PART A:

Self-supervised learning is a type of machine learning where the system teaches itself using its own input data. Unlike supervised learning, which needs external help (like labels) to learn, self-supervised learning creates its own learning tasks. For example, it might try to guess the next word in a sentence or the next part of a video. This method is useful when it's hard or costly to get labeled data. By learning this way, the system gets better at understanding patterns and structures in the data. This understanding is then used for other tasks like identifying objects, categorizing them, or figuring out where they are.

The main difference between self-supervised and unsupervised learning is their goals. Both don't use labels given from outside, but unsupervised learning looks for hidden patterns in data without a specific job in mind, like grouping similar items or simplifying complex data. Self-supervised learning, on the other hand, sets up its own tasks using the data it has, like predicting missing parts. This focus on specific tasks helps it learn more practical and broadly useful features than unsupervised learning.

Self-supervised learning is used in many areas. For example, in image processing, it helps computers understand pictures by guessing colors in black-and-white images or fixing broken images. In language processing, it trains systems like BERT to fill in missing words, which helps them get better at understanding context and meaning in text. In robotics, it allows robots to learn from what they do and see, making them better at handling objects. This method is really useful, especially when it's hard to get labeled data or the things to learn are complex.

PART B:

Online learning, also called incremental learning, updates the model constantly as new data comes in. It's like learning on the go, making it great for situations where data keeps changing or coming in, like stock market analysis or traffic management. The benefit here is that the model stays up to date with the latest trends and changes without being retrained from scratch. However, there's a challenge too: the model might focus too much on recent data and forget older but still relevant information.

Offline learning is when you train a machine learning model using a set amount of data all at once, and then use it without updating it. It's used when you have all the data you need right from the start and things aren't changing much, or you can update the model occasionally. This method is good for tasks like recognizing images, processing language the traditional way, or making predictions using old data. The advantage is that you can train the model really thoroughly, using advanced methods and fine-tuning it a lot. But the downside is that it doesn't adapt well to new or changing data, which can make it less useful in situations where things keep changing.

PART C:

https://dagshub.com/ROCCYK/ANN_Assignment4.mlflow

https://github.com/ROCCYK/ANN_Assignment4

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