Homework Assignment 6

Due Date: 6pm on Tuesday April 4th

1. Reading summary (6 points)

Reading material:

> Boudiaf, Malik, et al. "A unifying mutual information view of metric learning: cross-entropy vs. pairwise losses." European conference on computer vision. Springer, Cham, 2020

Please summarize the reading material in your own words. This exercise will help you comprehend the main objectives in the reading besides the technical details. Your summary should consist of three parts:

1. One-sentence summary
2. One-paragraph summary
3. Half-page summary

2. Questions (4 points)

Please select **Three** questions to answer from the following list, and write down **one** question that you have about reading material. Your question can be about a specific concept that is difficult to understand, a line of confusion, or something you would like to learn more about.

- What are some common challenges in existing pairwise deep metric learning methods?
- Why is minimizing the tightness term in contrastive loss equivalent to minimizing $H(\widehat{Z}|Y)$?
- How does the constrastive loss relate to the mutual information between input feature Z and label variable Y? Under what condition does this relation hold?
- What are the generative and discriminative view of mutual information $I(\widehat{Z}, Y)$?
- How does cross entropy loss relate to pairwise distance loss?
- Explain how the evaluation metric **Recall at k** works. Why is it preferred in metric learning than other metrics such as precision, according to this paper?

Open question:

- Why cross-entropy is ignored in deep metric learning?
- Do you agree or disagree with the view of the author? How would you choose between cross-entropy loss and other deep metric learning methods in practice?