Improving ELSA and adding a theoretical framework

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- **<u>Idea:</u>** Adding theoretical background to *Efficient Latent Search Algorithm (ELSA)* and making improvements to its search components.
- **<u>Datasets:</u>** CIFAR, MNIST and ImageNet-1k.
- **Relevant Papers:**
  1. *Bardes, A., Ponce, J., & LeCun, Y. (2021). VICReg: Variance-Invariance-Covariance Regularization for Self-Supervised Learning (Version 3). arXiv.*
  2. *Shwartz-Ziv, R., Balestriero, R., Kawaguchi, K., Rudner, T. G. J., & LeCun, Y. (2023). An Information-Theoretic Perspective on Variance-Invariance-Covariance Regularization (Version 2). arXiv.*
  3. *Li, J., Zhou, J., Xiong, Y., Chen, X., & Chakrabarti, C. (2022). An Adjustable Farthest Point Sampling Method for Approximately-sorted Point Cloud Data (Version 1). arXiv.*

- **<u>Work Distribution:</u>**
  - ▶ Aaditya : Understanding Self-Supervised Loss, specifically Contrastive Loss, building mathematical intuition behind the VICReg triplet loss, finding and verifying a theoretical error bound for the loss function, some implementations.
  - ▶ Rameswar : Understanding the techniques for Farthest Point Sampling in Graph Neural Networks, adapting Farthest Point Sampling for VICReg Space, some implementations, report.

- **Midway Targets:**
  - ▶ Complete the reading part of above mentioned topics.
  - ▶ Find some weak error bound for the loss function.

- **<u>Expected Results:</u>**
  - ▶ Improve the working of ELSA by having a better RandS (increasing both the metrics defined in the paper).
  - ▶ Providing theoretical justifications to the working of the two components and finding a theoretical error bound to the said algorithm.