# Design Software to calculate the degree centrality for the Hist1 region

Degree centrality can be described as the number of connections that a node has within a network.

We can interpret the normalized linkage table as a network with the following rules:

- The network contains a vertex for each window in the Hist1 region
- The network contains an edge $\langle A,B \rangle$ when $L(A,B) > L\text{-avg}$, where:
  - $L(A,B)$ = the normalized linkage of Windows A & B
  - L-avg = the average value in the normalized linkage table for the Hist1 region

| Windows | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1 | 0.59 | 0.41 |
| 2 | 0.59 | 1 | 0.44 |
| 3 | 0.41 | 0.44 | 1 |

To calculate L-avg on this minimized version of the normalized linkage table, we do the following computation:

$$\frac{(1+.59+.41+0.59+1+.44+.41+.44+1)}{9}$$

$$\Rightarrow 0.65\overline{3}$$

So we have our L-avg as $\boxed{0.65}$

Now we must determine the edges of a network. If $L(A,B) > L\text{-}avg$, mark it as a '1' in an adjacency matrix.

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | X | 0 | 0 |
| 2 | 0 | X | 0 |
| 3 | 0 | 0 | X |

In this specific case, all $L(A,B)$ values were less than $L\text{-}avg$, marking no edges.

I presume this will change when I perform the operation on a $80 \times 80$ matrix

To manually Calculate Degree Centrality we sum each row and divide by $n-1$

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | x | 0 | 0 |
| 2 | 0 | x | 0 |
| 3 | 0 | 0 | x |

| Sum | / | (N-1) | = | Degree |
|---|---|---|---|---|
| 0 | | 2 | | 0/2 |
| 0 | | 2 | | 0/2 |
| 0 | | 2 | | 0/2 |

$$C_{Di} = \frac{\sum_{j=1}^{n} \frac{a_{ij}}{1}}{n-1}$$

numerator: sums all possible ties

denominator: number of possible ties

This scales the degree centrality between 0 and 1