

SOCIAL NETWORKS

Sept 17 2015

LECTURE #5

STRONG TRIADIC CLOSURE

Strong Ties → Frequent/Regular Contacts

Weak Ties → Occasional contacts
→ Rare Contacts.

Marc Granovetter [American Sociologist -
Currently at Stanford Univ]

"Weak ties enable reaching populations and audiences with much higher efficiency than what is achievable or accessible via strong ties."

STRENGTH OF WEAK TIES (1973)

WHY?

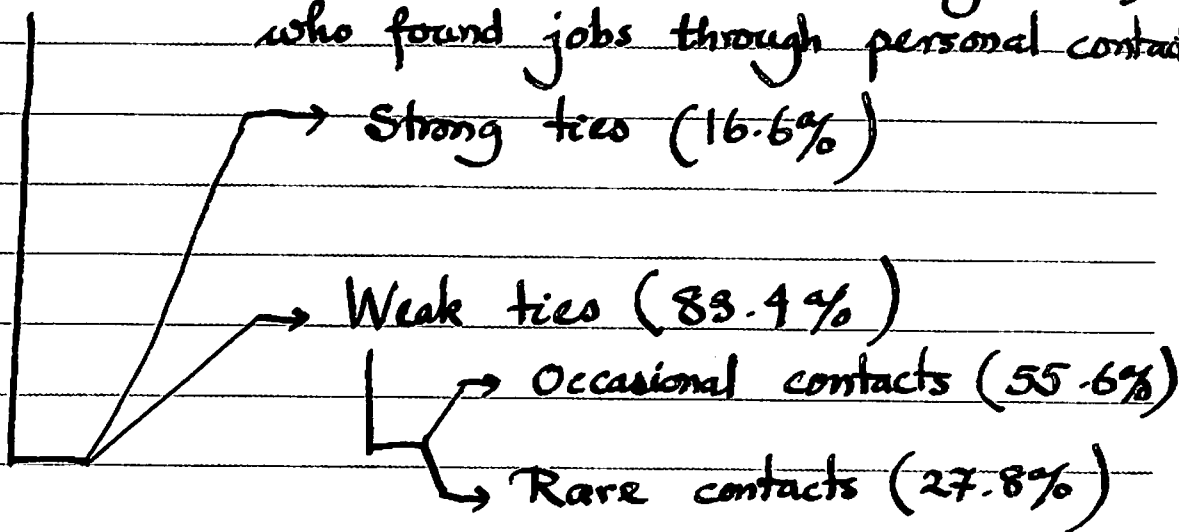
Ref. "Getting a Job." PhD Diss, Granovetter, M.,
Dept. of Social Relation, Harvard Univ.

Experiment

Location: Newton, MA.

Subjects: 282 professionals, technical & managerial workers.

Result: $N=54$ = # individuals (out of 282) who found jobs through personal contacts.



◊ In a social network, let f_1 and f_2 be two close friends of yours..

⇒ They are connected by strong ties to you.

⇒ Then, it is likely that f_1 and f_2 are at least acquaintances and are connected to each other by weak ties.

$$\Pr[(v,w) \in E \mid (u,v) \in E_s \wedge (u,w) \in E_s] > \Pr[(v,w) \in E]$$



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AUGMENTED GRAPH

Defⁿ: Consider an "augmented" undirected graph

$$G = (V, E, E_s)$$

in which $E_s \subseteq E \subseteq V \times V$

E = The edges/ties.

E_s = The strong ties $\Rightarrow E \setminus E_s$ = The weak ties.

$\Rightarrow (u, v) \in E \Rightarrow u$ and v are friends

(acquaintances + close friends)

$(u, v) \in E_s \Rightarrow u$ and v are close friends.

The Strong Triadic Closure Property (STC)

If $(u, v) \in E_s$ and $(u, w) \in E_s$
then $(v, w) \in E$ a.s.

\Leftrightarrow

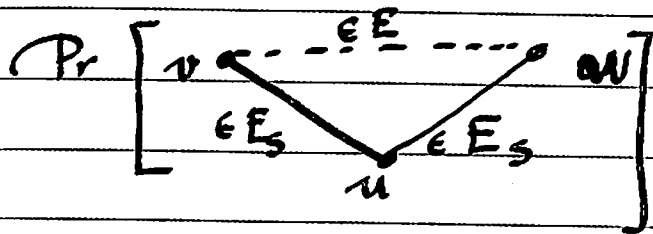
$$\Pr[(v, w) \in E \mid (u, v) \in E_s \wedge (u, w) \in E_s] \\ > \Pr[(v, w) \in E]$$

Probability Raising in Social Network

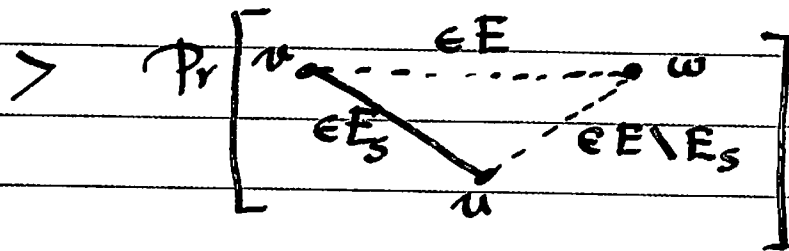
Homophily vs Social Influence.

$$(I) \Pr[(v, w) \in E \wedge (u, v) \in E_s \mid (u, w) \in E_s]$$

$$> \Pr[(v, w) \in E \wedge (u, v) \in E_s \mid (u, w) \in E \setminus E_s]$$



Corollary of
STC



(II) Consider a new relation R

$\{(u, v) \in R\}$ = Event u obtained a job through a "recommender" v .

- v recommend u to w ;
- w verified u independently;
- w determined whether u is a suitable candidate.

Strong Recommendation $\Rightarrow (v, w) \in E_s$

Weak Verification $\Rightarrow (u, w) \notin E$

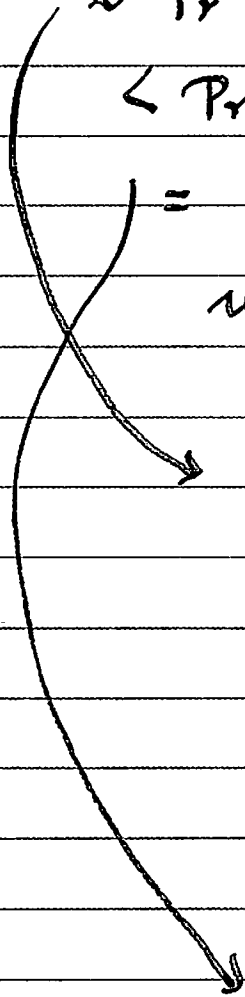
$$\Pr[(u,v) \in R \mid (u,v) \in E_s]$$

$$\approx \Pr[(u,w) \notin E \wedge (v,w) \in E_s \mid (u,v) \in E_s]$$

$$< \Pr[(u,w) \notin E \wedge (v,w) \in E_s \mid (u,v) \in E \setminus E_s]$$

$$= \Pr[(u,v) \in R \mid (u,v) \in E \setminus E_s]$$

u = Applicant v = Recommender
 w = verifier.



Strong Ties

$$(u,v) \in E_s \wedge (v,w) \in E_s$$

$$\Rightarrow (u,w) \in E$$

w knows about u and
 can use information in addition
 to what's provided in v's recommend

Weak Ties

$$(u,v) \in E \setminus E_s \wedge (v,w) \in E_s$$

$$\Rightarrow (u,w) \notin E$$

w will go by v's recommendation only