Graph Mining CSF426
Lab session 7 (evaluative)
Time: 5 pm – 7 pm
Date: 26-09-2024
Instructor IC - Vinti Agarwal

Instructions: All questions need to be answered. **You are required to write programs in jupyter notebook and submit .ipynb on canvas**. Please rename your solutions in format <ID-NAME-LABNO>. For theoretical questions, you can type answers in the jupyter notebook itself. There is no need to create a separate text file. **[Total Marks =10]**

Objective: Design a classifier to classify Iris data utilizing two different loss functions; cross-entropy loss and supervised contrastive loss.

Dataset: Iris data which contains 150 data points belonging to 3 different classes.

Tasks: For the given exercise implement the following steps.

Step 1: Design an MLP with two hidden layer (size - 128,64) and use cross entropy loss at output layer to learn MLP weights and then extract embeddings (X_{CE} from last layer.

Step 2: Design an MLP with two hidden layer 128,64 and use supervised contrastive loss to learn MLP weights and then extract embeddings (X_{SCL}) from the last layer.

Step 3: Use the two sets of embedding X_{CE}, X_{SCL} and pass it through 3 traditional classifiers (Random Forest, SVM, Xgboost) and compare the test accuracy.

Appendix:

Cross entropy loss:

$$L = -\frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{C} y_{ij} * log(p_{ij})$$

NOTE: Take the output from last MLP layer and pass it through softmax function to get p_{ij} and use it to compute CE loss.

Supervised cross entropy:

$$\mathcal{L}_{out}^{sup} = \sum_{i \in I} \mathcal{L}_{out,i}^{sup} = \sum_{i \in I} \frac{-1}{|P(i)|} \sum_{p \in P(i)} \log \frac{\exp(z_i \cdot z_p/\tau)}{\sum_{a \in A(i)} \exp(z_i \cdot z_a/\tau)}$$

NOTE: Get the embedding matrix X_{SCL} from the last layer of MLP. And positive pairs (excluding self-pair) and negative pairs for every datapoint to compute the supervised contrastive loss.