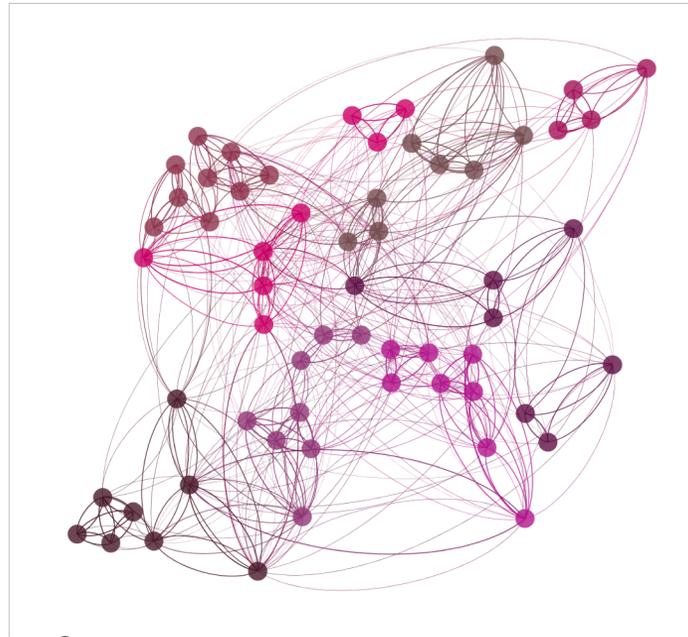


HIVE: Collective Design through Network Rotation

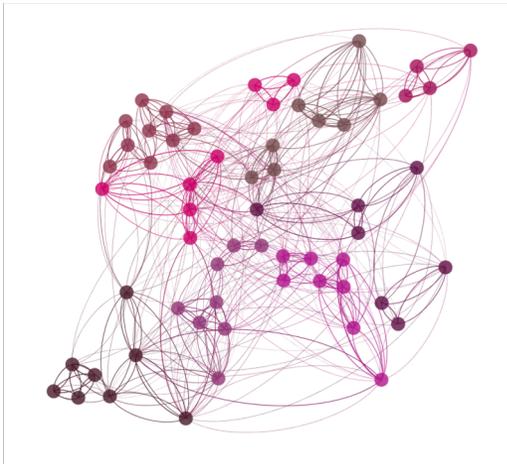


Niloufar Salehi, UC Berkeley

Michael S. Bernstein, Stanford University

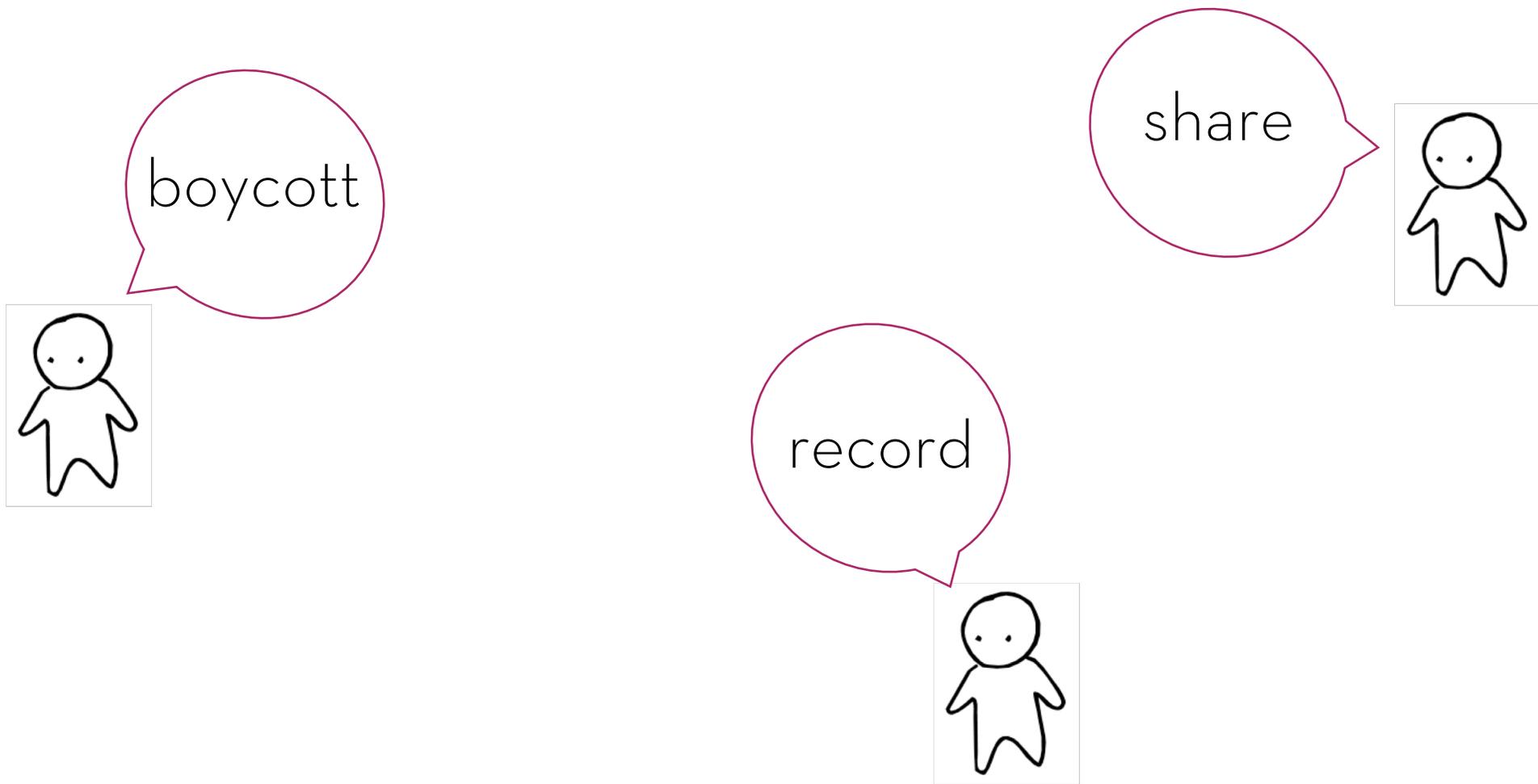
HIVE

Build familiarity
while engaging
with diverse
perspectives.



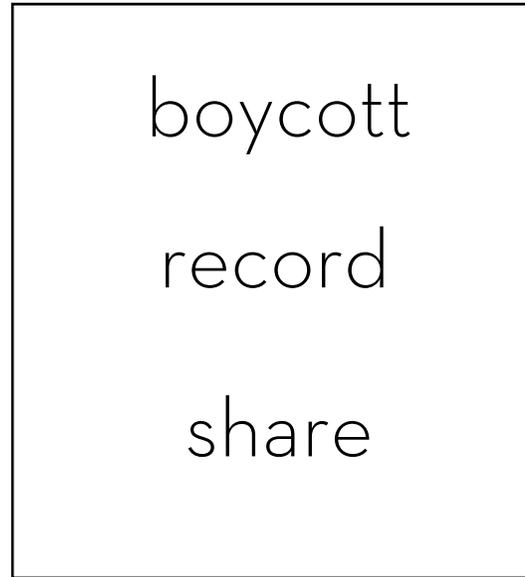
**Deliberation: understanding
and articulating the
problem.**

**Collectively imagining goals
and paths forward to
alternative futures.**



[Chan et al., 2017; Siangliulue et al., 2016; Yu et al., 2014; Yu et al., 2011]

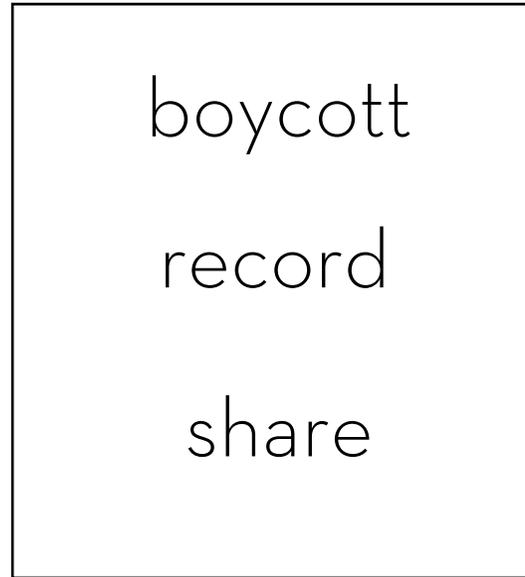
intermixing ideas



boycott + record = boycott

[Chan et al., 2017; Siangliulue et al., 2016; Yu et al., 2014; Yu et al., 2011]

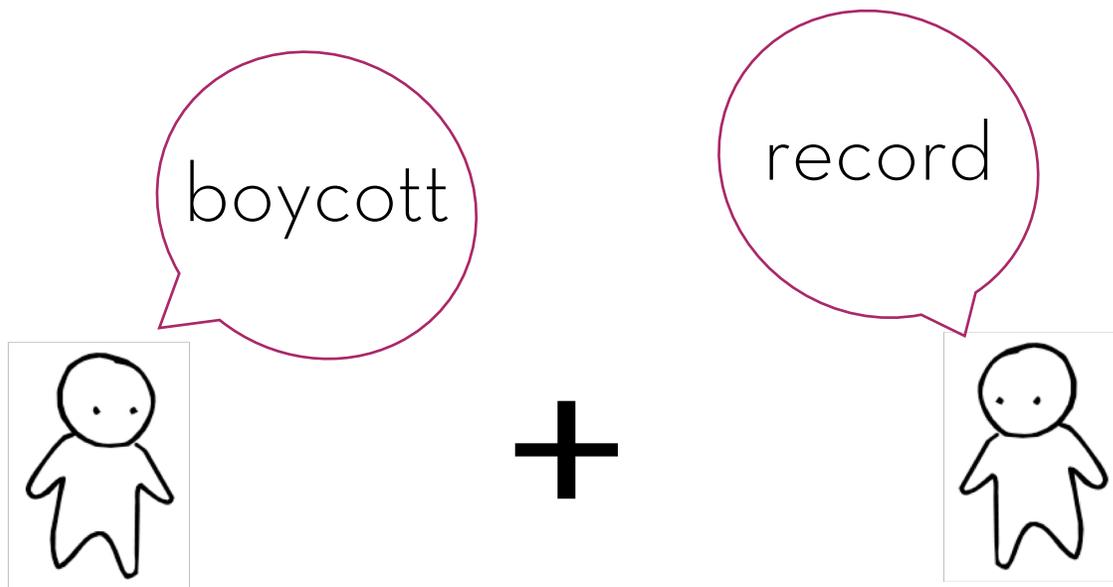
Mere exposure to other people's ideas
doesn't actually influence us.



boycott + record = boycott

[Rogers, 2010; Choi & Thompson, 2005]

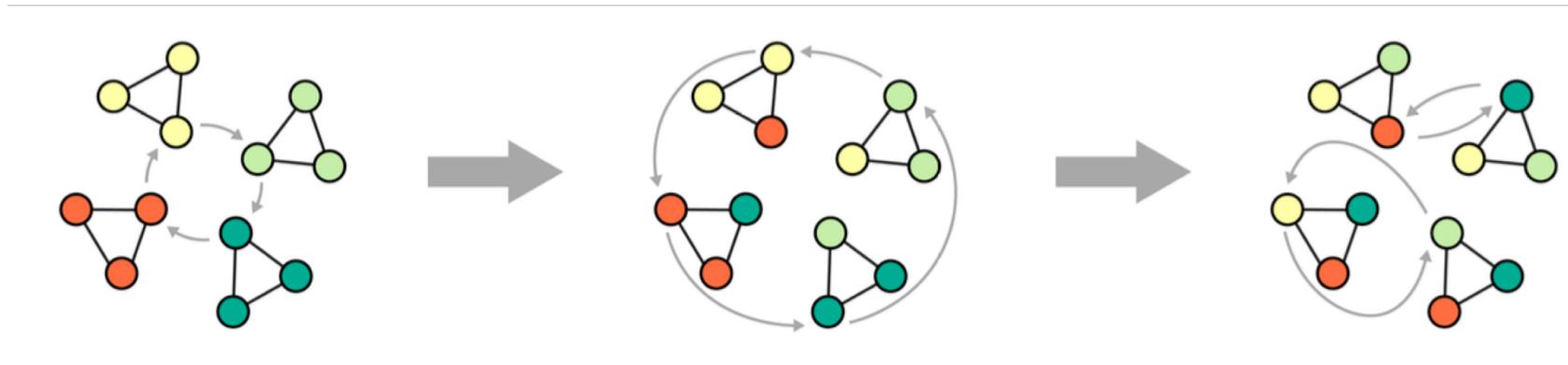
intermixing people



[Choi & Thompson, 2005]

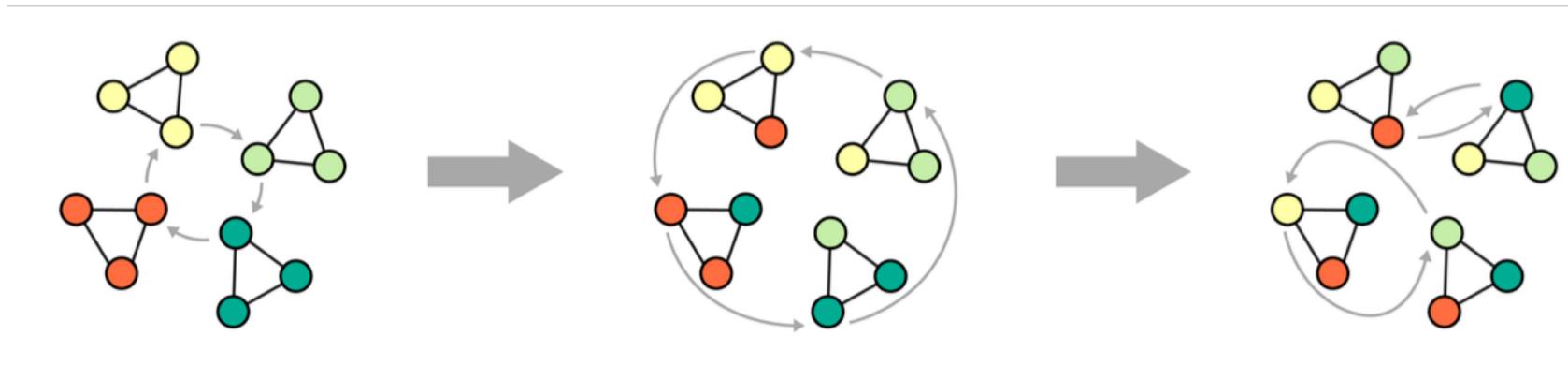
Network Rotation

1. form teams
2. manage membership, iteratively weaving people together from distant parts of the network

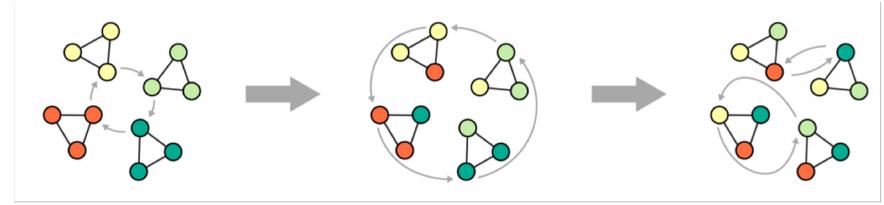


Network Rotation

what are the conditions for effective network rotation?



Network Rotation

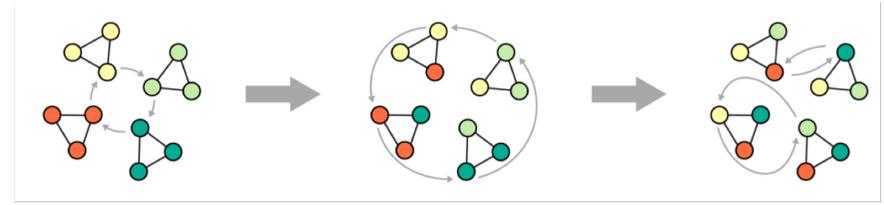


How to make network rotation effective?

talk to people you are
familiar with

[Van De Ven et al., 1976; Salehi et al., 2017]

Network Rotation



How to make network rotation effective?

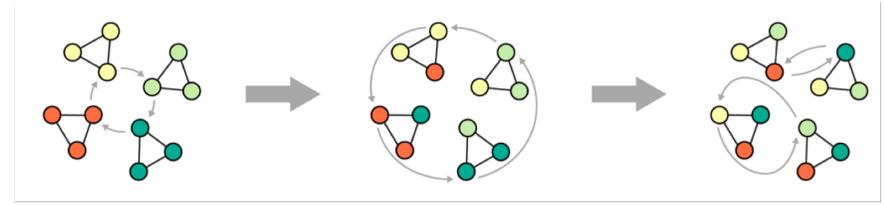
talk to people you are
familiar with

engage with diverse
perspectives

[Van De Ven et al., 1976; Salehi et al., 2017]

[Sutton & Hargadon, 1996; Huckman et al., 2011]

Network Rotation

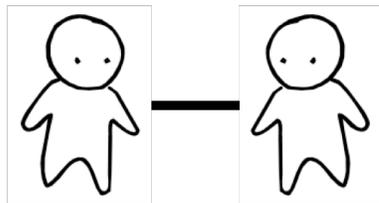


How to make network rotation effective?

talk to people you are familiar with

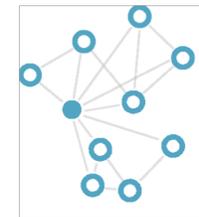
engage with diverse perspectives

tie strength



[Van De Ven et al., 1976; Salehi et al. 2017]

network efficiency



[Sutton & Hargadon, 1996; Huckman et al., 2011]

Deployments

controlled experiment

quality of proposals
increased

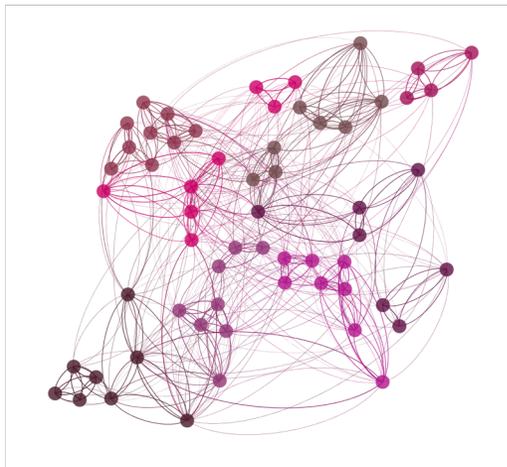
psychological safety
remained consistent

field deployment

Mozilla accessibility advocates

HIVE

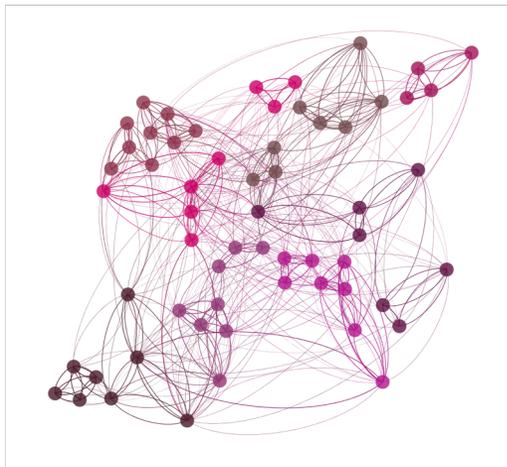
Balancing familiarity and engagement with diverse perspectives.



- network rotation
- controlled experiment
- Mozilla field deployment

HIVE

Balancing
familiarity and
engagement with
diverse
perspectives.



- **network rotation**
- **controlled experiment**
- **Mozilla field deployment**

Network Rotation

manage membership, iteratively weaving people together from distant parts of the network

Network Rotation

Mozilla Open D...
niloufar

#n_mozilla_team04
7 | 1 | Add a to

August 31st, 2017

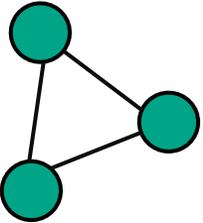
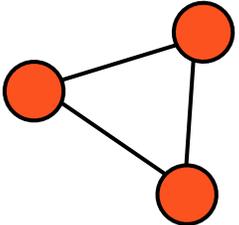
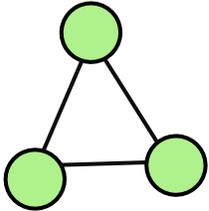
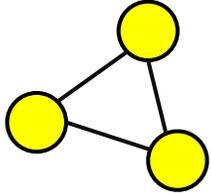
randomacts 9:45 AM
It would be a product of that type but they still aren't perfect

iriskuo 9:47 AM
i think it just translates a visual page to an audio one but i was also thinking in terms of how one would go about building a verbal web experience independent of that

jayde 9:49 AM
What about something like the chess boards idea where the screen is broken up into quadrants? And you could say "E5" (I don't play chess)

iriskuo 10:58 AM
uploaded this image: [Image uploaded from iOS](#)

+ Message #n_mozilla_team04



Network Rotation

bot APP 1:05 PM
I'm adding bugsbunny to this team. Say hi!

bugsbunny 1:05 PM
joined #n_neighbor_team06 by invitation from niloufar.

bot APP 1:05 PM
I'm moving skykackle to another team.

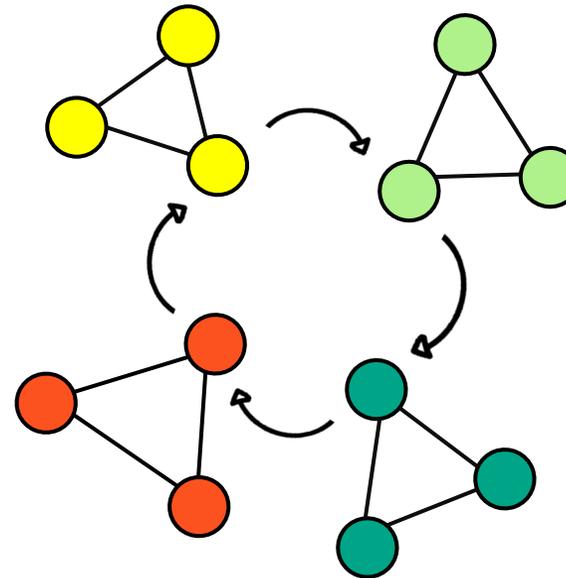
skykackle 1:05 PM
left #n_neighbor_team06.

mithrilsocks 1:05 PM
welcome back bugs!

bugsbunny 1:05 PM
thanks!

steelabjur 1:05 PM
Howdy!

bot APP 1:07 PM
Thanks everyone! You're all done with today's work. Instructions for phase 4 can be found in this folder:
<https://drive.google.com/drive/folders/OBOJkFEI5K4rzLTR2WnhnNkduT00> . Look for a file named: **phase4_prototype_team06**. You



Network Rotation

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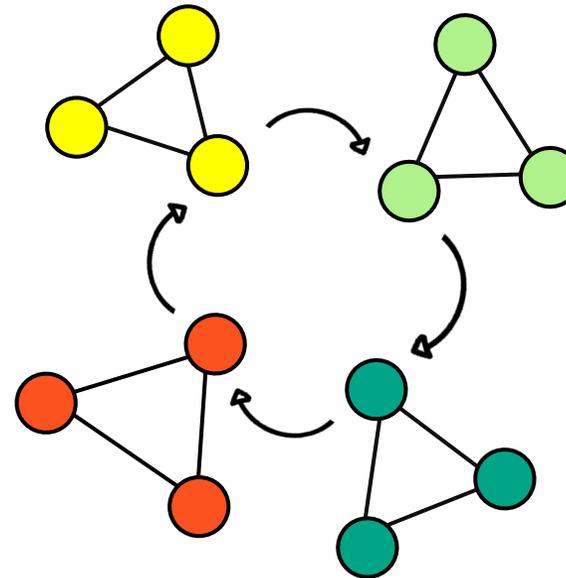
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Network Rotation



m_c_dj_que 7:10 PM

Appreciate that! Yes, privacy could definitely be an issue.

Thank you for your input!!

Don't feel obligated to go over all 3 Sbs if you don't have time!



lions1975 7:12 PM

You're welcome! I just looked at number 3 and that also looks great. I LOVE that you have an idea that recognizes sign language! This is a really unique idea and people would benefit from this for sure!! Does this by any chance track eye movement as well? Great job on all of your ideas and SB's, guys! Thank you for letting me offer feedback.



m_c_dj_que 7:15 PM

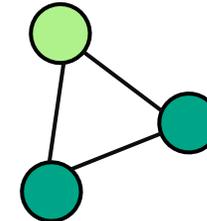
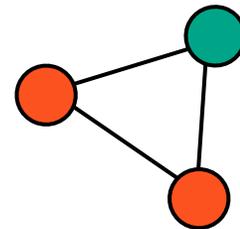
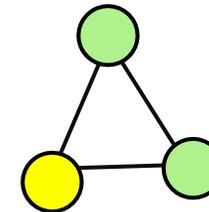
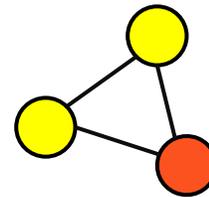
Yes, like gestures it would definitely be possible to use eye tracking too!

Thank you!!

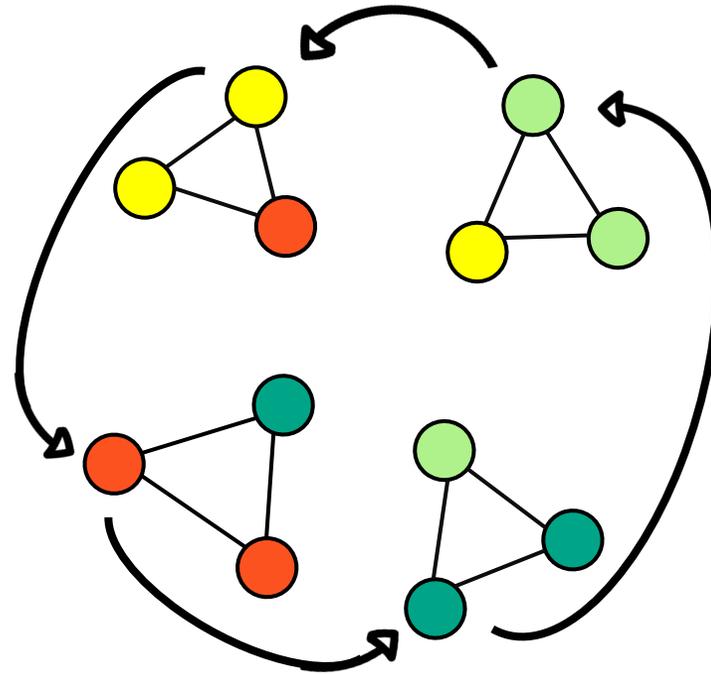


lions1975 7:16 PM

Very cool idea! You are very welcome! The only question I have is about the learning curve. Something that might be helpful would be a



Network Rotation



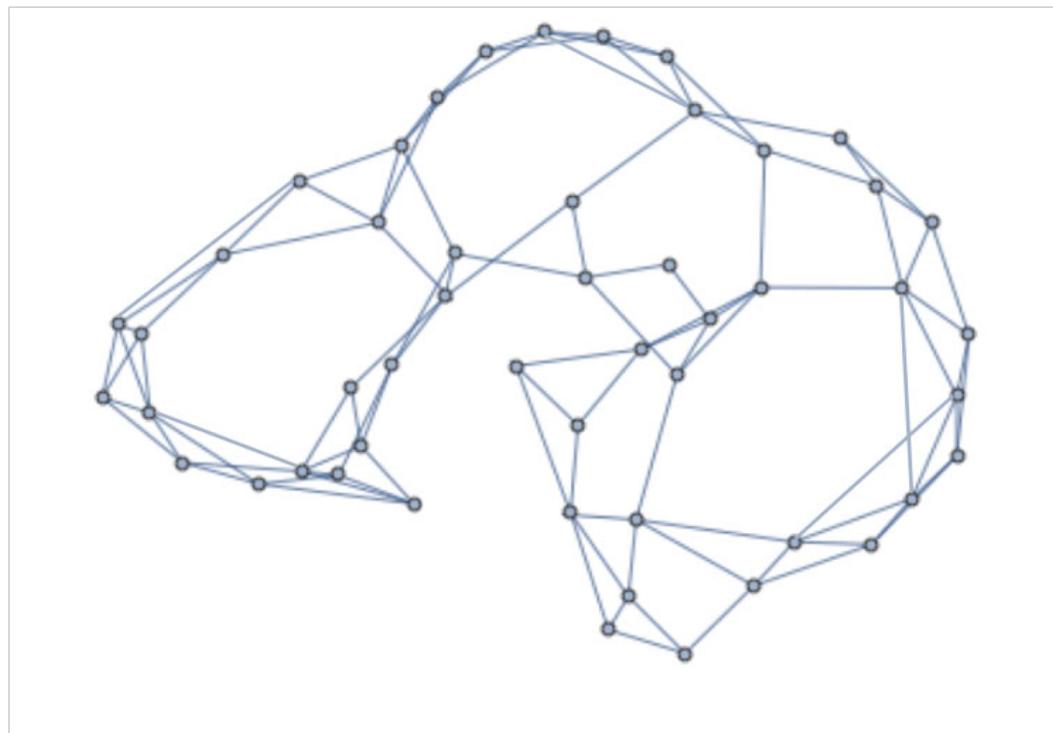
Network Rotation

weighted undirected graph

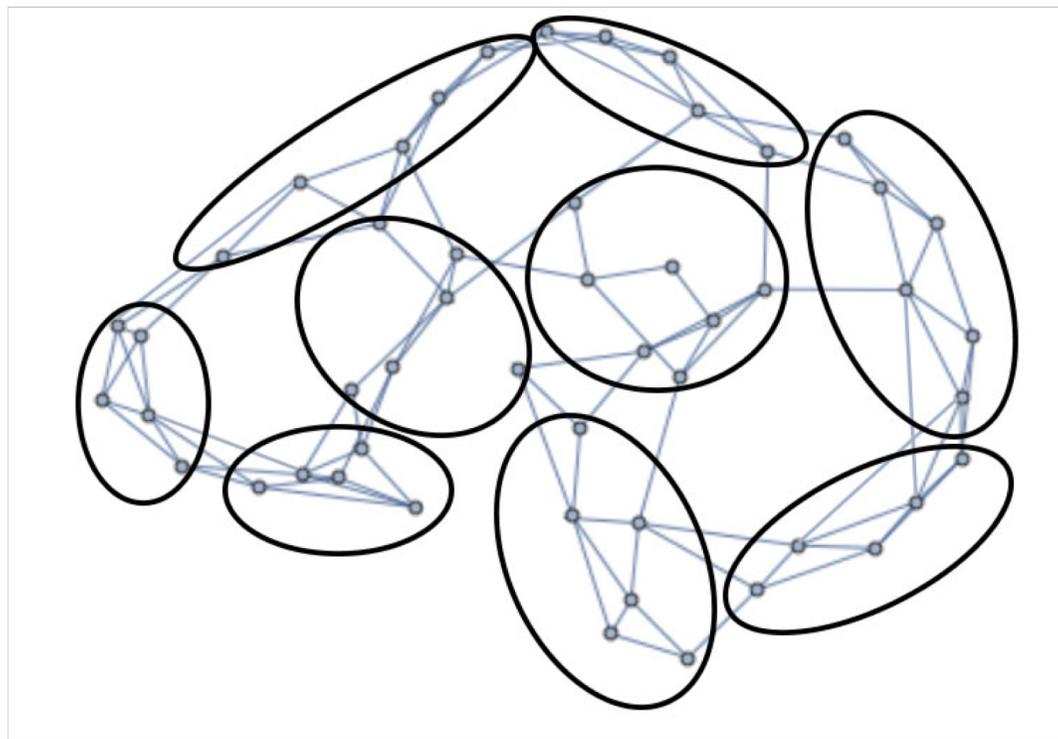
- **tie strength**: familiarity between two people

[Argote 1984; Van De Ven et al., 1976; Hackman 2002; Gruenfeld et al, 1996; Harrison et al., 2003; Huckman et al., 2009; Lave & Wenger, 1991]

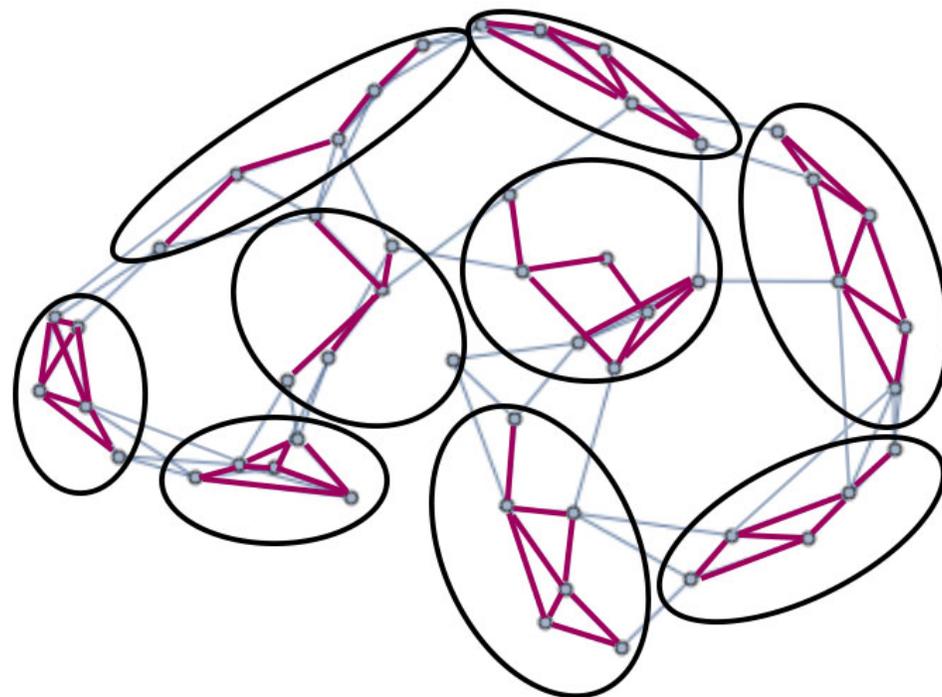
tie strength



tie strength



tie strength

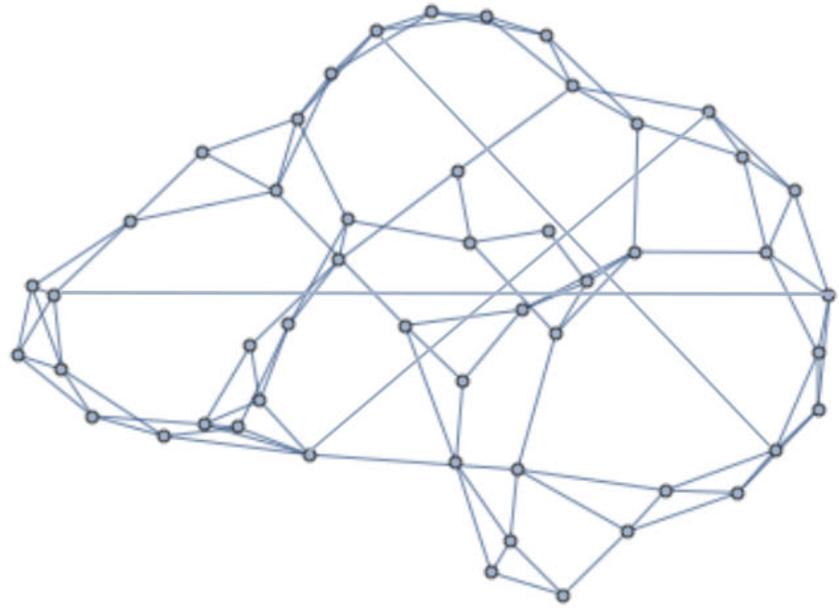


Network Rotation

weighted undirected graph

- **tie strength**: familiarity between two people
 - average pairwise number of rounds people have worked together
- **network efficiency**: how closely knit the network is

network efficiency



network rotation

weighted undirected graph

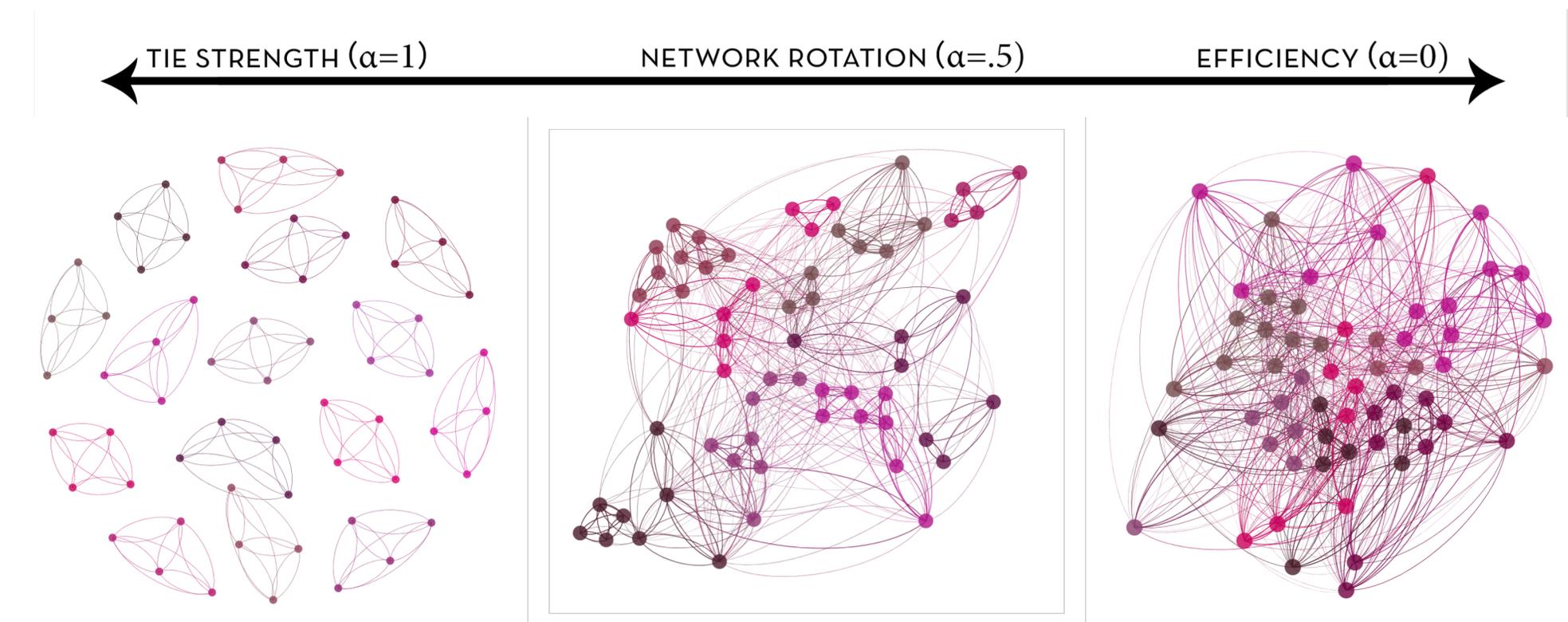
- **tie strength:** familiarity between two people
 - average pairwise number of rounds people have worked together
- **network efficiency:** how closely knit the network is
 - average pairwise shortest path between every two people

network rotation

$$f(G) = \text{TieStrength}(G) + \text{Efficiency}(G)$$

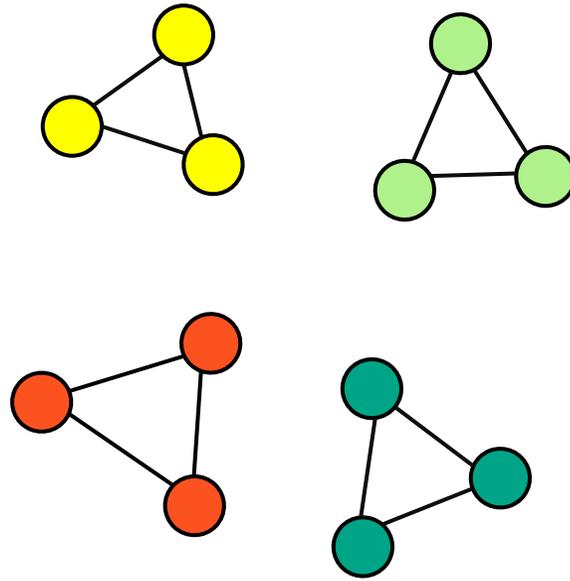
network rotation

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$



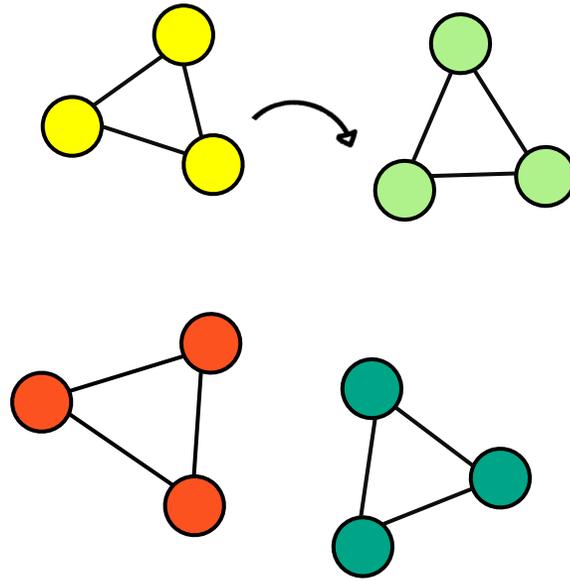
network rotation

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$



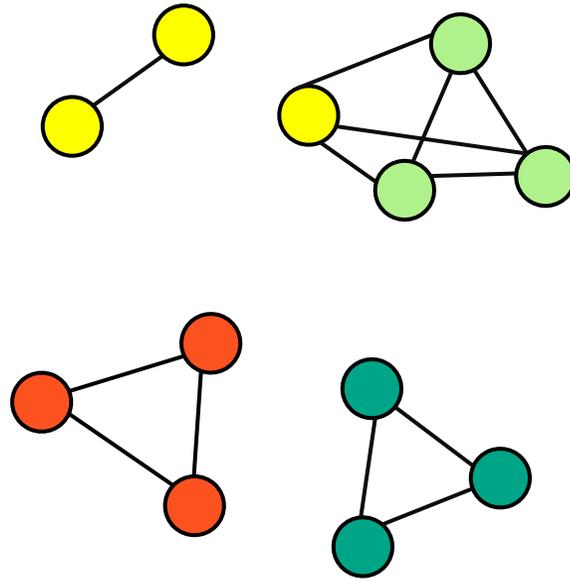
network rotation

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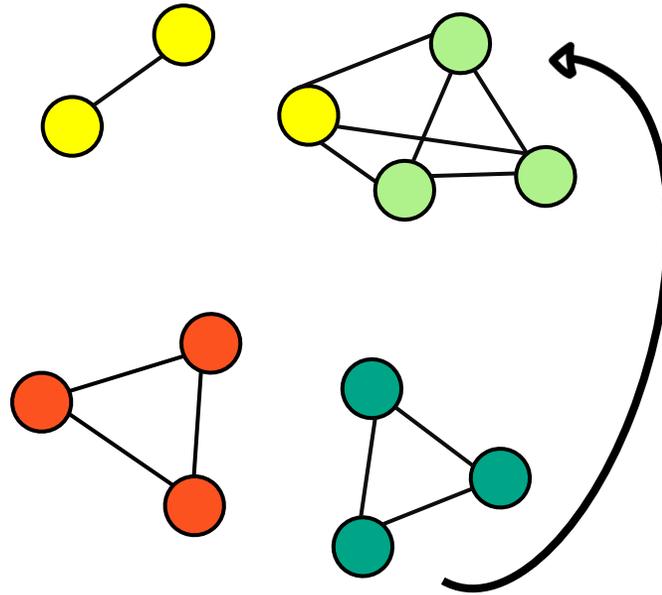
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network rotation

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$



network rotation

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$

exponential possible solutions

team composition changing, so impossible to know value of single move

network rotation: stochastic search

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$

take all possible moves

stochastic search on subsets
of moves

choose the best subset

network rotation

$$f(G) = \alpha * TieStrength(G) + (1 - \alpha) * Efficiency(G)$$

loop 100,000 times

move a random person to a random team in current solution

if the move increases $f(G)$

add this move to current solution

if $\text{Random}() < \epsilon$

remember best solution so far and restart

HIVE

Mozilla Open D...
niloufar

Jump to...

All Unreads
All Threads

Channels

- # general
- # mturk
- # n_mozilla_fac
- # n_mozilla_queue
- # n_mozilla_team01
- # n_mozilla_team02
- # n_mozilla_team03
- # n_mozilla_team04
- # n_mozilla_team05
- # n_mozilla_team06
- # n_mozilla_team07
- # n_mozilla_team08
- # n_mozilla_team09
- # n_mozilla_team10

#n_mozilla_team04

7 | 1 | Add a to

August 31st, 2017

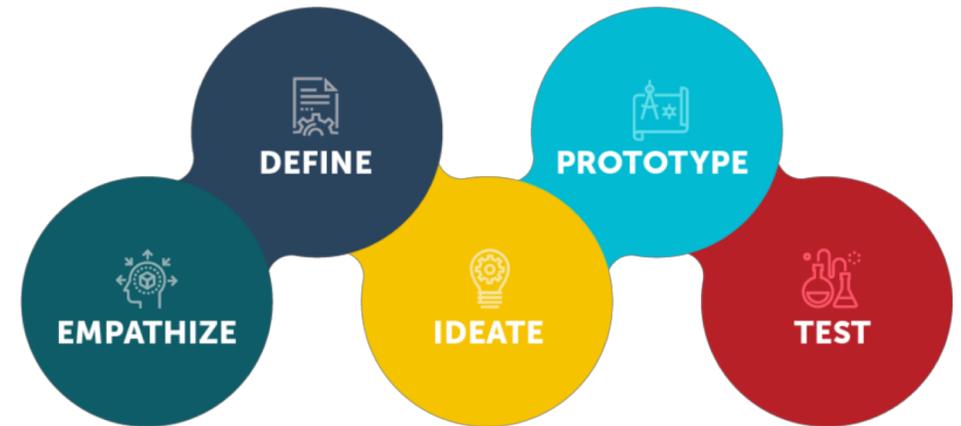
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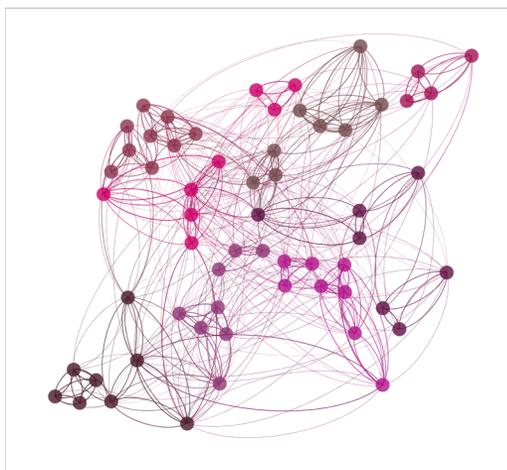
iriskuo 10:58 AM
uploaded this image: [Image uploaded from iOS](#)

+ Message #n_mozilla_team04



HIVE

Balancing familiarity and engagement with diverse perspectives.



- network rotation
- **controlled experiment**
- Mozilla field deployment

controlled experiment

Amazon Mechanical Turk

designing a neighborhood commons

participants: 115 people, 29 teams, N=87 final proposals (3 per team)

three conditions: control, network rotation, network efficiency

measure: expert score on openIDEO rubric

controlled experiment

Amazon Mechanical Turk

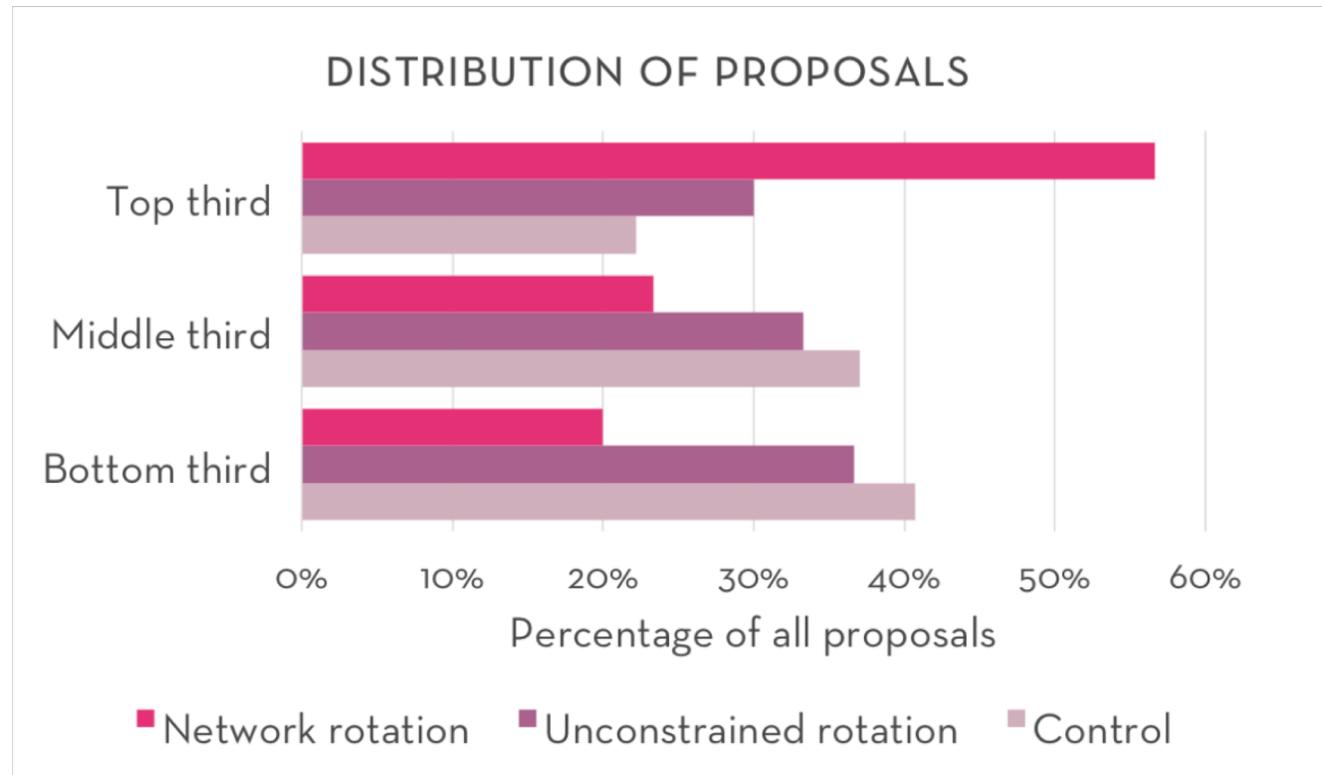
designing a neighborhood commons

participants: 115 people, 29 teams, N=87 final proposals (3 per team)

three conditions: control, network rotation, network efficiency

measure: expert score on openIDEO rubric

controlled experiment: results

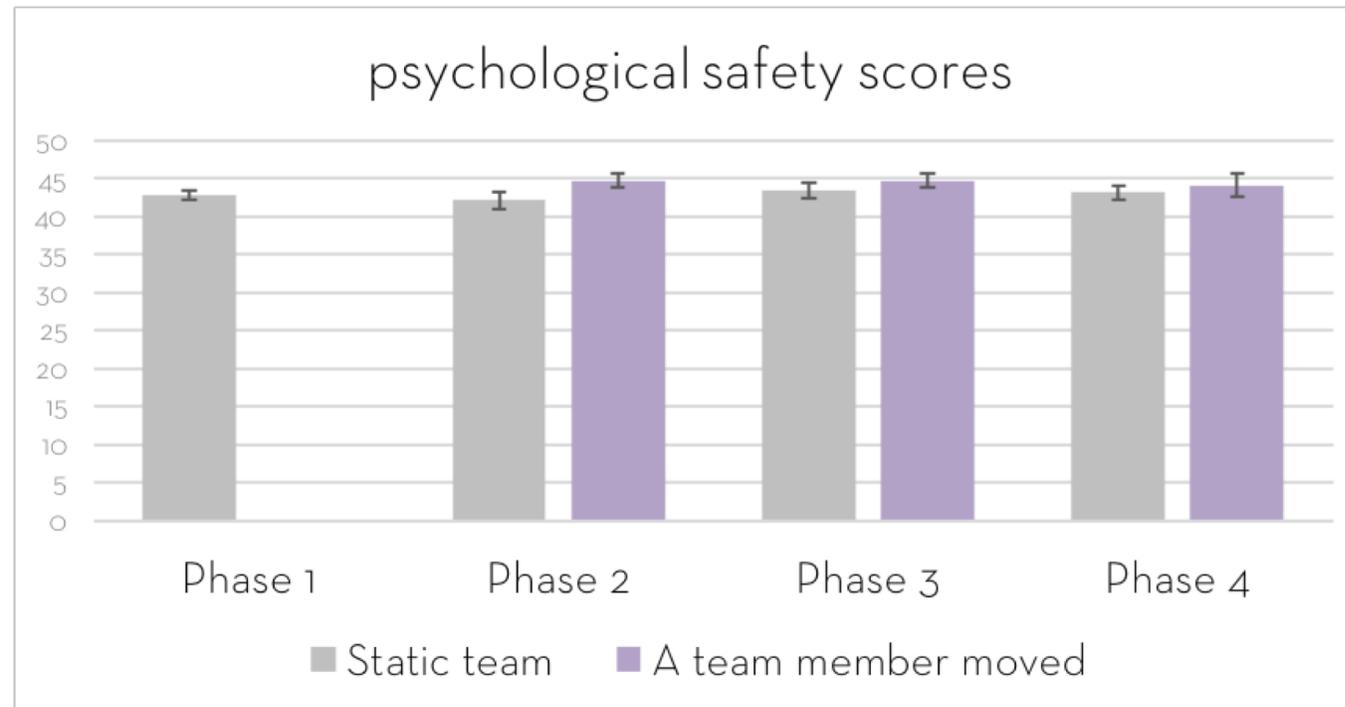


Linear regression on score: network rotation condition significantly better than control ($p < 0.05$), but unconstrained rotation was n.s.

psychological safety

“Members of this team are able to bring up problems and tough issues.”

“Working with members of this team, my unique skills and talents are valued and utilized.”



[Edmondson, 1999]

psychological safety

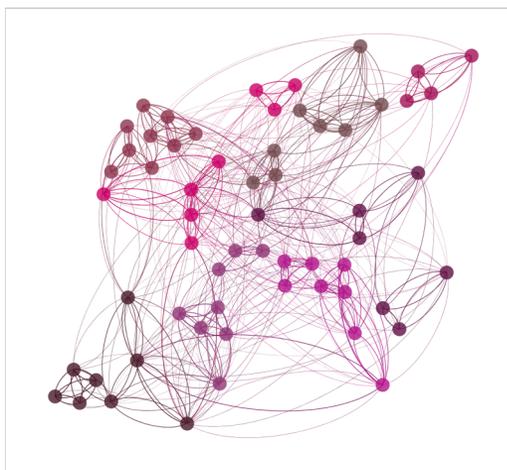
Two-way ANOVA (team status x phase): significant interaction ($p < .001$), driven by decreasing scores for people moved on later days



[McGrath et al., 2000; Rink et al., 2013]

HIVE

Balancing familiarity and engagement with diverse perspectives.



- network rotation
- controlled experiment
- **Mozilla field deployment**



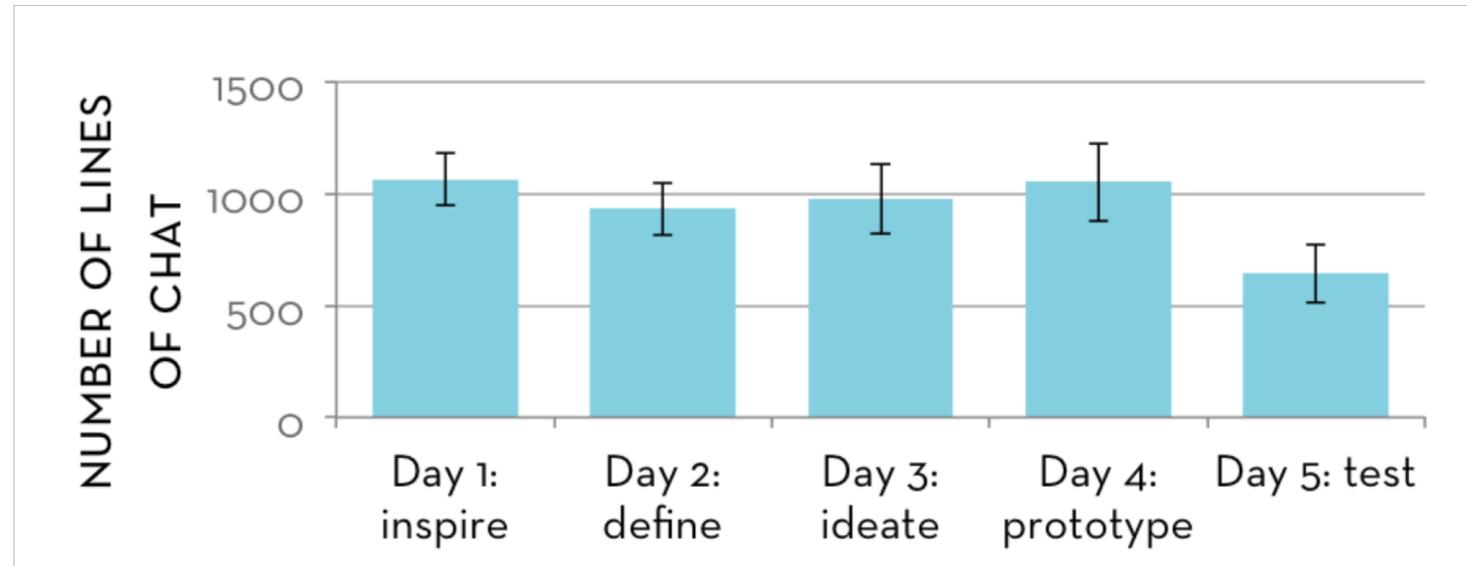
moz://a

ACCESSIBILITY
DESIGN DRIVE

<http://mzl.la/MZopensprint> | AUG 28 - SEP 1

Accessibility Design Drive

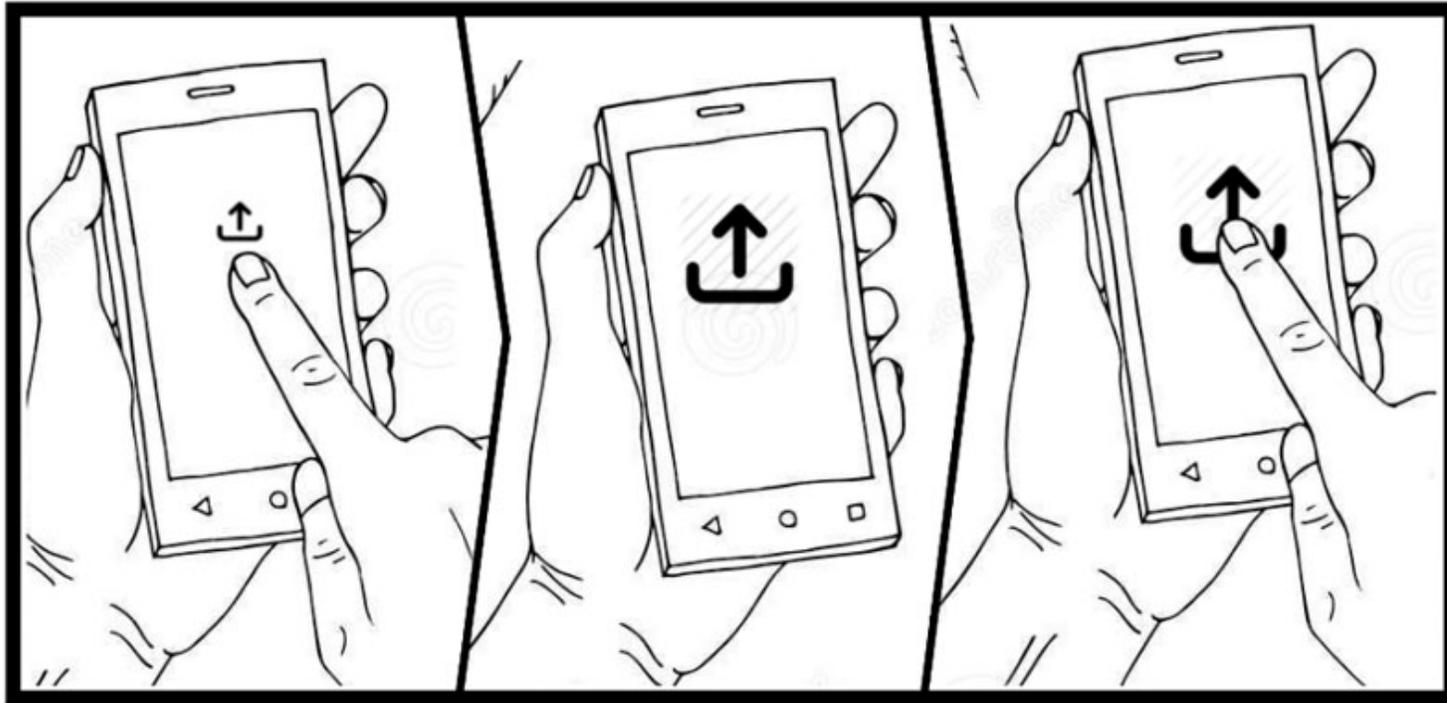
over one hundred disability experts, designers, and programmers reached out to disabled people to join as team leads, \$150 gift card
85% completion rate



Mozilla deployment



Mozilla deployment



Membership change brought new perspectives but added effort

Meeting new people was great. Mixing ideas was very helpful, especially as people dropped in and out later in the week.

Membership change brought new perspectives but added effort

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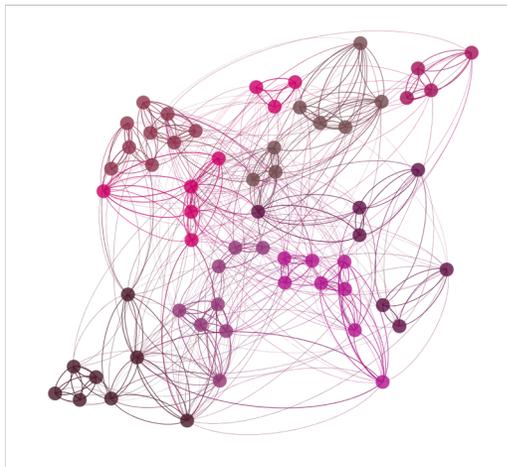
I liked bringing in fresh ideas every day. Gave a different/new perspective [. . . but] sometimes you build good working relationships with others and do not want to lose them.

Anonymity made people more comfortable in sharing their stories.

Wow, that didn't even feel like an hour! [...] I'm loving this! This is stuff I never talk about, it's helping me realize some things about myself that I was blind to before I started talking about it here. Thank you all.

HIVE

Balancing familiarity and engagement with diverse perspectives.

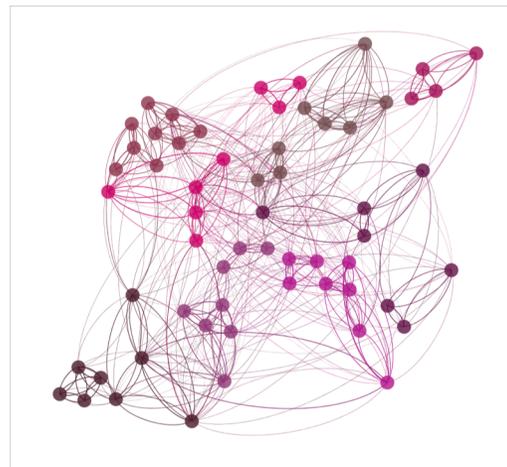


- network rotation
- controlled experiment
- Mozilla field deployment

Thank you participants!

Hive: Collective Design Through Network Rotation

build familiarity while engaging
with diverse perspectives



cosine similarity of text

