Schizophrenia, neuroimaging, and connectomics

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OPPORTUNITY

- ***Schizophrenia***
  - Typical onset in late adolescence/ early adulthood
  - Positive symptoms: hallucinations and delusions. Negative symptoms: emotional, motivational, social, and functional deficits.
  - Avg. potential life lost: 28.5 years
  - Greater predisposition to certain medical conditions
  - Highly heritable

- **A disorder of connectivity**

CHALLENGE

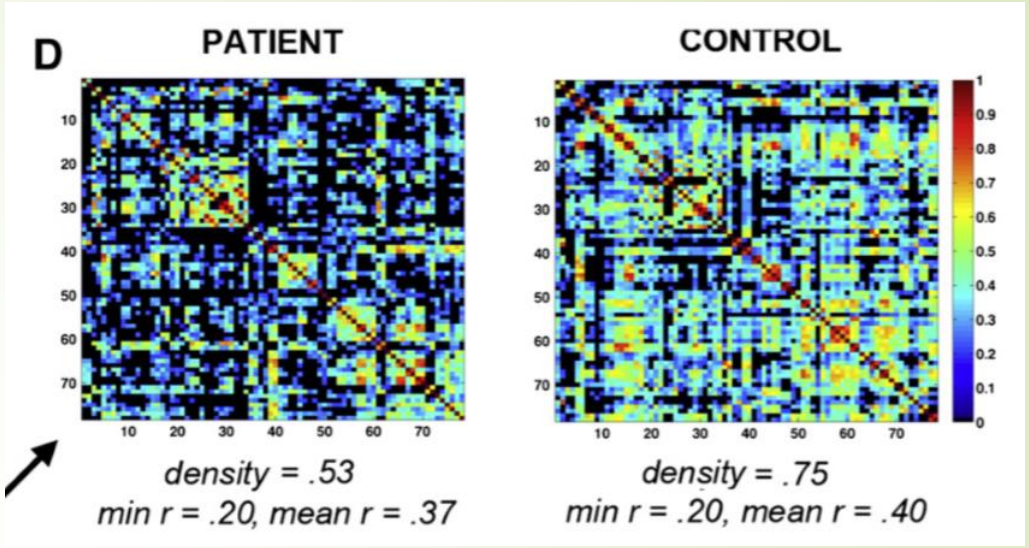
- Defining nodes: anatomically, randomly, or by spherical ROIs. Want distinct areas that are functionally alike.
- Defining edges: weighted based on strength or unweighted. Undirected or directed.
- **Variability and transience**

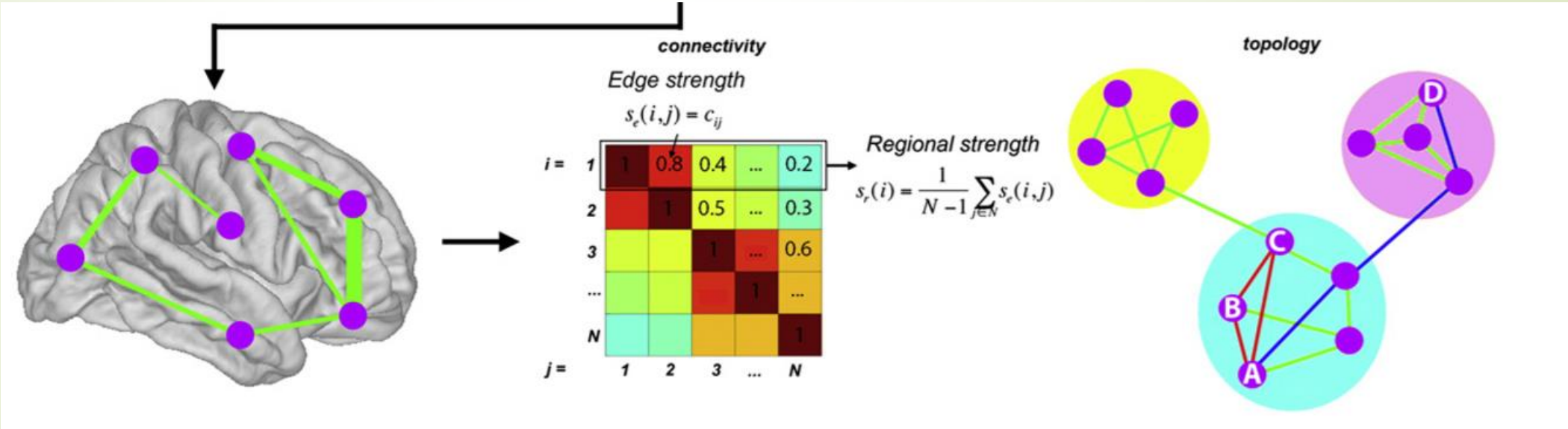
↓ s_e in 158 edges, involving connections with frontal, temporal, insular and striatal regions;
↑ in 19 edges involving cerebellar regions.
↑ s_e within DMN;
↑ and ↓ s_e in edges linking DMN and TPN and within TPN.
↓ s_r in most regions, particularly fronto-temporal cortex;
↑ s_r in occipital, frontal and striatal regions;
↓ s_e in 32 edges and ↑ s_e in 29 edges linking frontal, parietal temporal and occipital cortices;
↓ k in frontal, occipital and medial temporal regions.
↓ mean s_r in all regions (significant in nearly all tested).

↑ s_e within DMN;
≈ within TPN and between DMN and TPN.
↓ mean s_r in all regions (significant in frontal, temporal parietal and occipital regions) and k in medial parietal cortex;
↓ I;
↑ s_d;
↑ k in orbital PFC.
≈ mean s_r within-networks;
↓ mean s_r r between CON, FPN and CERN.

ACTION

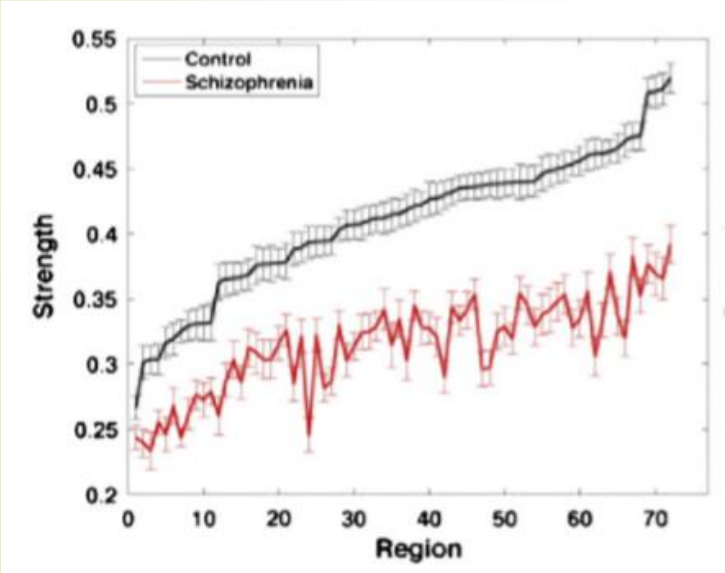
- Macroscopic- level imaging with fMRI.
- Anatomical nodes, undirected edges.
- Focus on functional connectivity of resting-state patients.

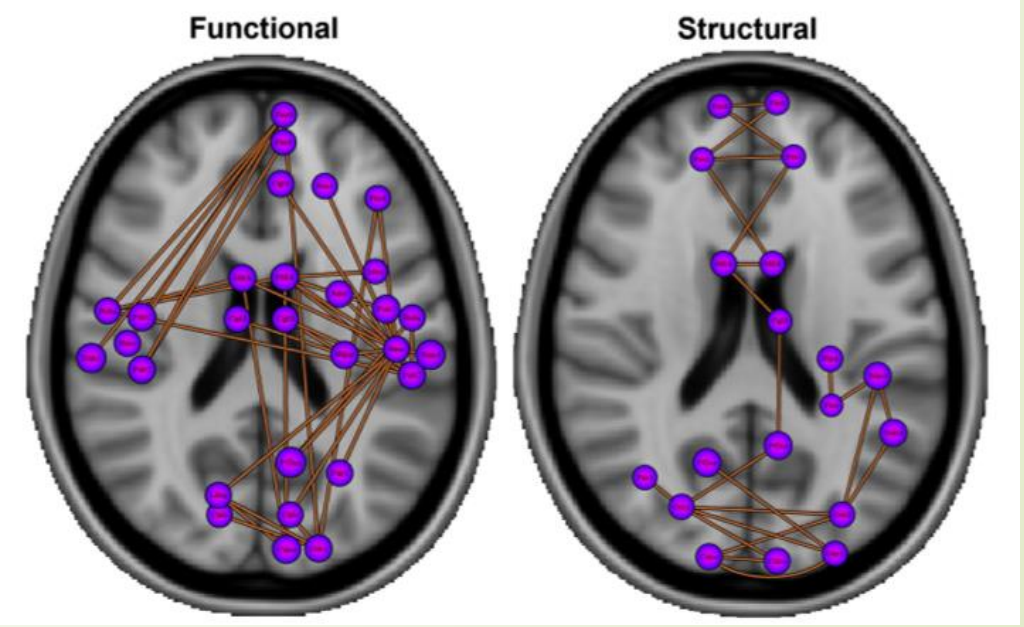




RESOLUTION

- Global connectivity disfunction
- Hyperconnectivity or hypoconnectivity in certain regions
  - Reduced PFC connection to other brain regions (cerebellum, parietal and occipital cortices)
  - Reduced connection between cortices
- Transient, environmental-dependent shifts
- Functional abnormalities are related to anatomical abnormalities





FEEDBACK/ FUTURE WORK

- Very broad overview
- Macroscopic, disorder-focused

- Neuroplasticity/development
- Micro-level imaging
  - Neuronal-level structural connectivity
  - Intra-regional functional connectivity