Multiple Sources of Interdisciplinary Training

PhD Production Network
Faculty linked by shared students.
Nodes sized proportional to betweenness centrality.
Faculty limited to those who have sat on committees in at least two academic plans in the last 5 years; all others aggregated to the department level.

Measuring Interdisciplinarity
The core problem of interdisciplinarity aims to solve is bridging otherwise disconnected academic silos, and we have three ways to think about such bridging: by the structure of the PhD production network, by academic plans, or by scholarly fields. For the network, betweenness centrality (Freeman 1977) captures the extent to which faculty connect otherwise disconnected faculty. Academic program bridging captures how faculty training crosses PhD programs, while field bridging captures how faculty publications cross multiple scholarly fields. While programs are given in the data, we must infer faculty field from faculty publication patterns, some of which employ multiple disciplines. We do so by clustering the Web of Science journal co-citation tables, to generate sets of similarly cited journals, excluding generic journals. We then match faculty publications to these clusters to identify a field for each publications. For both programs and fields, interdisciplinarity occurs both within faculty or by committees.

Results
The PhD production network is broadly organized by division, with high connectivity within division and low between. The faculty with highest betweenness centrality generally cross divisions. The humanities and interpretive social sciences are fairly well-integrated by program, while the remainder of the social sciences are more modular. Within the natural sciences, seemingly high program interdisciplinarity is less pronounced at the field level, as many faculty from different nominal programs publish in similar outlets.

Technical Details
The faculty sample is limited to 1271 faculty who have served on a PhD committee in the last 5 years and who have data in the provided Scholar@Duke visualization data file. As such, some junior, new & emeritus faculty are thus missing. Faculty were assigned to academic programs based on the most common service, with the option to the mode within their primary appointment organization. We used a fuzzy matching algorithm to link faculty publication journals to the disciplinary cluster file. This resulted in about 80% of faculty publications being matched, with very high levels of missing data in the Humanities and interpretive social sciences, and we thus limit the analysis to exclude those in that analysis. We used a Fruchterman Reingold layout algorithm (implemented in Pajek) to define the base faculty space, then used Kamada-Kawai within academic programs to minimize node overlap. The network tiling procedure is a hill-climbing algorithm seeking to maximize the number of similar neighbors in the neighborhood of each tile. Analysis, cleaning and figure production were done initially in SAS, network figures were processed in Pajek then edited in Illustrator and the poster compiled with InDesign.

References