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## Chapter 8 Reflection

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

This passage introduces the generative models for healthcare. It compares generative models with supervised models like DNN, RNN, CNN, and GNN. While supervised models require labeled data for training, generative models can create complex samples from scratch.

Generative models have the potential to revolutionize healthcare. This can happen in drug discovery, clinical trials, and rare diseases. They address challenges related to privacy and legal constraints by the generation of synthetic but realistic data. Furthermore, generative models can augment original datasets.

Recent advancements in generative vision and natural language processing are highlighted, including the development of large language models (LLMs) like GPT-3. Additionally, diffusion models have demonstrated impressive capabilities in image generation, producing images and videos that are difficult to distinguish from real ones. The passage ends with 3 generative models: GAN, VAE, and diffusion.

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

I think the main point to be improved upon is the size of the images in the chapter. While their inclusion is great, they are a bit too small and should have been rendered a bit larger. Especially for the diffusion model. It's hard to appreciate the relation of the model inputs to the outputs with poor quality images.

### 3. What are the typos in this chapter?

- Pg 190 “The sizes of these sets are distributed in the ratio of 60% : 20% : 20% respectively.” The problem is there are too many colons. It should be “ratio of: 60%, 20%, 20% respectively.”

Otherwise no other typos were noticed.

### 4. Which part of the chapter do you like most

I quite liked the breakdown of the diffusion model from a mathematical standpoint. The transition to the PyTorch implementation made the most sense to me in this chapter.

### 5. What are the most useful things you learned from this chapter?

The code blocks and numerous examples provided in this chapter were particularly beneficial, offering readers practical demonstrations of the concepts discussed. The final example, which guides through a complete process, is especially effective in illustrating how PyTorch can be utilized to implement a generative network. The chapter effectively builds up to this demonstration by thoroughly explaining the components and workings involved.

6. Could you find at least one research papers that use generative methods for handling healthcare predictive tasks?

[1] is a research article that documents the use cases of many generative models for healthcare purposes.

## References

- [1] Reddy, S. Generative AI in healthcare: an implementation science informed translational path on application, integration and governance. *Implementation Sci* 19, 27 (2024). <https://doi.org/10.1186/s13012-024-01357-9>
- [2] Xiao, C., Sun, J. (2021). Introduction. In: *Introduction to Deep Learning for Healthcare*. Springer, Cham. [https://doi-org.proxy2.library.illinois.edu/10.1007/978-3-030-82184-5\\_1](https://doi-org.proxy2.library.illinois.edu/10.1007/978-3-030-82184-5_1)