Course : CS 598 Deep Learning for Healthcare

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1. **Please give a brief summary of the chapter?**

In this chapter we learned about generative models, a new type of neural network that generates realistic data from scratch. These models can produce new images, videos, and sequences. This chapter introduces GAN, VAE, and Diﬀusion Models for healthcare applications. In this chapter we also compare differences between VAE and GAN, and challenges in training GAN models.

1. **What improvements do you want to see in this chapter? Please elaborate on them.**

The chapter proposes solutions to improve GAN training and highlights the use of LDM for data generation; this could be very helpful for future research. There are ample code examples and architecture level details to go through in this chapter, which was very helpful personally. However, I would have liked a detailed explanation for the formulas in the chapter.

1. **What are the typos in this chapter?**

I was not able to find any typo.

1. **Which part of the chapter do you like most?**

I liked section 8.4.4 that explains the use of the Latent diffusion model to create synthetic chest X-ray images.LDM combines the strengths of both VAE and the simple diffusion model. The trained VAE model first uses its encoder to map high-dimensional samples into latent low-dimensional space where the LDM is trained. During generation, the noise goes through the LDM model and then uses the VAE decoder to synthesize data.

1. **What are the most useful things you learned from this chapter?**

The chapter explains the architectures and differences between VAE and GAN models, including their strengths and limitations. This combined with the code examples makes it very helpful. I found this most useful.

1. **Could you find at least one research papers that use attention models for handling healthcare predictive tasks? Use one sentence to summarize the paper and add citation.**

**“Deep generative molecular design reshapes drug discovery"** by Zeng et al. (2022) explores the application of generative models in molecular design to revolutionize drug discovery processes.

**Citation**: Zeng X, Wang F, Luo Y, Kang SG, Tang J, Lightstone FC, Fang EF, Cornell W, Nussinov R, Cheng F. Deep generative molecular design reshapes drug discovery. Cell Rep Med. 2022 Dec 20;3(12):100794. doi: 10.1016/j.xcrm.2022.100794. Epub 2022 Oct 27. PMID: 36306797; PMCID: PMC9797947.