Name: Kaley Nguyen Email: kaleynn2@illinois.edu

Question 1. What are the main messages you learned from this chapter?

- Autoencoder: an autoencoder is an unsupervised and nonlinear dimensionality reduction model and is widely used in many healthcare applications. Three different kinds of autoencoders are introduced in this chapter: stacked AE, sparse AE (sparse representation), and denoising AE (robustness representation).
- Sparse AE: this method adds a penalty term to the AE objective function to penalize $$\hat\rho$$ that deviates from the sparsity parameter $$rho$$.
- Stacked AE: each new AE layer receives its input from the output of the previous one.
- Denoising AE: adds noise to the original input x to obtain corrupted version $$\tilde{x}$$ and then train the AE on the corrupted version $$\tilde{x}$$.

Question 2. What related resources (book, paper, blog, link) do you recommend your classmates to checkout?

- Variational AE (similar to Denoising AE): https://medium.com/@smallfishbigsea/varational-auto-encoder-448d7072e7e4

Question 3. Which part do you want to improve in this chapter?

A clearer explanation of the layered AE would be helpful to me.

Question 4. What are the main difference between autoencoder and principal component analysis?

In both the encoder and decoder, an autoencoder adds a nonlinear activation layer. In a PCA, the activation function is simply an identity function, which is a form of linear dimensionality reduction.

Question 5. What is the main difference between autoencoder and denoising autoencoder?

A denoising autoencoder adds noises to the original input $$x$$ by adding noises and then attempts to recreate the input $$x$$ from $$\tilde{x}$$ - corrupted $$x$$. Different types of noise can be added, such as random Gaussian noise at all locations / some locations or modeled noises based on the input $$x$$.