**Example 4: Neural Networks**

4a. A neural network was shown to act differently to most other technology thus far. Particularly, it is often portrayed as a more accurate enhancement to SVMs. Using what we have learned, is this the case?

4b. Suppose there is a database of previously bought homes in a region of the country. In order to cut down time studying buyer preferences for price targets, the realtor would like to use deep learning to create a neural net to predict this value. The database contains features, compiled from a series of surveys, that are of biggest importance to a homebuyer. These common features include:

* Size of house
* Number of bedrooms
* Zip code
* Wealth
* Proximity to school

Design a neural network with a single hidden layer that takes these features into account and produces a final price target for the user. Describe what kind of neural network would best fit this scenario from the types we discussed.

4c. In the above neural network, how would backpropagation fit into the design? Explain your answer using your design.

4d. Now suppose that the features above are not actually the most important. Rather, buyers are shown to care most about how the home looks by first seeing it in a photo. The realtor would like to know what kind of houses are therefore generally more appealing. Modify the neural network in 3b) to incorporate the new feature. Assume there is now a database of home images to work with. What kind of neural net would be best in this scenario?

4e. Analysis of satellite imagery is vital in many spheres of information gathering. Real-time analysis of this imagery is key to prompt decision-making. How would a convolutional neural network help expedite the process? What are some of the pitfalls that could be encountered?

4f. A land surveillance company would like to hire consultants to make them a machine learning platform for their images. They would like to know what kinds of objects are commonly found in the areas they survey. Using a neural network, how would they go about creating this platform? Would they need multiple neural networks to do so?