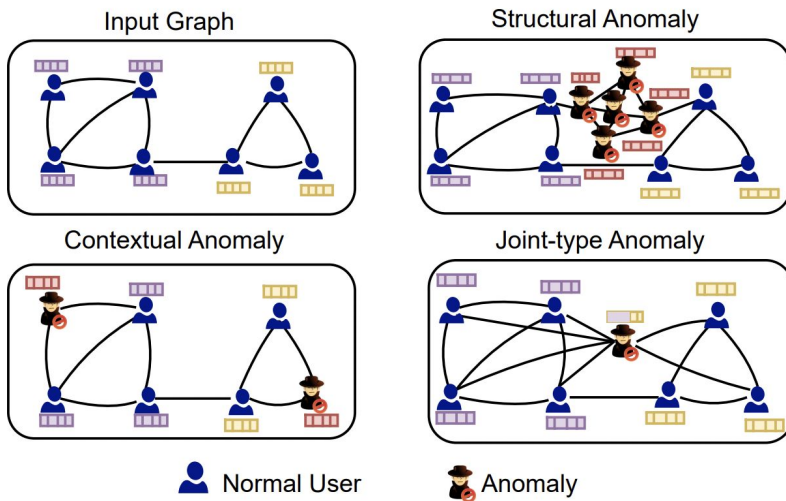




# Improved Graph Anomaly Detection based on Network Control Theory

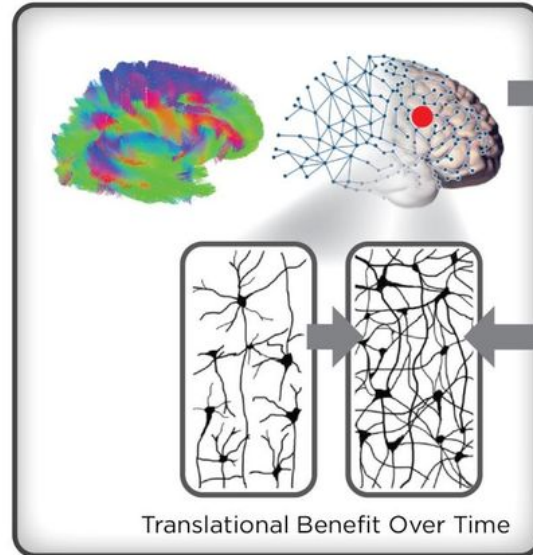
Yifan Wei

# Graph Anomaly Detection

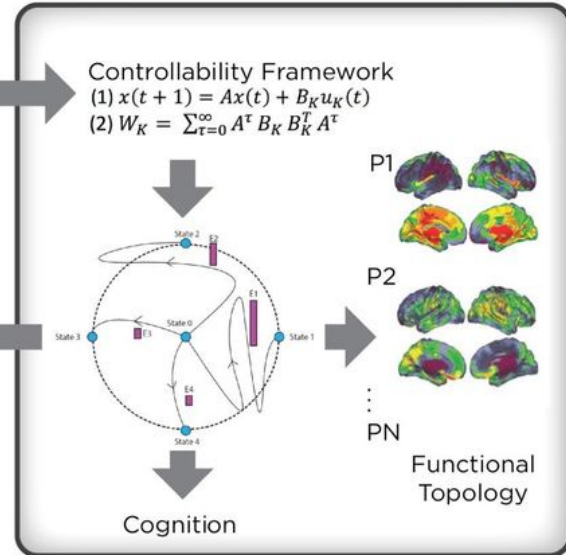


# GCN & Network Control Theory

## Connectome



## Network Control Theory



## One hot encoding as Edge Attribute

Original Data		One-Hot Encoded Data			
Team	Points	Team_A	Team_B	Team_C	Points
A	25	1	0	0	25
A	12	1	0	0	12
B	15	0	1	0	15
B	14	0	1	0	14
B	19	0	1	0	19
B	23	0	1	0	23
C	25	0	0	1	25
C	29	0	0	1	29



## Benchmark with Reddit Dataset (Edge\_Attr)

- Edge\_Attr

	name	reddit-AUROC mean	reddit-AUROC std	reddit-AUPRC mean	reddit-AUPRC std	reddit-Reck mean	reddit-Reck std	reddit-Time
0	GEN	0.686941	0.034823	0.085102	0.017834	0.126531	0.015867	10.278472
0	RES	0.613557	0.026013	0.061188	0.010054	0.096599	0.031144	17.620392
0	GAT2	0.661011	0.030512	0.056398	0.008115	0.062585	0.027683	6.157925
0	TRANSFORMER	0.690946	0.011186	0.071001	0.005858	0.095238	0.015513	10.955891

- No Edge\_Attr

	name	reddit-AUROC mean	reddit-AUROC std	reddit-AUPRC mean	reddit-AUPRC std	reddit-Reck mean	reddit-Reck std	reddit-Time
0	GEN	0.678656	0.018219	0.070466	0.006499	0.099320	0.024565	6.721701
0	RES	0.592959	0.029924	0.046035	0.002502	0.043537	0.016440	5.309175
0	GAT2	0.661011	0.030512	0.056398	0.008115	0.062585	0.027683	4.923253
0	TRANSFORMER	0.676220	0.014179	0.061927	0.005388	0.063946	0.014008	6.107946