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Lab session # 7
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1 Question 1

The points lay on the segment Y=X.
If we take $\phi(X) = |x + y|$ which can be done with two linear layers $A_1 = [[1, 1], [-1, -1]] + ReLU + A_2 = [1, 1]$
Then for each respectively we get the respective representations (2,4,6,8). And thus DeepSets can distinguish these sets.

2 Question 2

DeepSets architecture is made to be permutation invariant. Such features can be useful for graph classification task enforcing (approximately) isomoprhism invariance.
It's worth noting that this architecture represents a more general class of the Graph classification architecture studied in lab 6 (If we take away matrix P we find the same setting).

3 Question 3

In order to have the exact solution to our problem we will need to evaluate every possible combination of K nodes in our graph. This results to C_n^k subgraphs to evaluate.

4 Question 4

Central nodes tend to be close to one another, sampling the largest nodes in terms of a centrality measure (like K core) can result in limited spread as the area's of influence of these nodes will have high overlap such that the overall influence is highly reduced.
One potential way is to use a centrality measure coupled to a distance measure (eg: shortest path) to try and tackle the issue of overlap. Like for example choosing iteratively the best node (in terms of centrality) such that the shortest path between it and the already chosen nodes is at least 20.

5 Plots

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We report our plots in the following section.

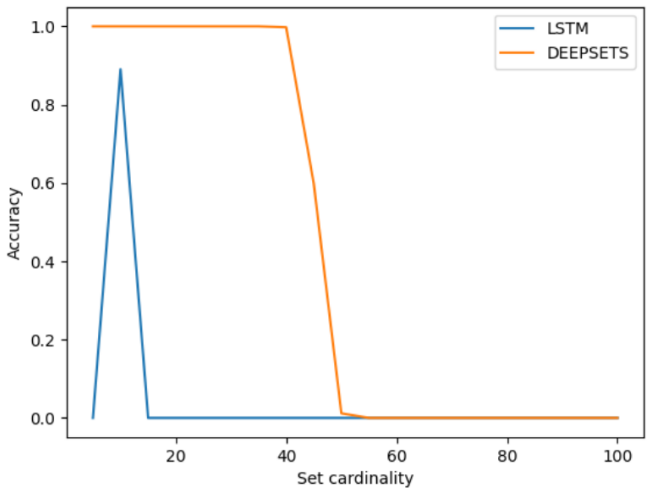

Figure 1: LSTM Vs DeepSets loss

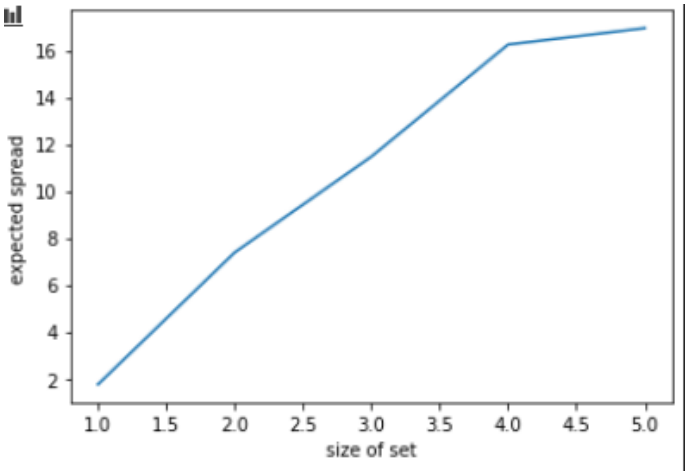

Figure 2: Evolution of spread with greedy algorithm.

References