Exploring Interdisciplinary Connections in Duke Ph.D. Committees

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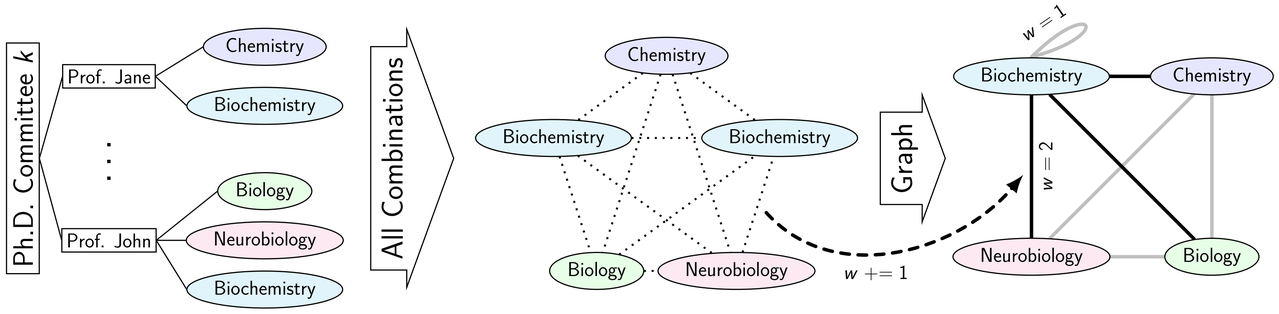
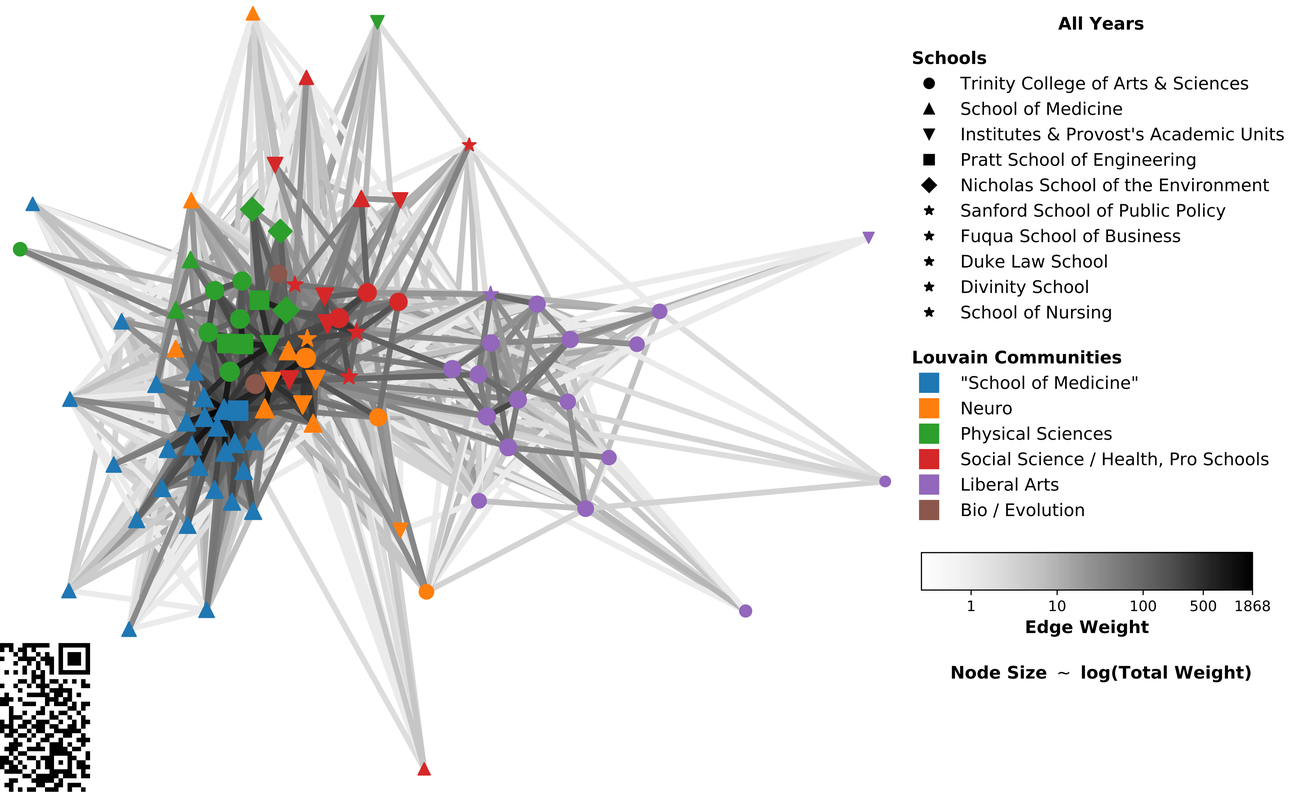
Methods

- Graph connections between academic organizations found in Duke Ph.D. committees
  - For each committee, find all combinations of committee member's non-administrative appointments
  - For each combination, increase the graph's corresponding edge weight (w) by 1



- Find communities of organizations (nodes) in graph via the Louvain method [1]
  - Construct communities by optimizing the density of interior to exterior edges (modularity)

Academic Organizations Graph



Interactive

Conclusions

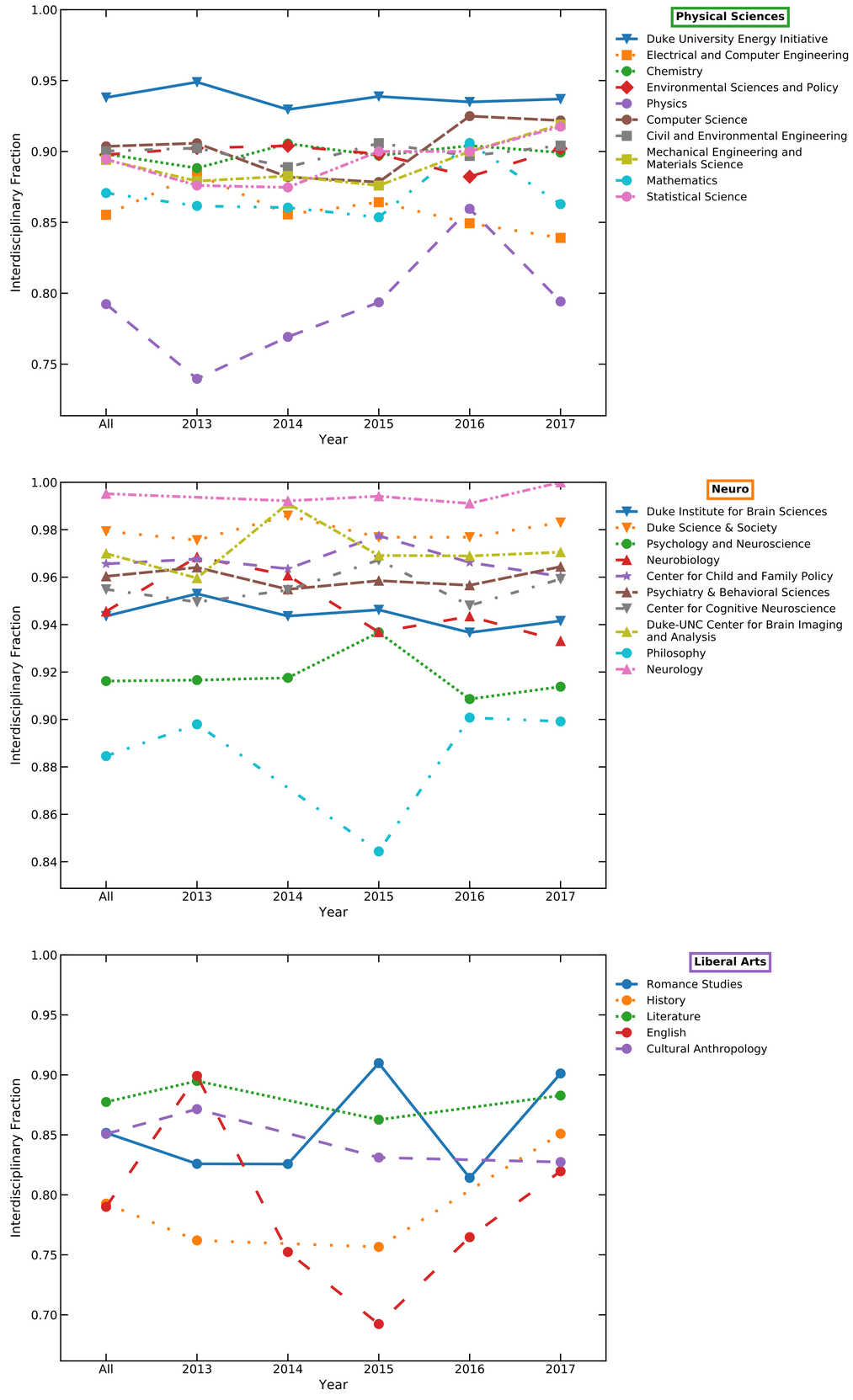
- **Identified communities of closely connected academic organizations at Duke**
  - Most as expected, but with interesting Neuro cluster, and insular Biology / Evolutionary Anthropology paring
- **Measured interdisciplinary activity via organization's external/total edge weights**
  - Most large organizations in the Physical Sciences and Neuro clusters were steady at $f \approx 90 - 95\%$
    - Excluding the noticeably lower & more variable Physics, Psychology and Neuroscience, and Philosophy departments
  - As a community the Liberal Arts were lower at $f \approx 75 - 90\%$, but suffered from poor statistics

Potential Future Improvements

- Non-Ph.D. granting orgs have low statistics and artificially high interdisciplinary fractions
  - Collect data on other graduate degrees (M.D. J.D., ...) to improve professional school statistics
  - Could create a similar graph from publication author lists to better include institutes & centers
- Try different weighting schemes to isolate secondary appts from interdisciplinary committees

Measuring Interdisciplinary Activity

- Compute "Interdisciplinary Fraction" $f = w_{\text{external}} / \left(w_{\text{external}} + w_{\text{self}} \right)$
- Bin graph by academic year to observe any changes over time
- Plot the top 10 organizations by total weight for each community
  - For satisfactory statistics require $w_{\text{total}} > 100$ per year, for ≥ 3 years



References

[1] V. D. Blondel, J.-L. Guillaume, R. Lambiotte, and E. Lefebvre, Journal of Statistical Mechanics: Theory and Experiment **2008** (2008) P10008, http://stacks.iop.org/1742-5468/2008/i=10/a=P10008.

[2] A. A. Hagberg, D. A. Schult, and P. J. Swart, *Exploring network structure, dynamics, and function using NetworkX*, in *Proceedings of the 7th Python in Science Conference (SciPy2008)*.