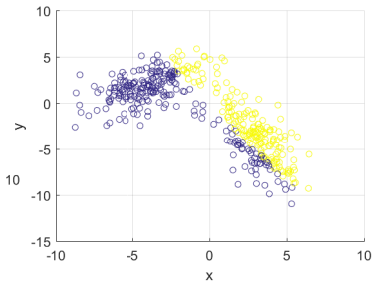
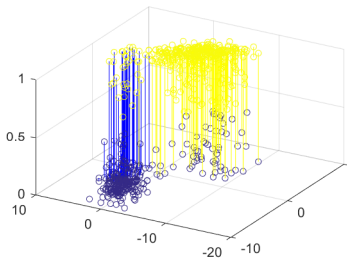
# Epoch 12, SSR = 183.14



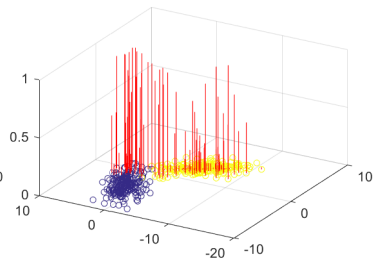
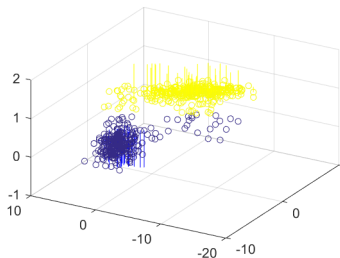
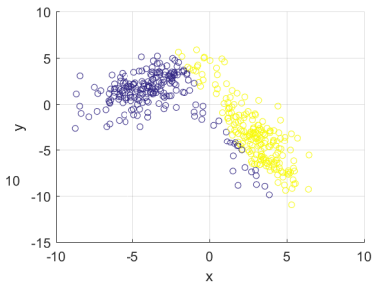
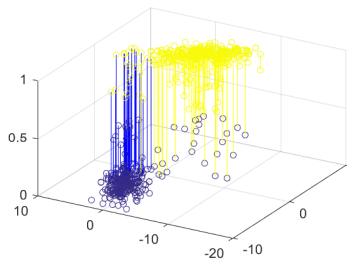
# Epoch 14, SSR = 147.53



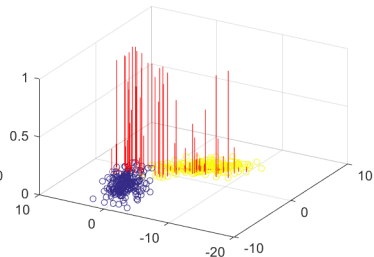
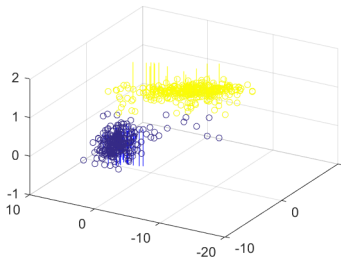
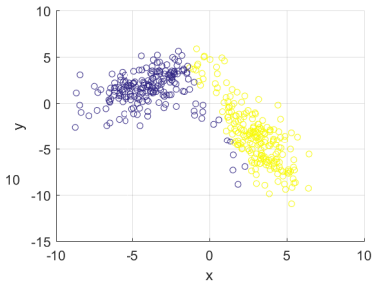
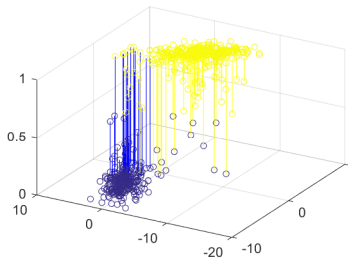
# Epoch 16, SSR = 75.57



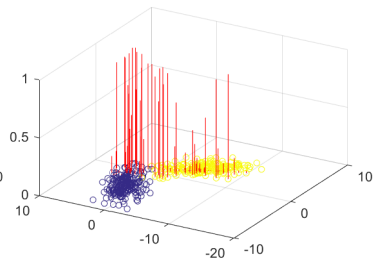
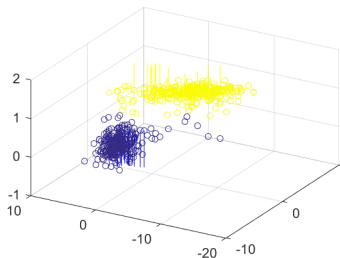
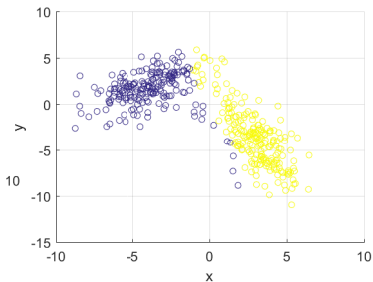
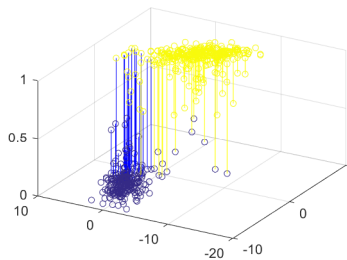
# Epoch 18, SSR = 37.85



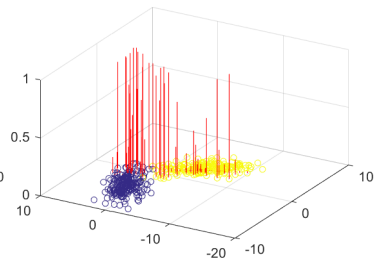
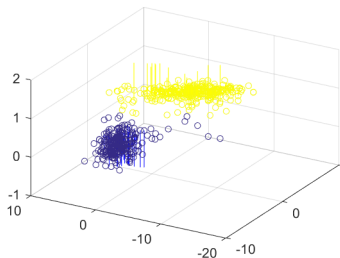
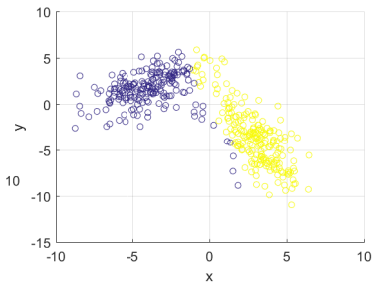
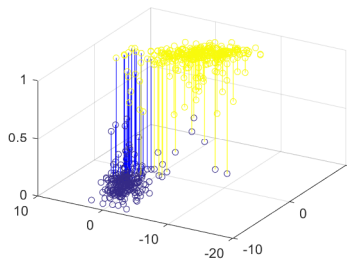
# Epoch 20, SSR = 27.86



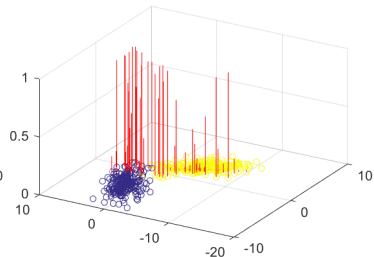
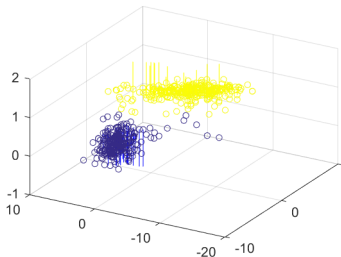
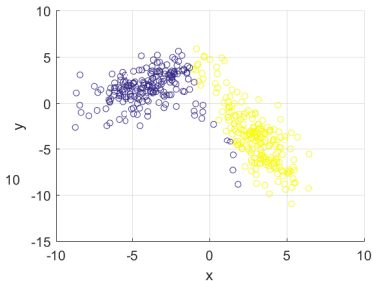
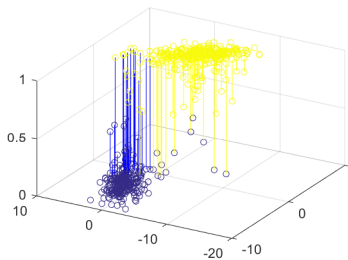
# Epoch 22, SSR = 26.39



# Epoch 24, SSR = 26.25

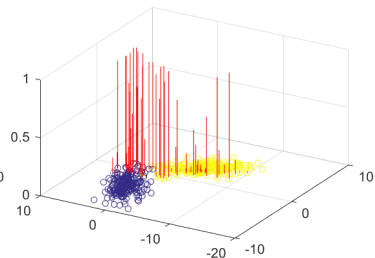
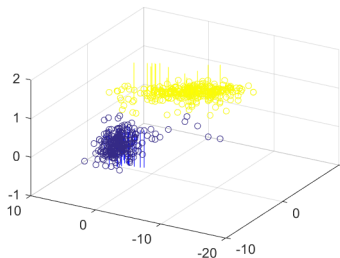
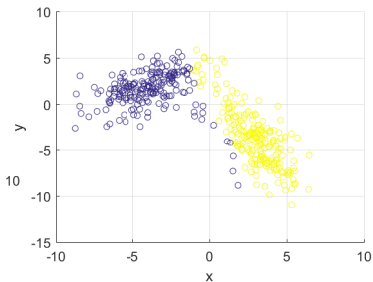
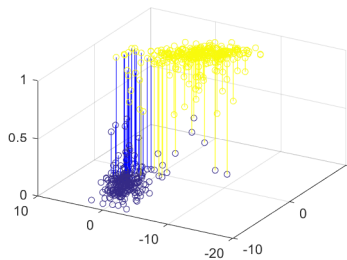


# Epoch 26, Training should stop here!

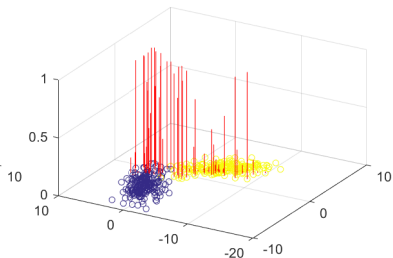
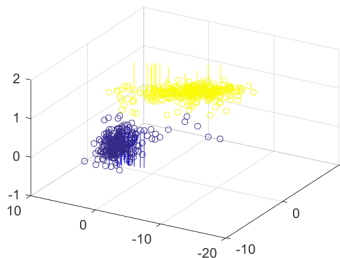
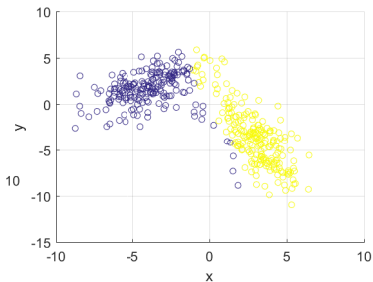
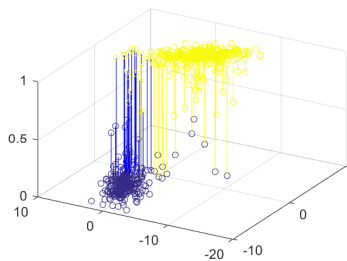




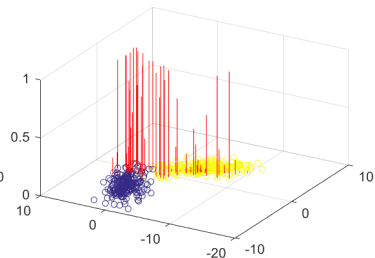
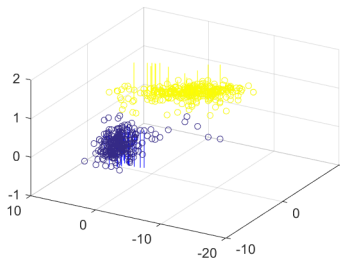
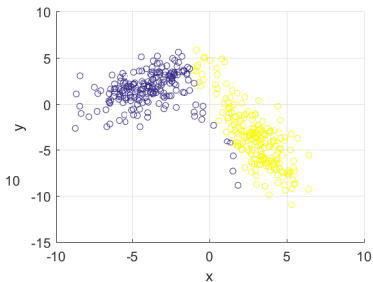
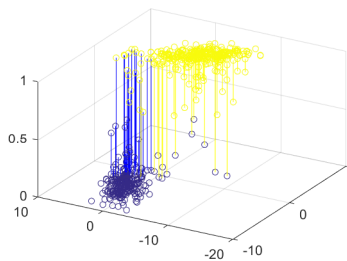
# Epoch 28



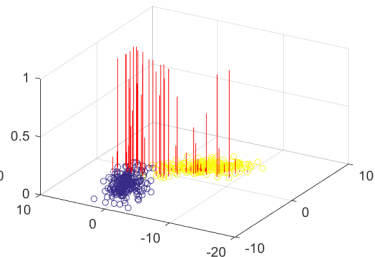
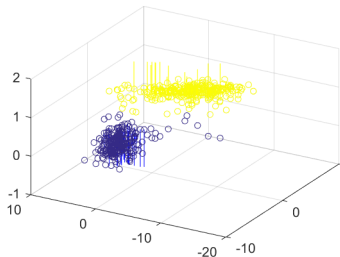
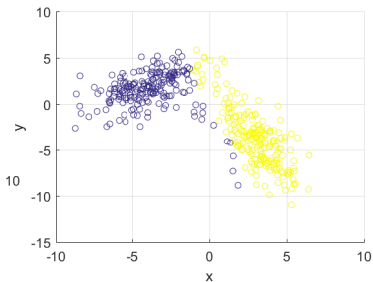
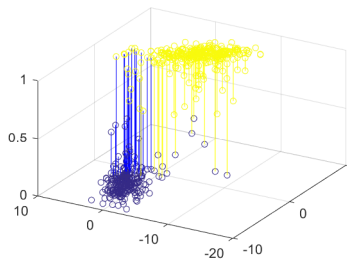
# Epoch 30



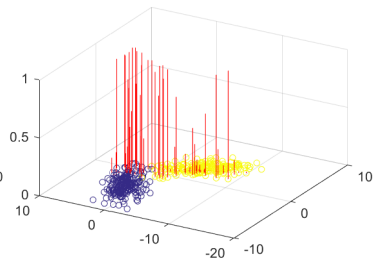
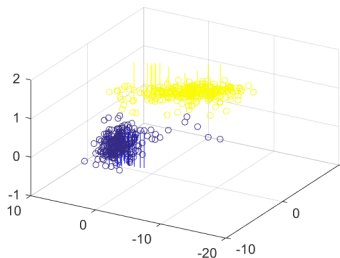
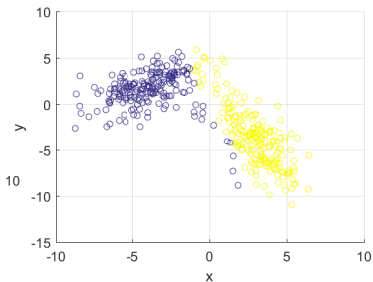
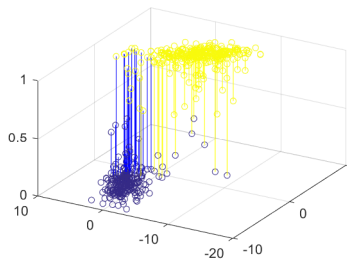
# Epoch 32



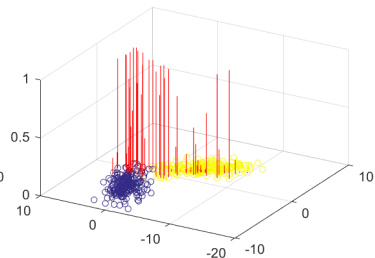
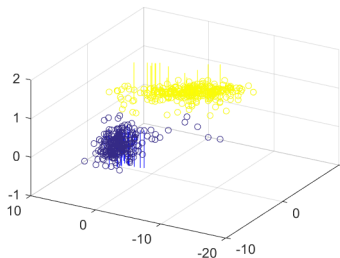
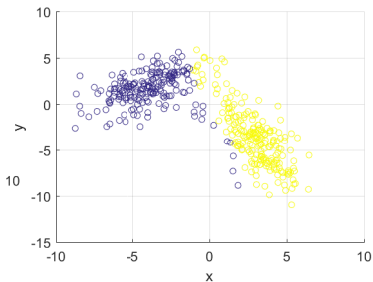
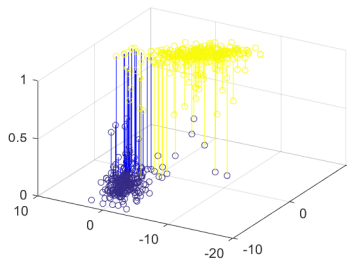
# Epoch 34



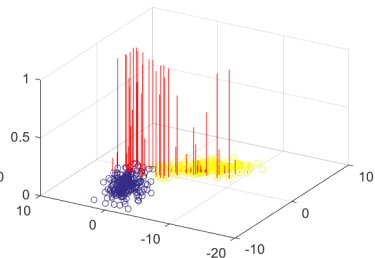
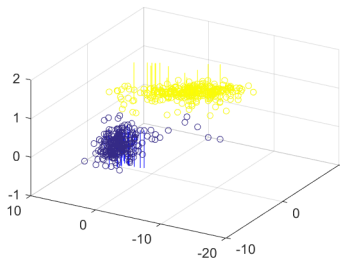
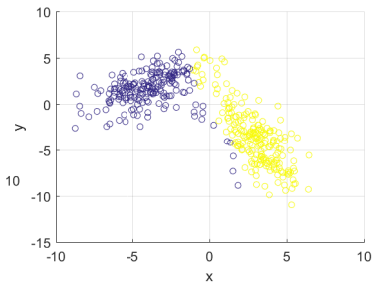
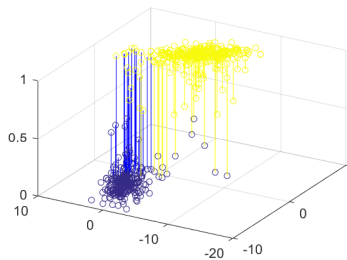
# Epoch 36



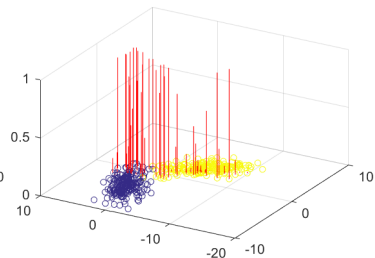
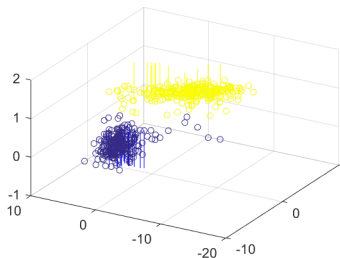
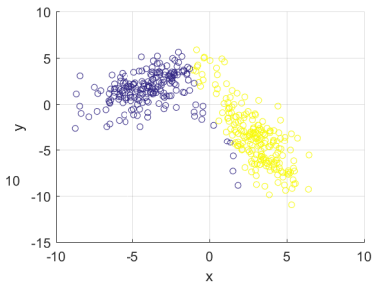
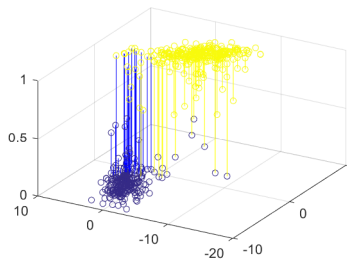
# Epoch 38



# Epoch 40

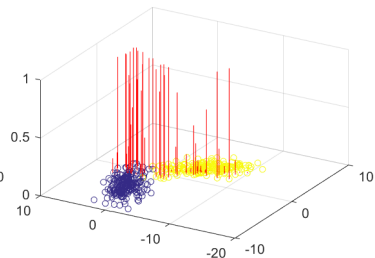
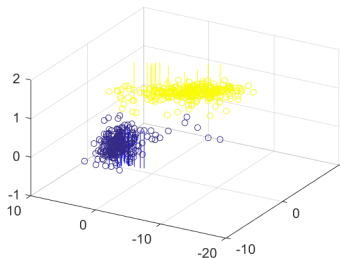
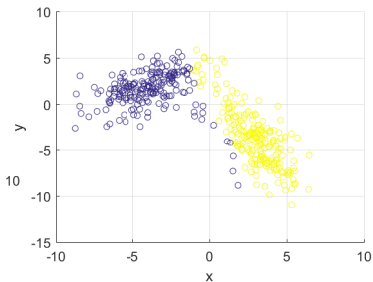
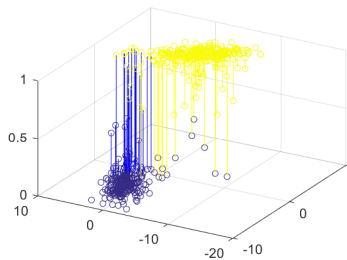


# Epoch 45

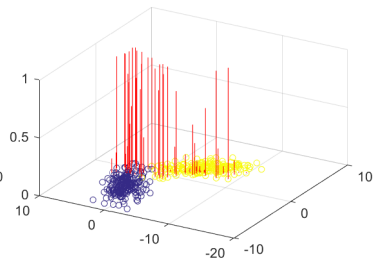
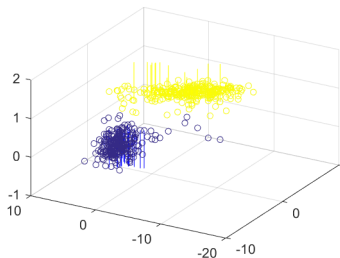
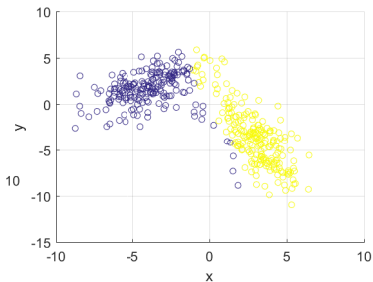
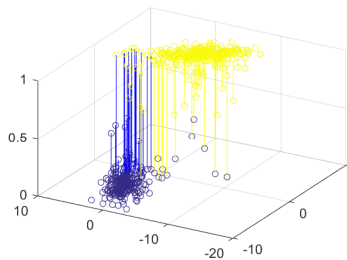




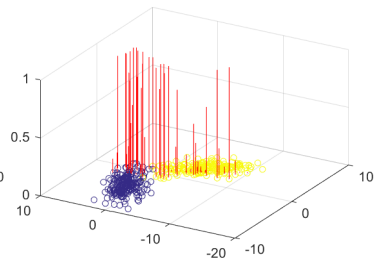
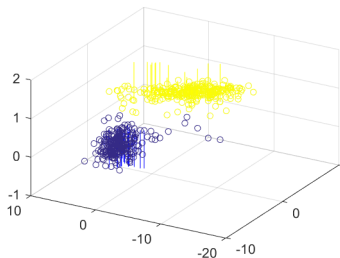
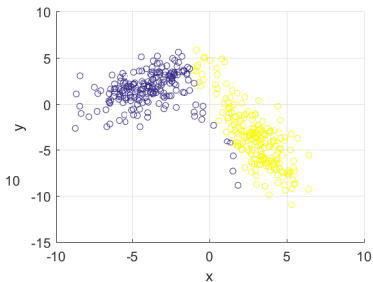
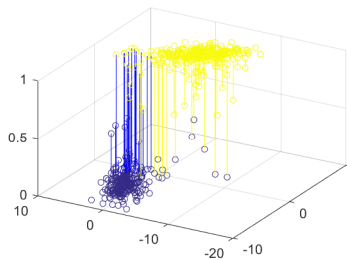
# Epoch 50



# Epoch 55



# Epoch 60



# Epoch 65

