Measuring Belief Homophily and Cognitive Similarity in Social and Political Networks to Advance the Advocacy Coalition Framework (and Other Theories)

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1. What's the problem?

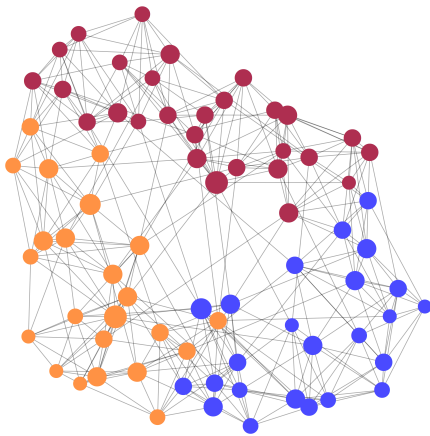BH&CS in networks research and ACF ⊙ data & methods challenges

2. What can we do about it?

data ⊙ measurement strategy ⊙ model

3. Three Applications

cognitive diversity and scientific game changers | mobilization against fossil fuel
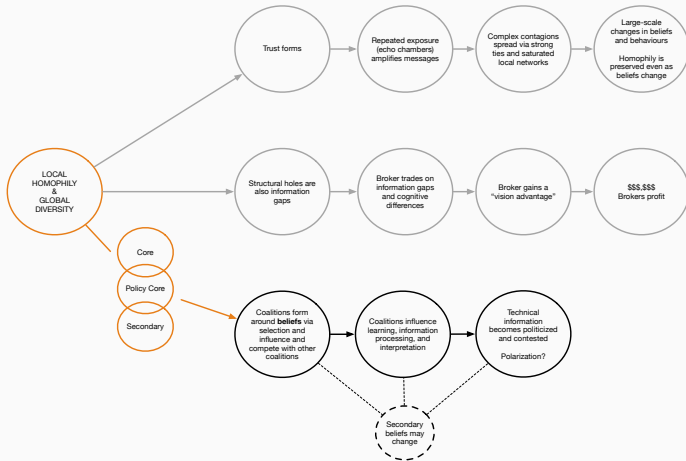infrastructure development | detecting advocacy coalitions online

1. What's the Problem?

A Foundational Idea
Cognition and behaviour tend to be similair
within cohesive subgroups and heterogeneous across subgroups.

homophily | selection vs. influence | structural holes and brokerage | diffusion and contagion | ACF | echo chambers | etc.

Top = Complex Contagion and Behaviour Change
Middle = Structural Holes and Brokerage
Bottom: Advocacy Coalition Framework (ACF)

We believe that what people believe – and how strongly they believe – depends in part on what their alters believe, and how strong their alters' beliefs are.

Networks research is much narrower without this fundamental idea. Specific theories – e.g. Advocacy Coalition Framework – don't work without it

Do people within cohesive subgroup tend to:

- ❓ have more or less the same **information**?
- ❓ share the same **specific beliefs** as their alters?
- ❓ think in similar ways or share **mental models**?
- ❓ differ from people in other cohesive subgroups?

What are the consequences for *x*? What are the mechanisms through which beliefs form and change?

Belief Homophily

$$\neq$$

Cognitive Similarity

Belief homophily is **specific**.
You share the same belief / position on a clear and explicitly stated issue.

Cognitive similarity is **general**.
You think and talk about the same things in similair ways.

We typically ask people what they think and believe about some specific issue, but...

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- ❗ it's not clear whether we should always trust what people say about what they believe and how they think;
- ❗ surveys are expensive, and response rates continue to decline;
- ❗ "found" observational data tends to be long and thin. Usually *extremely* limited when it comes to attribute data.

These are **not** reasons to stop asking people questions[1] or to stop using "found" observational data, but it is time to think through complementary ways of measuring belief homophily and cognitive similarity.
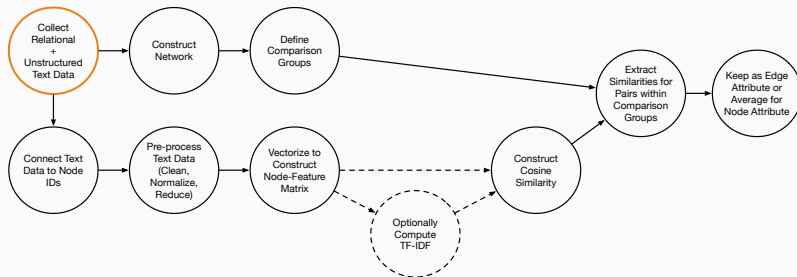
It is especially important to triangulate survey data and "found" data.

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[1]Matt Salganik. 2017. "Asking Questions" in *Bit by Bit*.
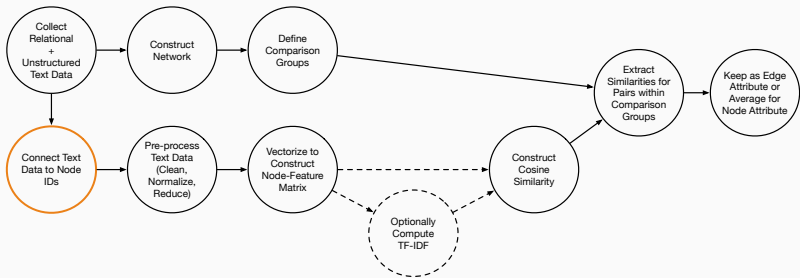https://www.bitbybitbook.com/en/1st-ed/asking-questions/
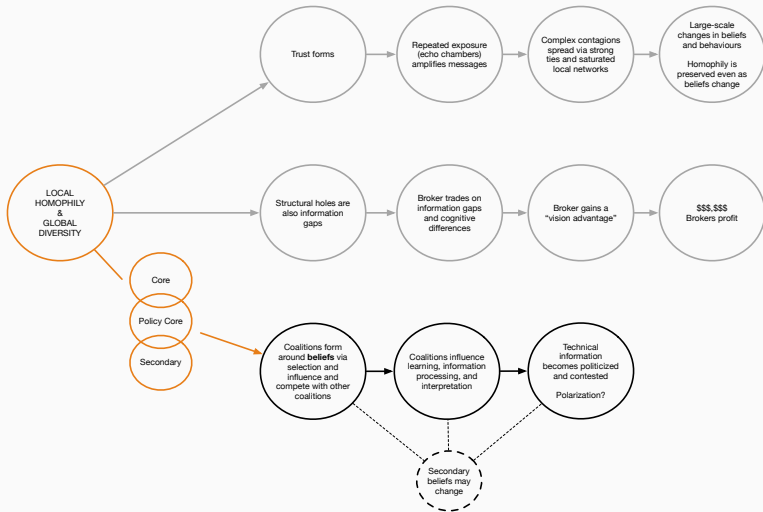
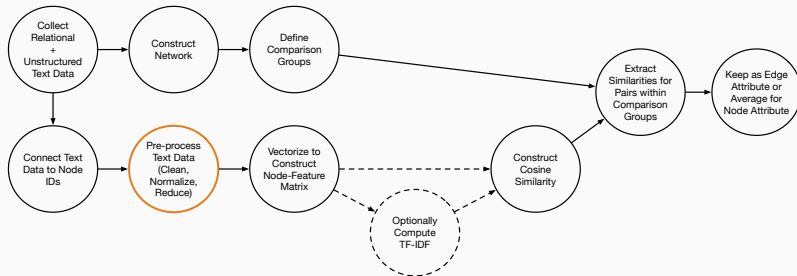Better measurements of BH&CS will help advance multiple theories.
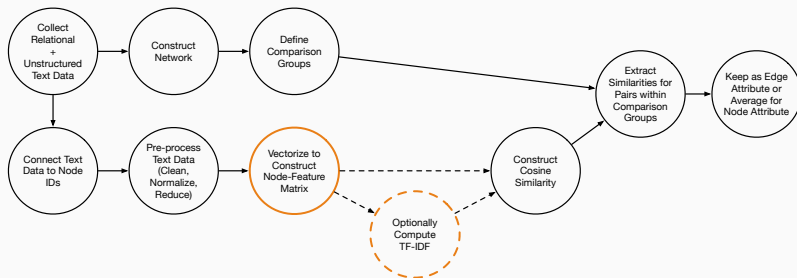
2. What can we do about it?

We need (1) relational data and (2) as much unstructured text as possible. Can come from surveys or other sources.
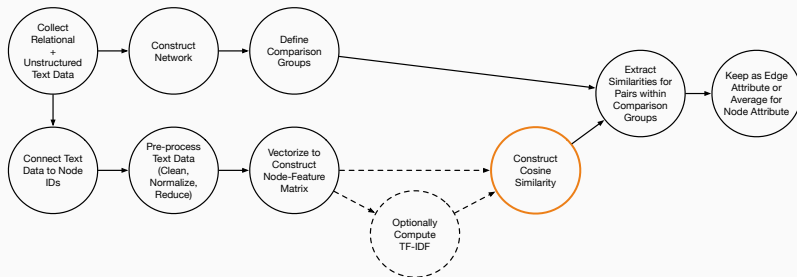
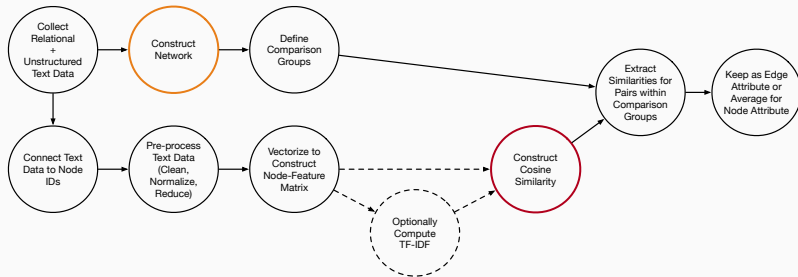Each chunk of text (e.g. Tweet, document authored) must be attached to a node ID.

Text has to be tokenized, cleaned, normalized, and reduced. This involves natural language processing.
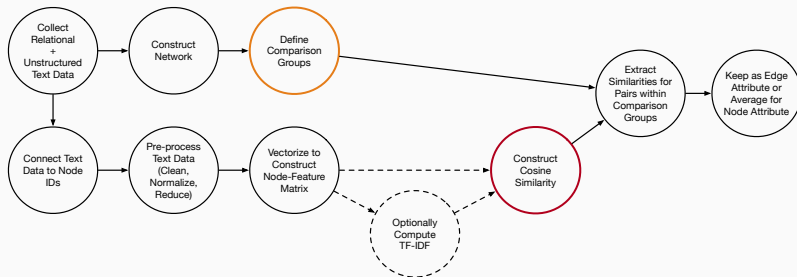
The text is then vectorized to produce a node-feature matrix, where a "feature" is a unique word. Cell values are counts or weights.
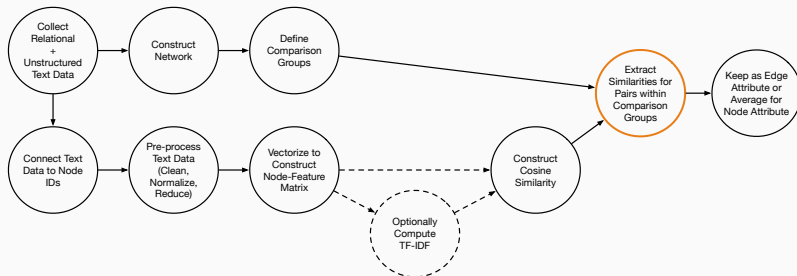
Construct cosine similarity matrix.
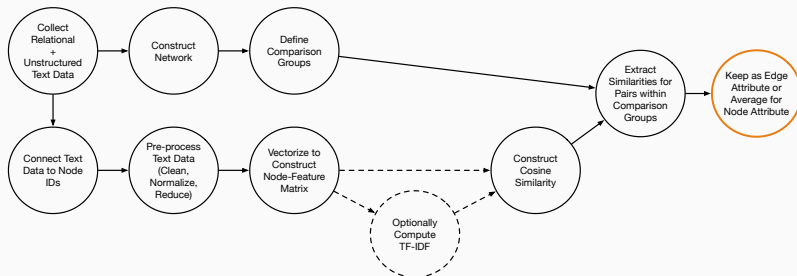
Construct network from data (e.g. from communication metadata, survey data, social media data, etc.)

Define comparison groups (e.g. ego-alter, ego-alter-alter, clique, membership in same community, membership in same block).

Extract similarity scores for each pair in each comparison group. The result is edge attribute data.

For each node, compute average of similarity values.

The result is a social network where the edges have conventional weights, but they *also* have (1) a quantitative value representing the degree of similarity between *i* and *j* and (2) an attribute describing how similar a node is to her alters in general.

Measuring belief homophily vs. cognitive similarity depends mostly the data you have and how you prepare it.

3. Three Applications

🏛 Cognitive Diversity and Scientific Game Changers

Two articles under review with my PhD students

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"Goldilocks" zone of cognitive diversity. This offers support for hypotheses from diversity bonus theory, which is... good!

🏛 Mobilization Against Fossil Fuel Infrastructure Expansion

Data collection phase

David Tindall (PI), John McLevey (Co-I), Mark Stoddart (Co-I) + Collaborators (Mario Diani, Jennifer Earl, Dana Fisher, Philip Leifeld, Andrew Jorgenson, Philippe Le Billon, Don Grant, Moses Boudourides). *"Making Sense of Climate Action: Understanding Social Mobilization to Curb Anthropogenic Climate Change Through Advances in Social Network Analaysis."* SSHRC Insight Grant.

Compares face-to-face vs. digital networks re: mobilization. Does **not** sample on the dependant variable.

❓ What role do digital networks play in mobilization? Can we use the proposed measures to differentiate between selection and influence? Is homophilous or heterophilous engagement more predictive of mobilization?[2]

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[2]These are just a subset of questions within the larger project that I am working on.

🐦 Detecting Advocacy Coalitions & Echo Chambers Online
Planning stage

❓ Can we detect advocacy coalitions and echo chambers[3] using social media data? Do detected coalitions and echo chambers mirror those detected using survey data?

Collect data on Twitter users (1 or 2 steps out) ➡ construct [follow, retweet, quote] network ➡ concatenate tweets from each node ➡ process text ➡ compute similarities ➡ add similarity as edge attribute ➡ compute average similarity for each node ➡ model!

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[3]e.g. Lorien Jasny, Joseph Waggle, Dana Fisher. 2015. "An empirical examination of echo chambers in US climate policy networks." *Nature Climate Change.* 5, 782-786.

thanks.

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