Long Question 1:

At eSewa, I think focusing on two specific areas would help make unsupervised learning more effective. First, I find it hard to sleep because fraud is a constant threat to digital payment services. I would make use of Isolation Forest for its efficiency with millions of transactions and combine it with Autoencoders to detect patterns that could easily evade simple detection algorithms. We can spot suspicious activity immediately and do away with the false alerts that society blasts on those who are doing the right thing (Kumar, 2020).

After that, I'd focus on segmenting customers. Currently, the same promotions are being shared with every customer - how pointless! Using K-Means, I arranged users by how they spent and then resorted to DBSCAN to find small and unique groups of users. If we find students who pay both for education and delivery using eSewa, we can make them special offers. All these points would go straight into our marketing automation tools (Nandapala, 2022).

Long Question 2 (E-commerce - ML Challenges):

Working in e-commerce, I expect to run into three problems.

1. Data drift – customers' tastes change as frequently as the weather. Without detecting it, the recommendations we offer can't do anyone any good. To make sure models are always updated, I used statistical tests for automatic monitoring and mounted monthly retraining (Gama, 2020).

2.Inbalanced data trap: The fraud model may indicate nearly perfect accuracy but still fail to identify genuine fraud. I would contest this with SMOTE to build extra examples of fraud and make the model more concerned about the unique, yet crucial, samples with focal loss.

3.If suggestions take too long to appear, customers end up leaving. By quantizing the models and using TensorFlow Serving, I could achieve quick predictions. Regularly gathering experts from development, engineering and product management. Clearer communication allows us to handle problems early.

Short Question 1 (Overfitting):

If a model overfits, it gains knowledge of all the data points, including the random noise, making it function badly when tested on new examples. I would apply two different methods to avoid overfitting.

Dropout:

Dropout misses some neurons as part of the neural network's training. As a result, the model does not depend on only a few neurons which improves its ability to generalize. If the task is to recognize dogs and cats, including dropout in the dense layers helps the model prevent learning by heart the training images and improves its performance on unseen ones (Lengerich, 2020).

Data Augmentation:

It enlarges the training set by generating variations of existing images (by turning, flipping or enlarging them). It allows the model to become more effective with certain features. Rotating face images randomly during training in facial recognition helps the model detect a face from different angles. They contribute to the model gaining generality so it will work on various data, not only those used in training.

Short Question 2

Images are the main type of data used with a CNN (Convolutional Neural Network). It helps to analyze space using the presence of edges, shapes and texture details. An RNN is employed for handling tasks involving sequential inputs by keeping past information in loops.

Example:

With CNN, images can be analyzed to detect objects present in the picture. RNN is suitable for analyzing emotions or predicting trends in stock prices, since order matters in these tasks.

The Main Obstacles Relating to Training Deep Learning Models:

- Too small gradients during backpropagation in RNNs (and deep networks generally) leads to slow learning.
- A solution is to apply LSTM in RNNs or ReLU activations to ensure the gradients are not losing stability.

Overfitting: The solution is tailored to the exact data it was trained on.

Solution 1: Use early stopping so that training ends once the accuracy of validation data stops rising. They enable you to get stable and reliable training results.

References

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