Homework 1

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Problem 1:

By Theorem 1, the largest eigenvalue of $\alpha \mathbf{A}$ λ_1 should be less than 1 to make the geometric series convergent. With the help of Perron–Frobenius theorem, the upper bound of λ_1 is $\max_i \sum_j A_{ij} = \max_i d_i$. Hence for $0 < \alpha < \frac{1}{\max_i d_i}$ guarantee the convergence.

Problem 2:

The number of common neighbors equals to the number of 2-walking paths between v_i and v_j, that is, $\mathbf{A}^2[v_i, v_j]$.
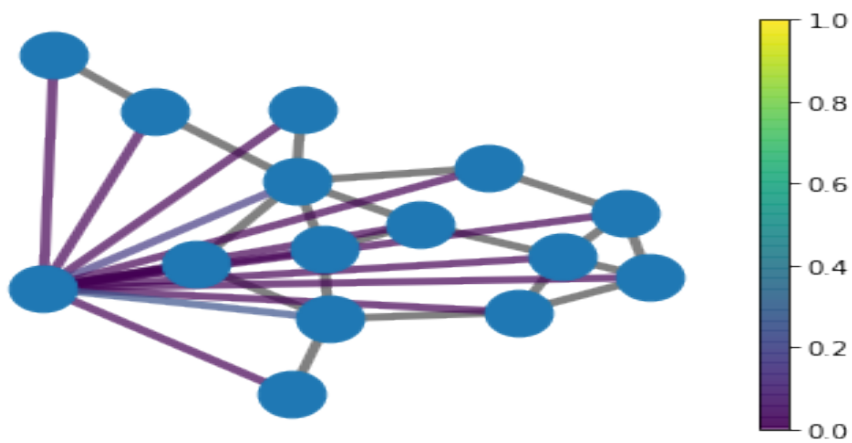
Problem 3: A. See the python code.

B.

Figure 1: Similarity of 'Ginori' family