Diffusion Dynamics of Games on Online Social Networks

Xiao Wei, Jiang Yang, and Lada A. Adamic
University of Michigan, Ann Arbor
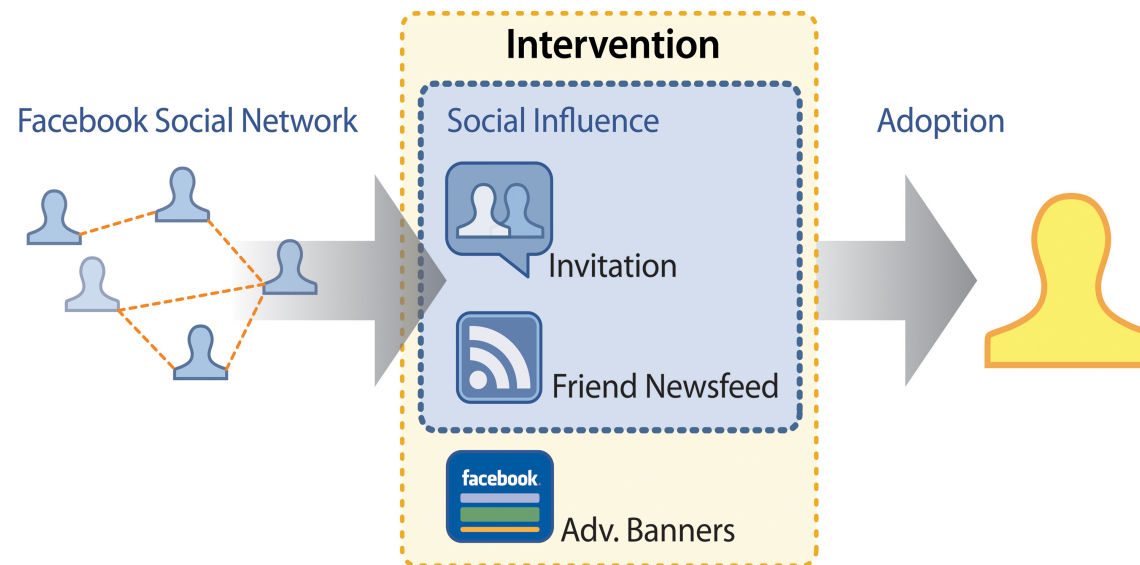
Ricardo Matsumura de Araújo
Federal University of Pelotas, Brazil

Manu Rekhi
LOLapps -> MySpace

Motivation

- How can games be designed to propagate efficiently along a social network?

  - What are the best invitation strategies at the individual level?

  - Are there network effects?

Related work

- Online viral marketing (Leskovec et al., EC'06)
- Social influence & diffusion
  - Backstrom et al. 2006: joining LJ groups or CS conferences
  - Aral et al. 2009: distinguishing homophily and influence
  - Liben-Nowell & Kleinberg 2008: email chain letters
  - many studies of diffusion in blogs and microblogs (Twitter)
  - Bakshy et al. 2009: social networks and content diffusion
- Facebook
  - Sun et al. (ICWSM 2009): diffusion of pages on FB
  - Gjoka WOSN 2008: more apps, decreased average usage

Outline

- games we studied

- invitation efficiency
  - inviter
    - profile
    - invitation patterns
  - invitee
    - how many and how different are the inviters?

- network effects for games that favor large within-game groups

- 50 million active users/month (June 2010)
- founded in 2008
- 300,000 user generated applications
- 11 games

a tale of 2 games

- Grow your family (Yakuza Lords) or entourage (Diva Life) and win battles/gigs
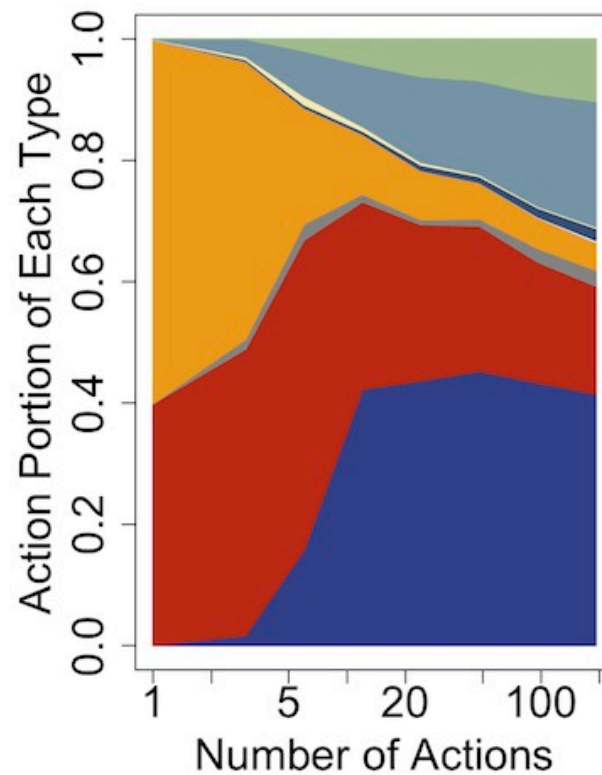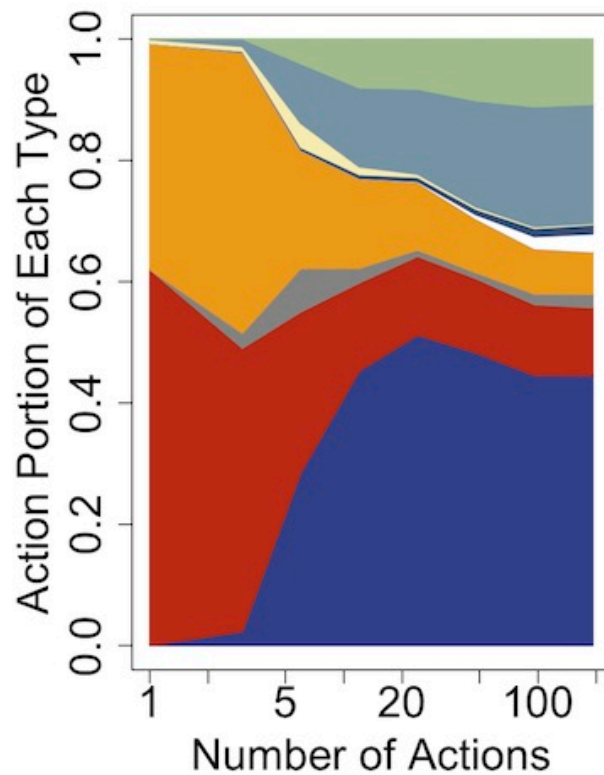
Game activities

Yakuza Lords   **Diva Life**

Legend:
- battles
- battle_view
- invites
- banks
- properties
- healing
- characters
- locations
- item
- mission

X-axis: Number of Actions

Y-axis: Action Portion of Each Type

Game demographics

Yakuza Lords	Diva Life
1 million users (July 2009 – Feb 2010)	2 million users (Sept 2009 – Feb 2010)
85% male	96% female
most players 18-38 years old	-''-

inviting friends

Your friends don't all want to play

	Name:	**I'm sick of Farmville notifications, I don't care about your lost cow.**
	Type:	Products
		13,329 people like this.

	Name:	**I don't care about your fishes, farm, pets or mafia... :P**
	Type:	Local Business
		1,023 people like this.

	Name:	**Stop sending me Farm ville requests I DONT PLAY!**
	Type:	Products
		1,012 people like this.

In defense of social invites

Name: **I don't care about your farm, or your fish, or your park, or your mafia!!**
Type: Club
1,468 people like this.

Name: **I don't care that YOU don't care about my farm, fish and mob!**
Type: Local Business
1,814 people like this.

Name: **I DON'T CARE if YOU DON'T CARE about my farm, cafe, fish, island, etc. LOL**
Type: Local Business
176 people like this.

Name: **I don't care that you don't care about my farm, or my fish...**
Type: Local Business
245 people like this.

Name: **Dont care about farm, fish or mafia?? Use HIDE and STOP COMPLAINING!!!!!!!!**
Type: Products
484 people like this.

Name: **If u don't care bout my farm, mafia, etc just block the app & stop whining**
Type: Game
1,293 people like this.

Name: **Learn to use the "Hide" game option & Stop Whining about my Farm or Mafia!**
Type: Local Business
143 people like this.

Name: **I care about your farm, fish, park, & your mafia! Those who don't R Haters!**
Type: Website
633 people like this.

Are social invites worth it?

- only 37/25% (YL/DL) users received invites before installing game…

- However…
  - 20% of non-invited players stayed past the first day
  - 50% of invited players stuck around more than a day, and 20% were still there 80 days later.

Intervention

Social Influence

Invitation

Friend Newsfeed

facebook

Adv. Banners
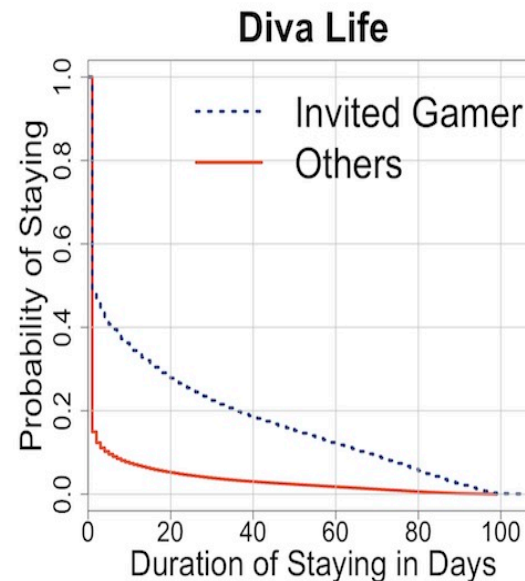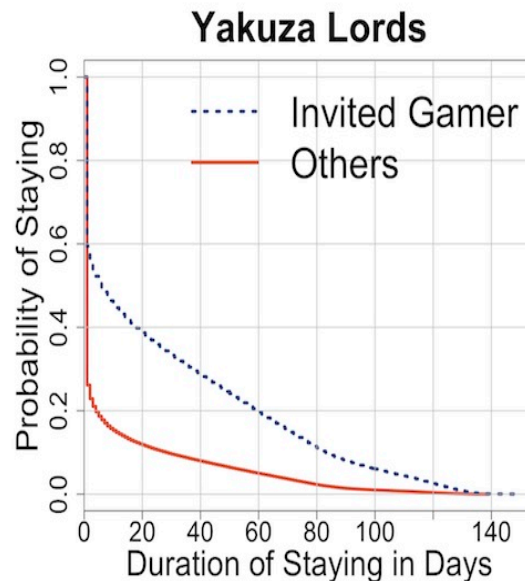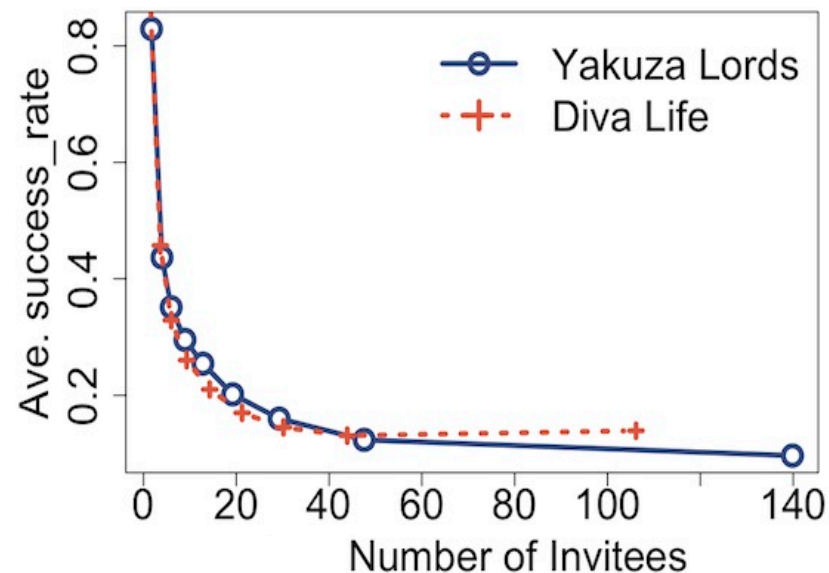
How broadly are users inviting?

- Invite a few friends who are close and/or might be interested? Or invite everybody?
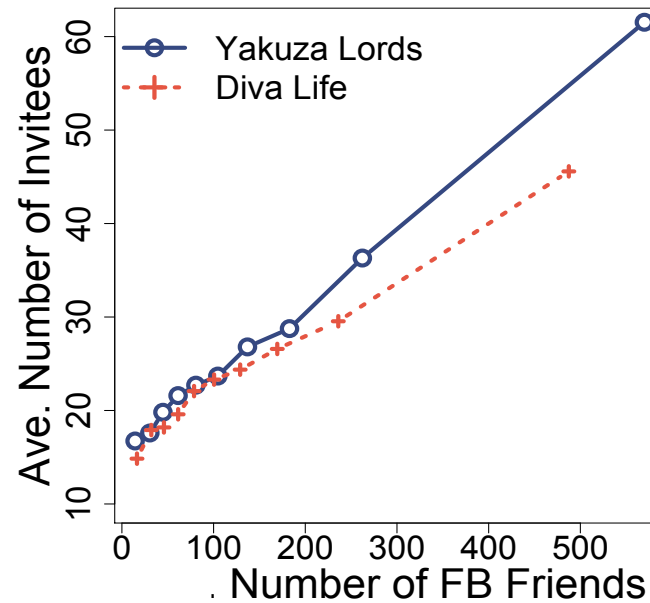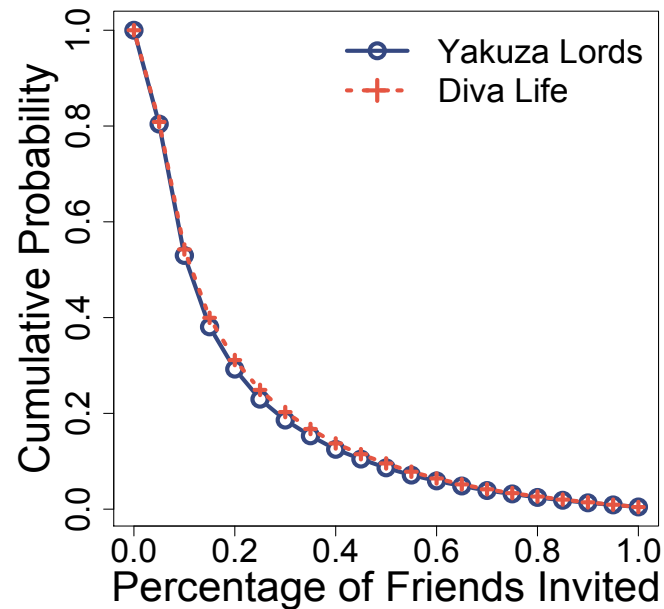
Inviter efficiency: strategy

- Some users are more active inviters:

  – 10% of users account for 50% of successful invites.

- But inviting fewer friends gives higher yield per invite

  – ρ(success rate, # invites sent) = -0.77

why is less more when it comes to invites? 🛈
pacing, repetition, selectivity

- to control for # of invites sent, consider separately users who have invited 6, 12, or 20 friends

- inviters who pace their invites are more likely to succeed:

  - ρ(median interval between sending an invite, success rate) = 0.09~0.19***

- sending repeat invites pays off

  - ρ (av. # invites per friend, success rate) = 0.23~0.27***

- inviting fewer users at once gives higher yield

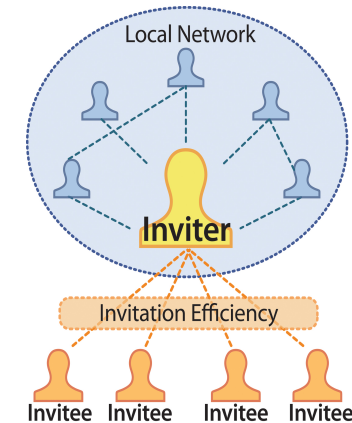 - ρ (av. # invites per click, success rate) = - 0.35~0.49***

Inviter efficiency: profile

- Can one identify successful inviters based on their profile?

  - no correlation with gender, education, hometown, relationship status

  - weak correlation ~0.1 with age

the inviter's network & sharing

- almost no correlation ($\rho \sim -0.04$) between the size of an inviter's network and success rate
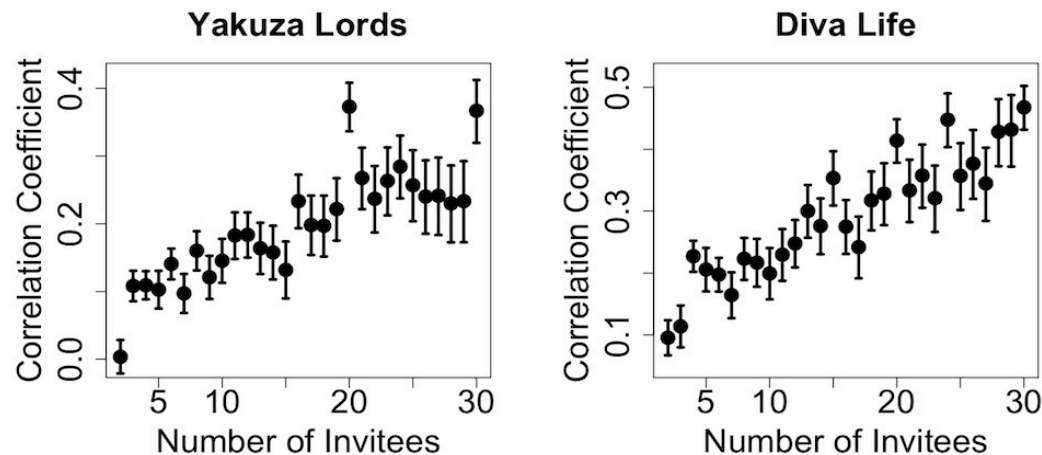

- almost no correlation with # of walls posts (game and other) $\rho \sim 0.04$

- or privacy level of profile ($\rho \sim -0.06$) (what gets shared publicly).
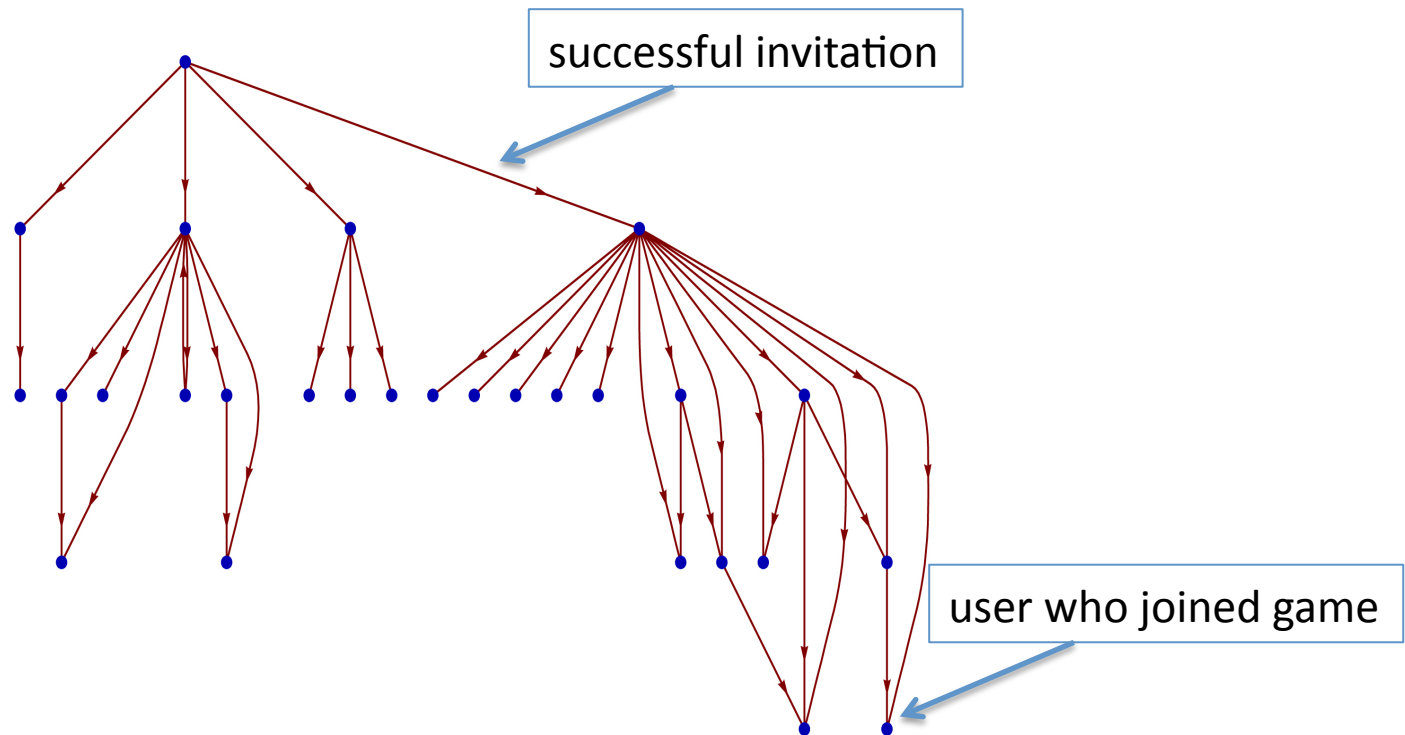
inviters engagement with the game and success

- higher engagement <-> higher invite success

correlation between Life Time an success rate

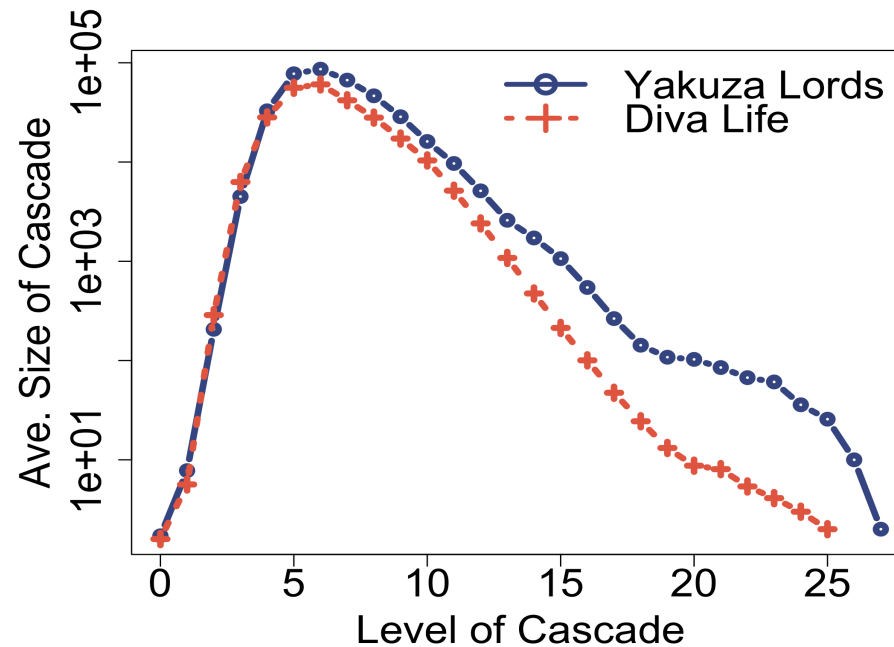- the top 10% of inviters by success rate have an average lifespan of 70 days

Putting it together:
Invitation cascades
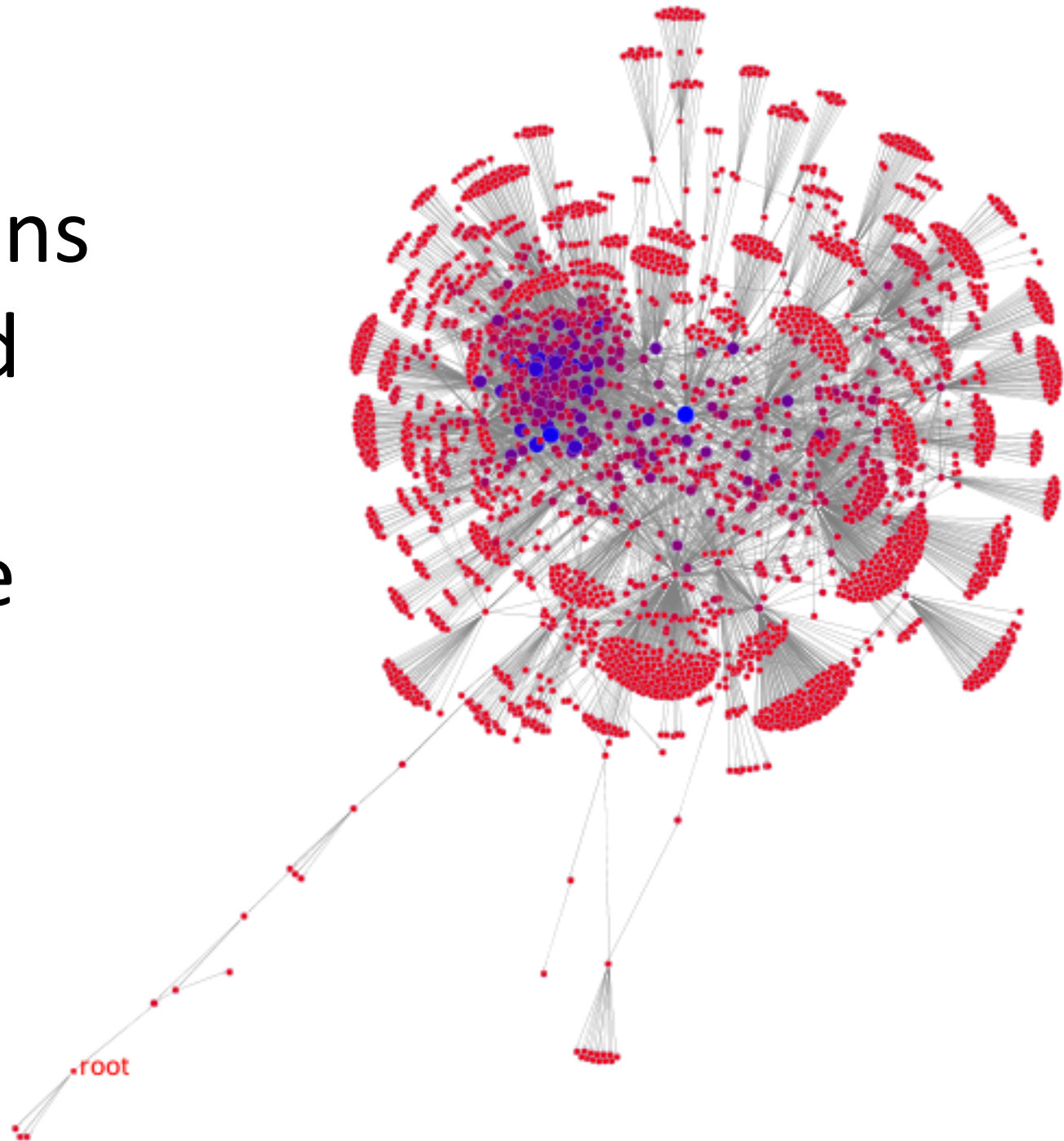

successful invitation

user who joined game

Cascades are wide and shallow

- small-world: everyone runs into everyone else in the game in a small number of steps
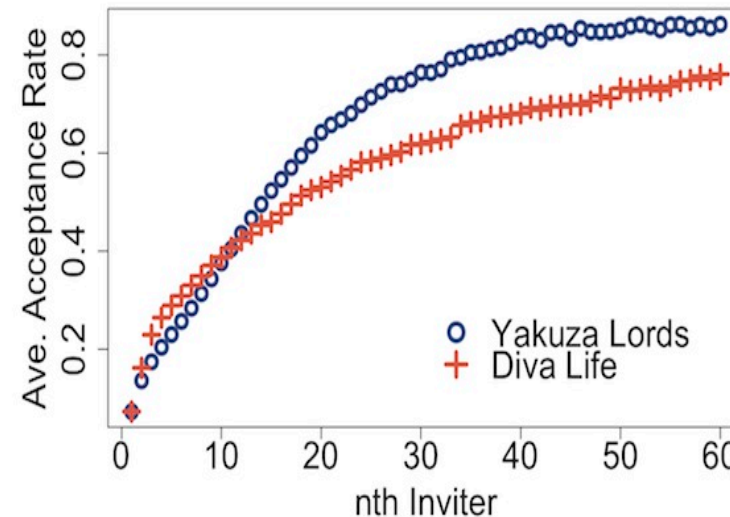
invitations
spread
and
collide

.root

who is inviting you?

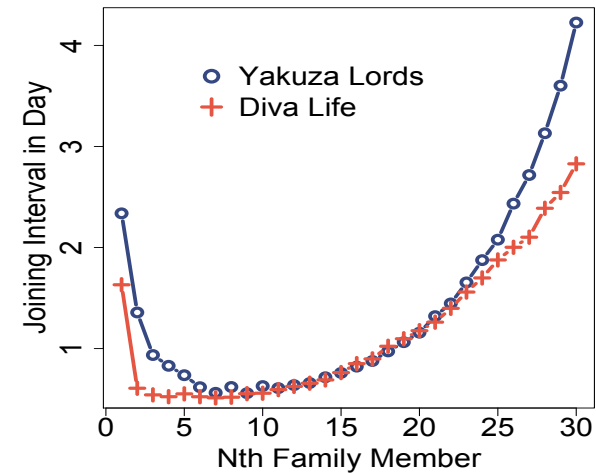- more invites from different people -> higher probability of joining

- but inviters don't have to be different form each other... entropy of profiles does not matter

- helps if inviters belong to the same clique
  - ρ(clustering coefficient) = 0.21 (YL), ρ = 0.14 (DL)
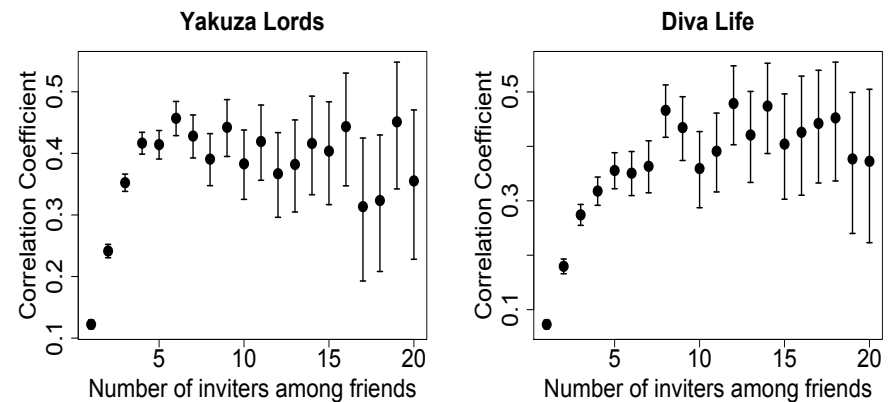
Are cliques being absorbed into the game?

- families grow rapidly at first, then more and more slowly

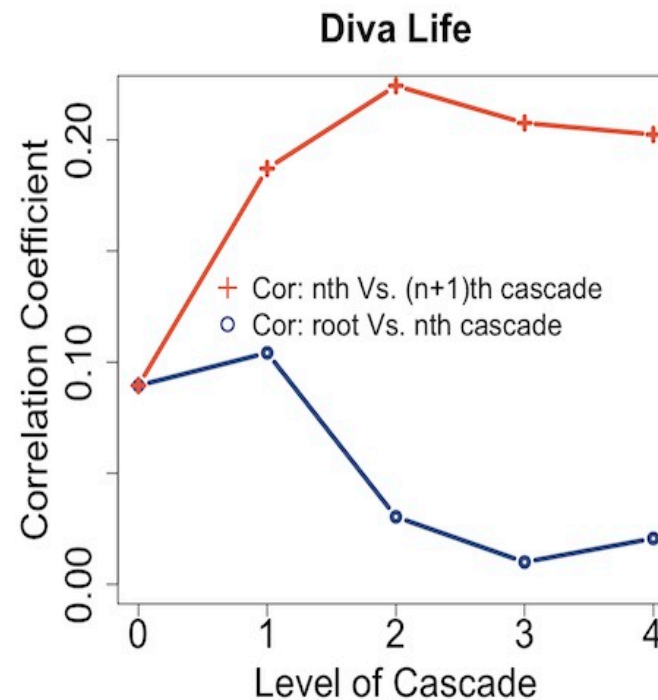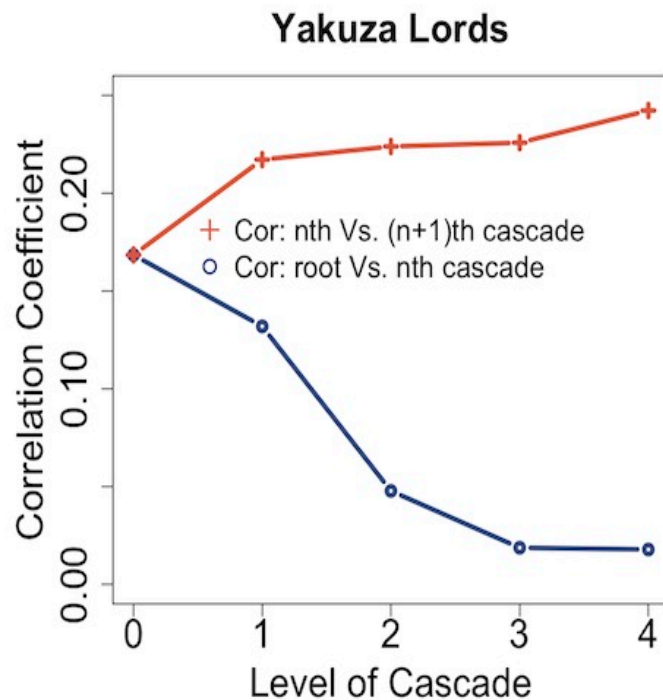correlation between one's own success rate and that of one's friends

- when friends join forces their success rate grows (they share credit for new recruits)

How far does influence carry?

- correlation between one's success rate and descendants' av. success rate

Using networks to propagate games or using games to grow networks?

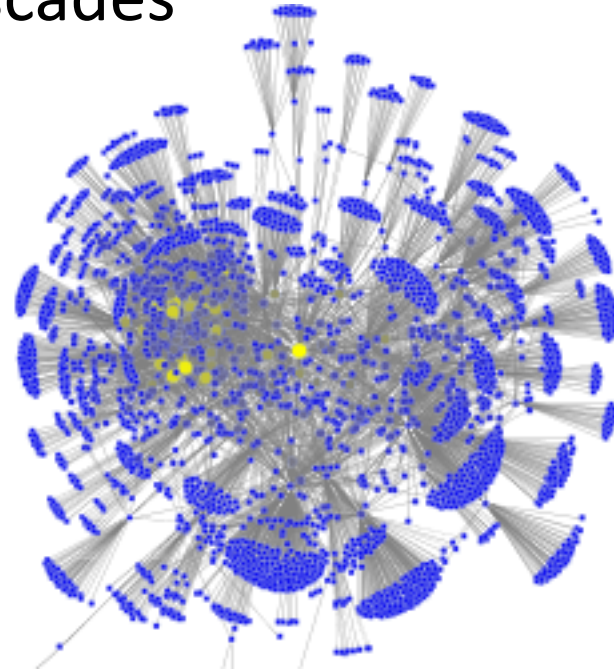- Users add each other as friends in order to grow families…

conclusion

- games are spreading successfully and virally over social networks, as users invite friends

- it's not so much who the inviter is, but how selective and persistent they are

- engagement correlates with success

- family-structured games experience boost from network effects

- persuasive users are proximate in the network

- games can modify the social networks they are spreading on

future work

- tracing user created games
  - what are the properties of viral games?
- characterizing large-scale cascades

more info

- http://netsi.org