AIH7150 - connectomics

Assignment (learning by doing).

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3.7: Functional connectivity values using Pearson's correlation coefficient (PCC).

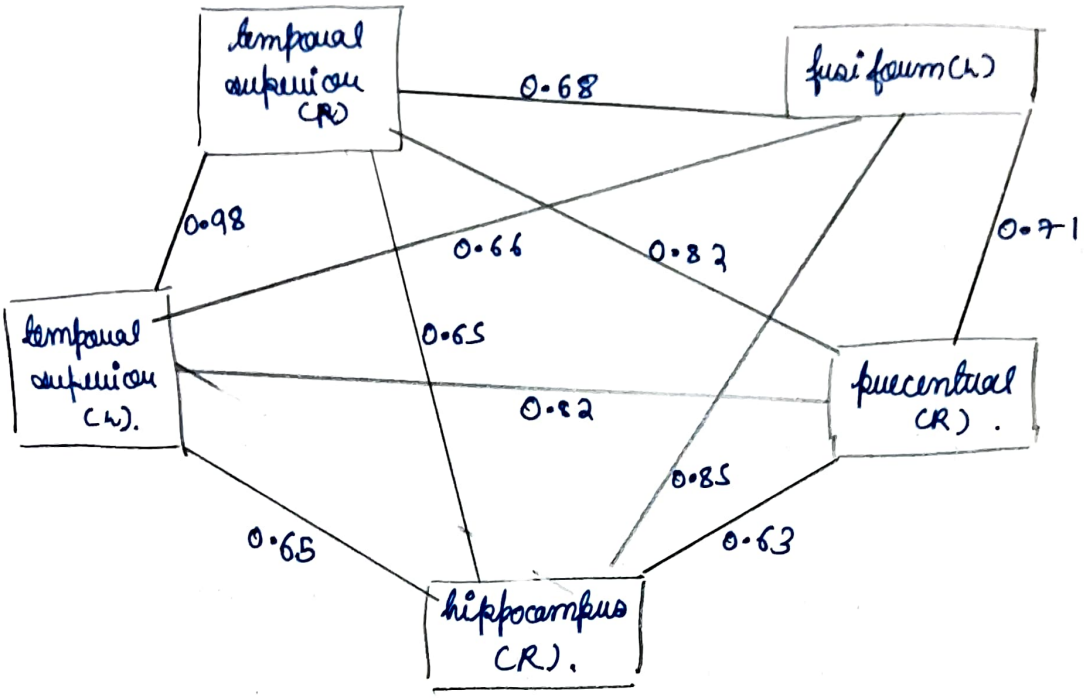
ROI's & their description for further analysis

	(x,y,z) in mm.	Label (AAH3)	% cluster
ROI-1	(-30, -31, -19)	Fusiform (left)	66.67
ROI-2	(-63, -28, 11)	Temporal superior (left)	51.97
ROI-3	(30, -31, -16)	Hippocampus (Right)	48.48
ROI-4	(54, 2, 47)	Precentral (Right)	100
ROI-5	(57, -22, 11)	Temporal superior (Right)	65.13

PCC values b/w pairs of ROI's in matrix form for better understanding

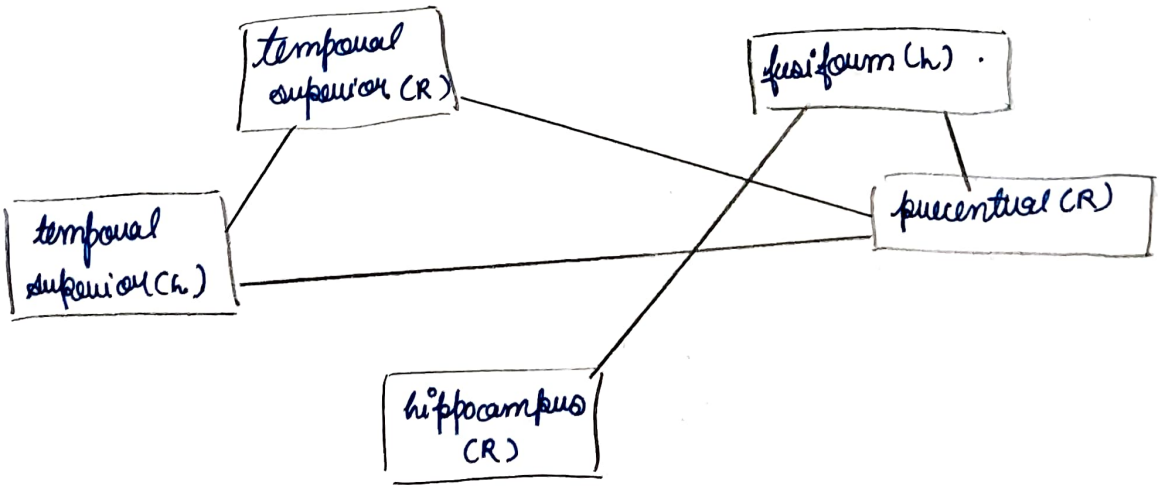
	fusiform (L)	hippocampus (R)	precentral (R)	temporal sup (L)	temporal sup (R)
fusiform (L)					
hippocampus (R)	0.85				
precentral (R)	0.71	0.63			
temporal_sup-(L)	0.66	0.65	0.82		
temporal sup (R).	0.68	0.65	0.82	0.98	.

undirected weighted network



3.8 two brain areas that have highest connectivity during the auditory f-MRI. are: → temporal superior (Right)
→ temporal superior (left).

3.9 conversion to binary graph with edge threshold of 0.7.



Graph theoretical analysis of binary graph.

(a) clustering coefficient for all the 5 brain areas.

(i) temporal superior (R)

$$C = \frac{1}{{}^2C_2} = 1.$$

(ii) temporal superior (L)

$$C = \frac{1}{{}^2C_2} = 1$$

(iii) precentral (R).

$$C = \frac{1}{{}^3C_2} = \frac{1}{3}$$

(iv) fusiform (L).

$$C = 0$$

(v) hippocampus (R)

$$C = 0.$$

(b) transitivity = $\frac{3 \times \text{no. of } \Delta\text{'s}}{3 \times \text{no. of } \Delta\text{'s} + \text{total triplets (non-}\Delta)}$

$$= \frac{3 \times 1}{3 \times 1 + 1} = \frac{3}{4} = 0.75$$

(c) Characteristic Path length of graph (binary) . (CPL)

$$CPL = \frac{\text{global average of distance matrix}}{\cdot |V(G)|^2 - V(G) \cdot} \quad \leftarrow \text{removing self-loops.}$$

Distance matrix =

$$\begin{bmatrix} 0 & 1 & 1 & 2 & 3 \\ 1 & 0 & 1 & 2 & 3 \\ 1 & 1 & 0 & 1 & 2 \\ 2 & 2 & 1 & 0 & 1 \\ 3 & 3 & 2 & 1 & 0 \end{bmatrix}$$

$\therefore CPL = \frac{34}{25-5}$ (total non-diagonal entries)

$= \frac{34}{20} = \frac{17}{10} = 1.7$

$\Rightarrow CPL = 1.7$

$\therefore$ Characteristic path length of the graph is 1.7 .