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Lab session # 6
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1 Question 1

If the number of columns of Z is chosen to be larger than the number of nodes in the graph, the accuracy is expected to be high, because each nodes would be allowed to have a dedicated dimension. No information is compressed, the decoding accuracy is high but we lost the interest of auto-encoding.

2 Question 2

We can use positional encoding to uniquely identify each nodes.

3 Question 3

For a graph Erdős-Rényi random graphs with $n = 15$ nodes, there is $\frac{n(n+1)}{2} = 120 =: m$ possible edges. The number of edges M thus follows a binomial law $M \sim \mathcal{B}(m, p)$. For $p = 0.2$ resp. 0.4, its expectancy is then $mp = 24$ resp. 48 and its variance $mp(1 - p) \simeq 19.2$ resp. 28.8.

4 Question 4

(i) computing readout with sum

$$Z_{G_1} = \begin{bmatrix} 0.7 \\ -0.49 \\ 2.39 \end{bmatrix} \quad Z_{G_2} = \begin{bmatrix} 3. \\ 0.4 \\ 2. \end{bmatrix} \quad Z_{G_3} = \begin{bmatrix} 1.5 \\ 0.2 \\ 1. \end{bmatrix}$$

(ii) computing readout with mean

$$Z_{G_1} = \begin{bmatrix} 0.233 \\ -0.163 \\ 0.796 \end{bmatrix} \quad Z_{G_2} = \begin{bmatrix} 0.75 \\ 0.1 \\ 0.5 \end{bmatrix} \quad Z_{G_3} = \begin{bmatrix} 0.75 \\ 0.1 \\ 0.5 \end{bmatrix}$$

(iii) computing readout with max

$$Z_{G_1} = \begin{bmatrix} 0.89 \\ 0.34 \\ 1.31 \end{bmatrix} \quad Z_{G_2} = \begin{bmatrix} 0.89 \\ 0.34 \\ 1.31 \end{bmatrix} \quad Z_{G_3} = \begin{bmatrix} 0.89 \\ 0.34 \\ 1.31 \end{bmatrix}$$

For this example, sum is able to discriminate the best between the 3 graphs, then mean, then max which doesn't discriminate.

References