



Know your network: people infer cultural drift from network structure, and expect collaborating with more distant experts to improve innovation, but collaborating with network-neighbors to improve memory



Emory Richardson & Frank Keil

Motivation

Problem solving is often a matter of knowing what kind of information we need, and who in our social networks is likely to have it. We suggest that reasoning about common knowledge and cultural drift may help us find the right kind of help for the kind of problem we're facing. Namely, we suggest that people:

- (1) Expect network-neighbors to think in more similar ways and share more common knowledge than agents from more distant parts of a network.
- (2) Infer that agents who think alike and share more common knowledge will better help each other remember, but that agents who think differently and share less common knowledge will better help each other innovate.

By extension, people may expect “network-neighbors” to improve memory, and “network-strangers” to improve innovation.

We test these predictions by providing participants with (Exps 1a-b) an **explicitly** drawn out network map and (Exp 2) a description of a social event with an **implicit** social structure which is congruent with the network in Exps 1a-b. Participants are then asked choose the more helpful source for a memory problem and innovation problem.

Conclusions

Studies of cumulative cultural evolution suggest that innovation is an evolutionary process. These accounts have two parts.

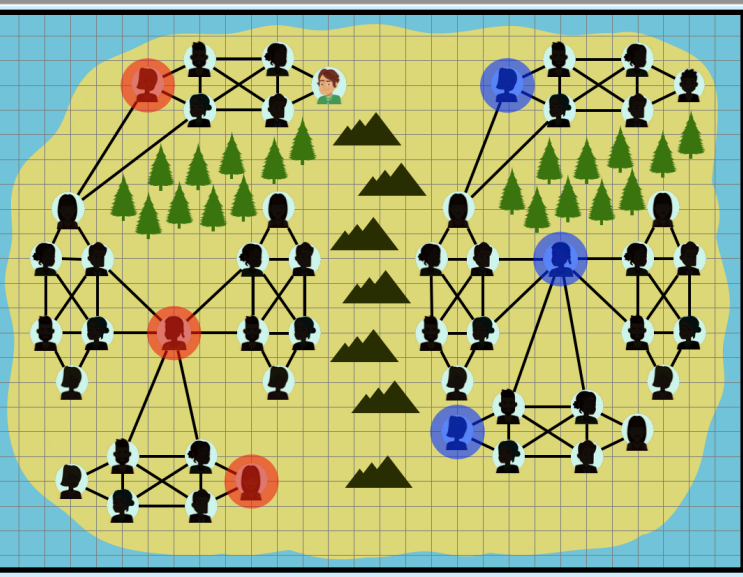
(1) Innovations can be generated by **synthesizing diverse elements** to produce incremental advances. As these advances accumulate over time, they maybe recombined to produce more incremental advances in the future.

(2) **Diversity** in the “gene pool” of accumulated knowledge can be maintained by fragmenting networks into smaller clusters. Conformist tendencies influence individuals’ explore-exploit decisions within-cluster, but between-cluster influences are reduced, allowing clusters to drift apart.

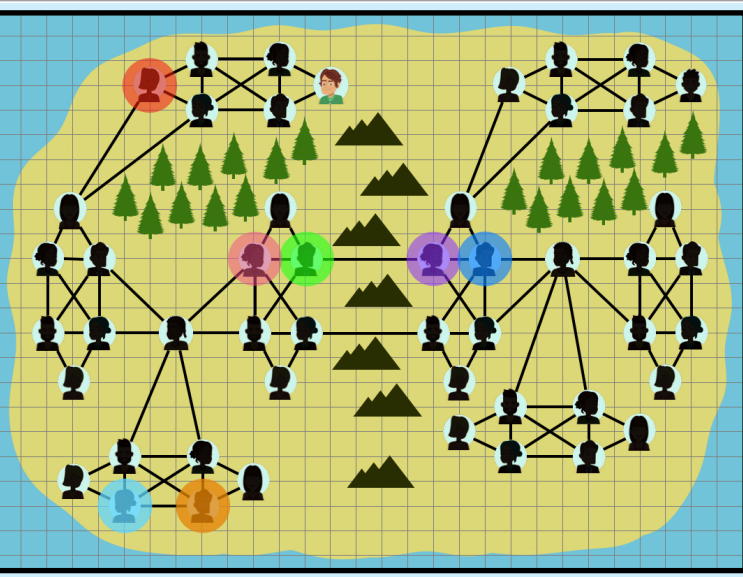
An advantage of this kind of account is that innovators don’t need to be exceptional geniuses: restoring lines of communication between clusters exposes communities to new ideas, so an **average** agent may become an innovator simply by being in the right place at the right time.

Our results suggest that elements of our commonsense psychology – reasoning about cultural drift, along with a tendency to seek out more or less diverse perspectives as appropriate – **could accelerate cultural evolution** by improving our ability to to both maintain existing knowledge and generate new knowledge.

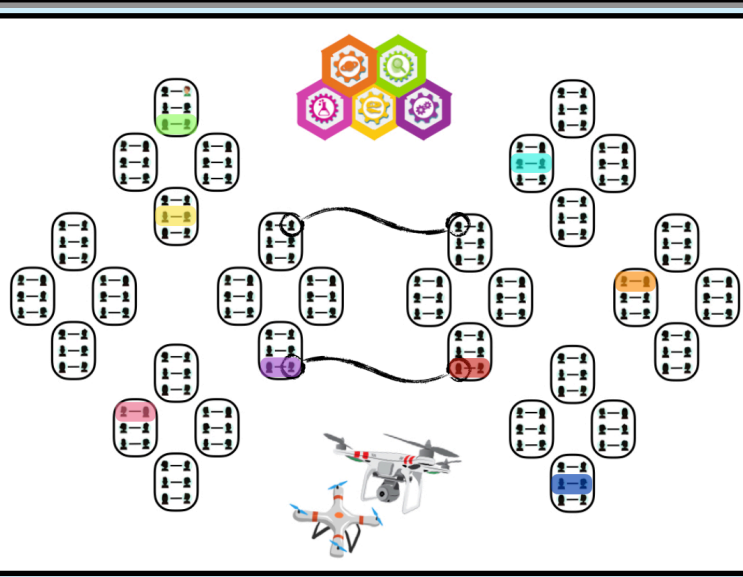
Exp 1a: Memory & Innovation



Exp 1b: Innovation - WeakLinks

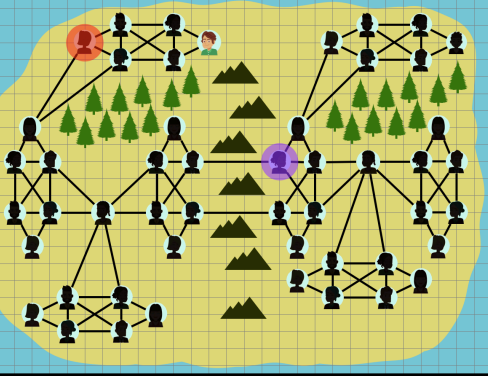
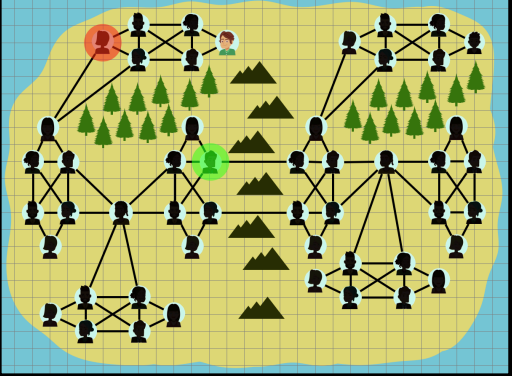


Exp 2: Memory & Innovation



EXPERIMENTS 1a-1b: The people on this island are expert boat makers. Each person learns to make boats when they're kids, from their parents and other people on their side of the island. But, the West Island people have never learned boat-making from East Island, and the East Island people have never learned boat-making from West Island. The black lines connect the people who talk with each other most often.

Innovation: Max wants to figure out how to build a new kind of boat - one that has never been built before
Memory: Max wants to remember how to tie a specific kind of knot that he needs for his boat.



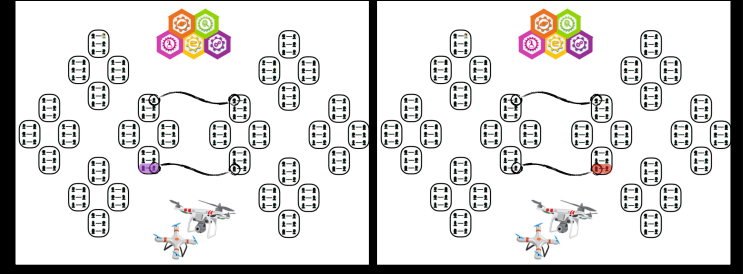
Edges between Max and...
...Red agent: 3
...Green agent: 7
...Purple agent: 8
Relative Network Distance:
RedGreen: 4
RedPurple: 5

Advice: Which expert can **better** help Max?
Similarity: How similar is each expert's building style to Max's?

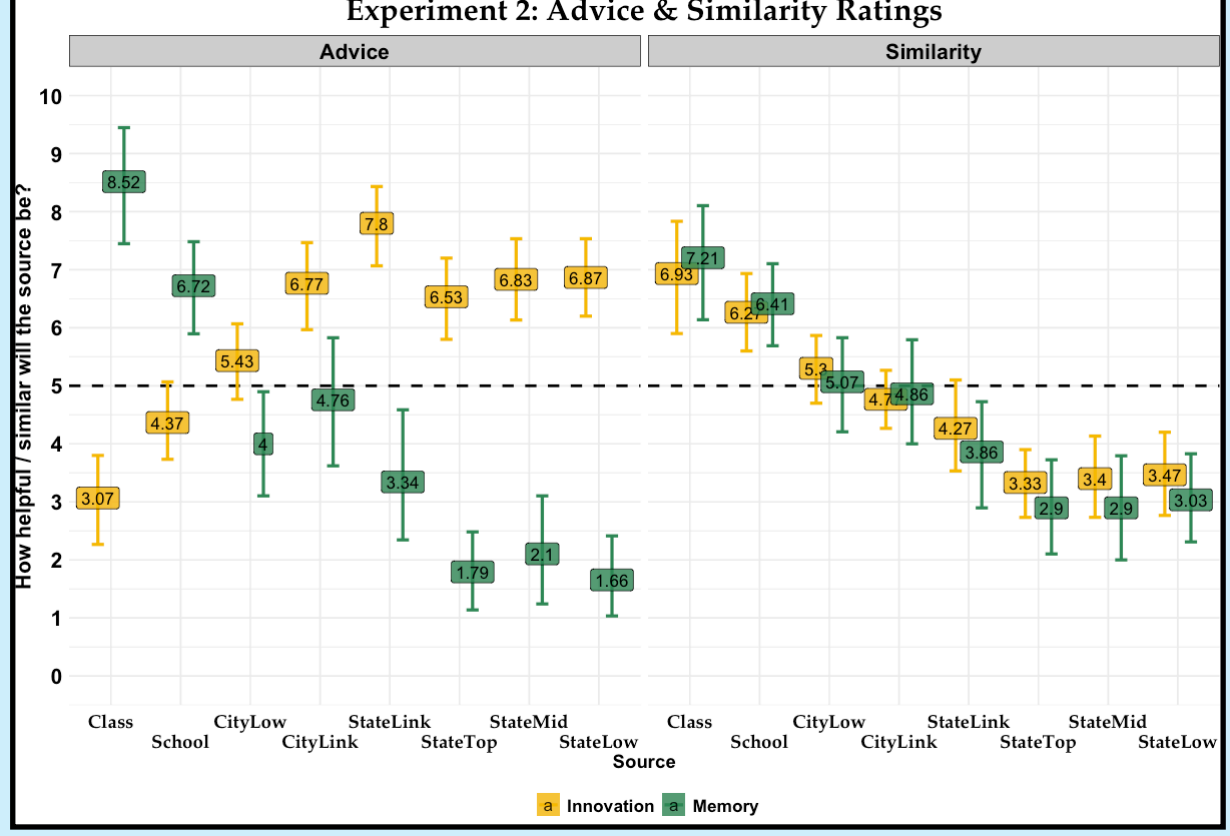
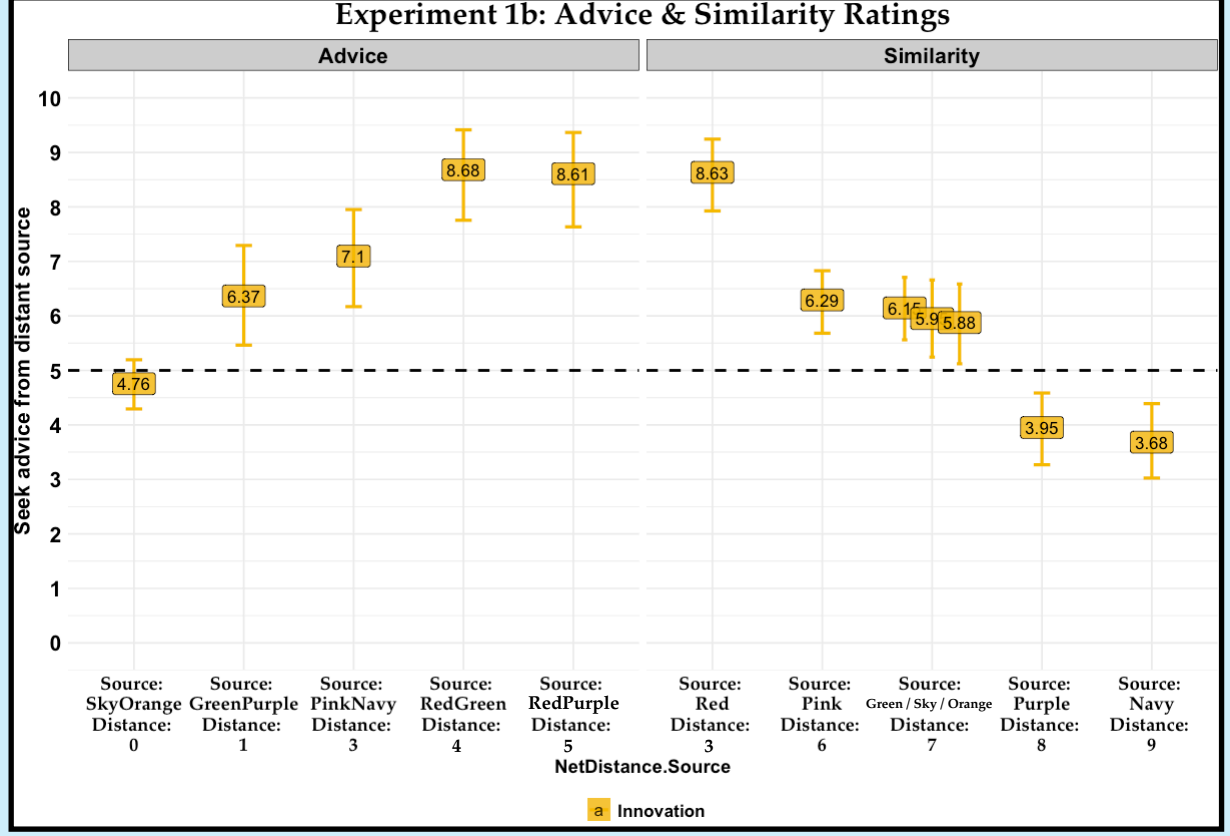
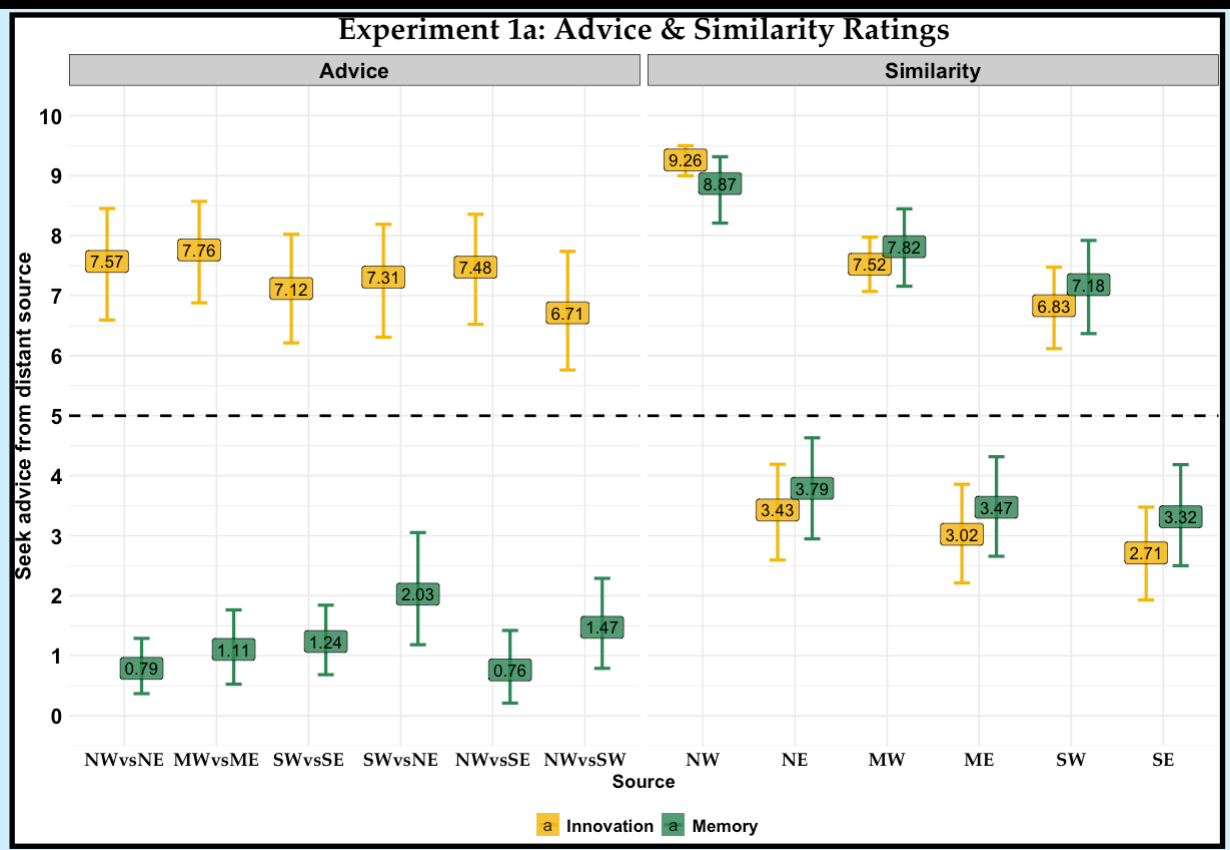
EXPERIMENT 2: During the first three months of camp, Max and his partner built drones every week to compete against the teams from their own class, and then their whole school, and then their whole city. In the last month of camp, each team can choose one other team from any class in either city to work with in a group.

Max and his partner realized that if they want to win the final contest, they need to choose a team that can help them...

Innovation: ... **figure out** how build a **new and creative** kind of drone.
Memory: ... **remember** which kind of propellor they used to do the special trick during the first week of contests.



Advice: How helpful will each expert be?
Similarity: How similar is each expert's building style to Max's?



Results

Participants inferred that...

- (1) Greater network distance (but not physical distance) would lead to less similarity between building styles
- (2) In-network (West Island) experts would have more similar building styles to Max than “Out-network” (East Island) experts.
- (3) More distant & dissimilar experts would better help Max innovate; more proximal & similar experts would better help Max remember