4th ACM RecSys Workshop on

RECOMMENDER SYSTEMS
&
THE SOCIAL WEB

DUBLIN, 9 SEPTEMBER, 2012

Content, Connections, and Context

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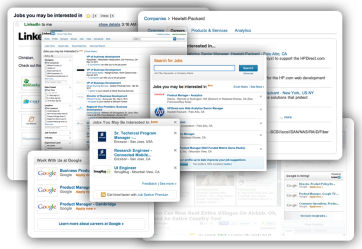
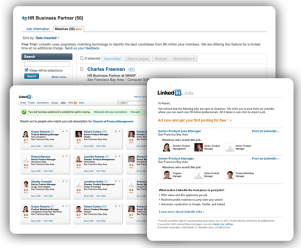
Principal Data Scientist at LinkedIn

Recommendation Products at LinkedIn

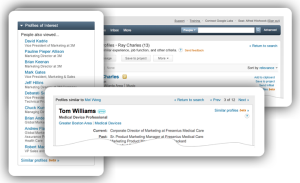
Jobs You May Be Interested In



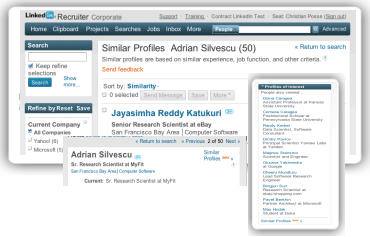
Talent Match



CAP

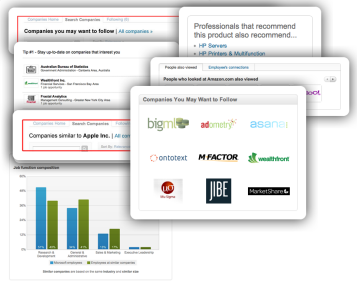


Similar Profiles

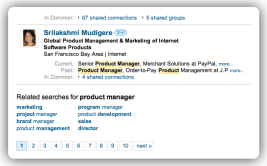


Companies

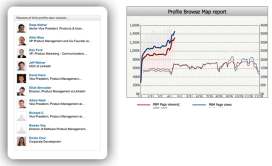
Recommendations, similar companies search, peer companies, and company browse maps, company products and services browse maps



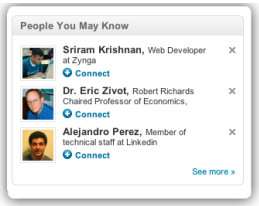
Related search



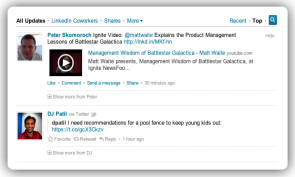
Profile browse maps



Connections



Network updates



Jobs browse maps

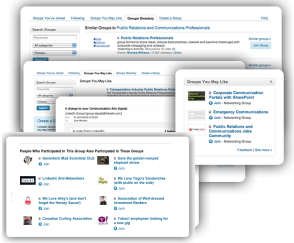
Events You May Be Interested In

Ad matching engine

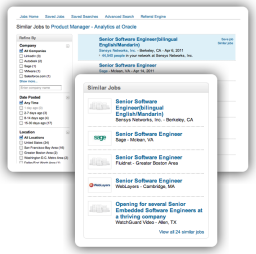
pCTR = f(member, creative, advertiser, context, inventory, OCTR)

Groups

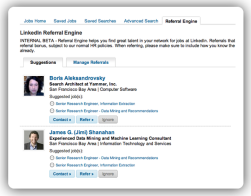
Recommendations, similar groups search



Similar jobs



Referral Engine



News

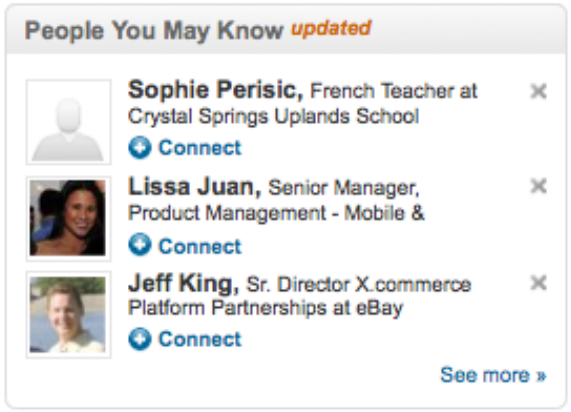
More than 50%

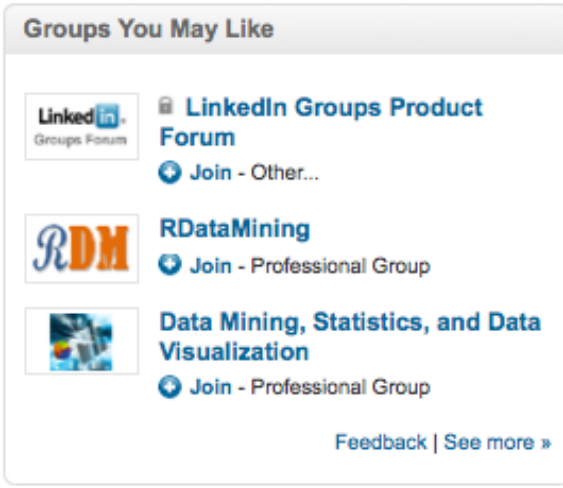
Recommendations drive:

> 50% of connections

> 50% of job applications

> 50% of group joins

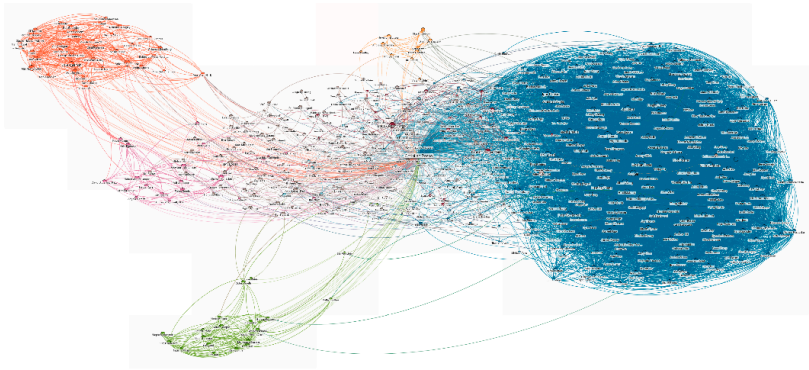




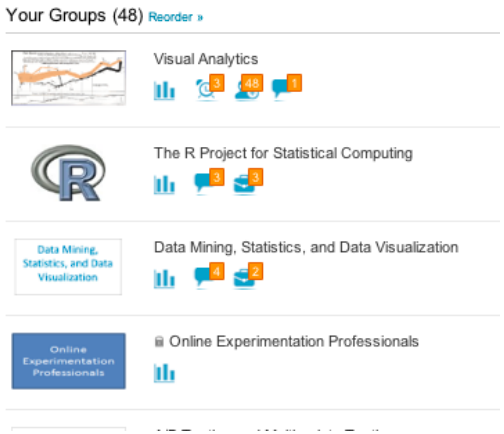
Inputs for Recommender Systems

Content

Social Graph



Behavior



Take-Aways

Content is king.

Connections provide social dimension.

Context determines where and when a recommendation is appropriate.

What is the goal of recommendations?

- Growth
- Engagement
- Revenue

What is the goal of recommendations?

- ~~Growth~~
- ~~Engagement~~
- ~~Revenue~~

Users First!

Provide relevant content

and establish social connections

in appropriate context.

Content is King

Goal-Seeking is about Content

Content (Ir)relevance

- No right answer, but many wrong answers.

%no

[Voorhees, 2004]

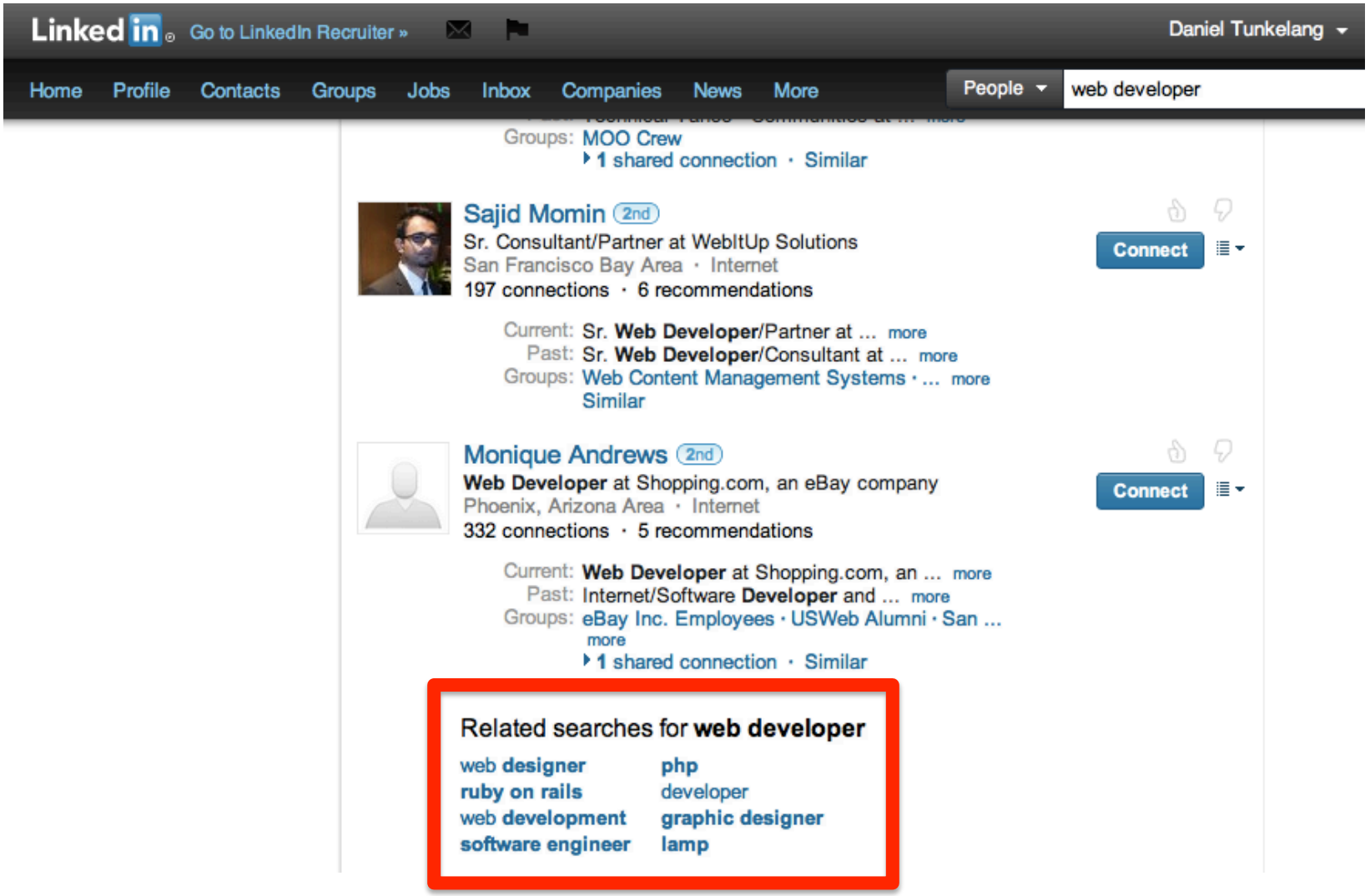
http://bit.ly/percentno

WTF!

@k

http://bit.ly/wtfatk

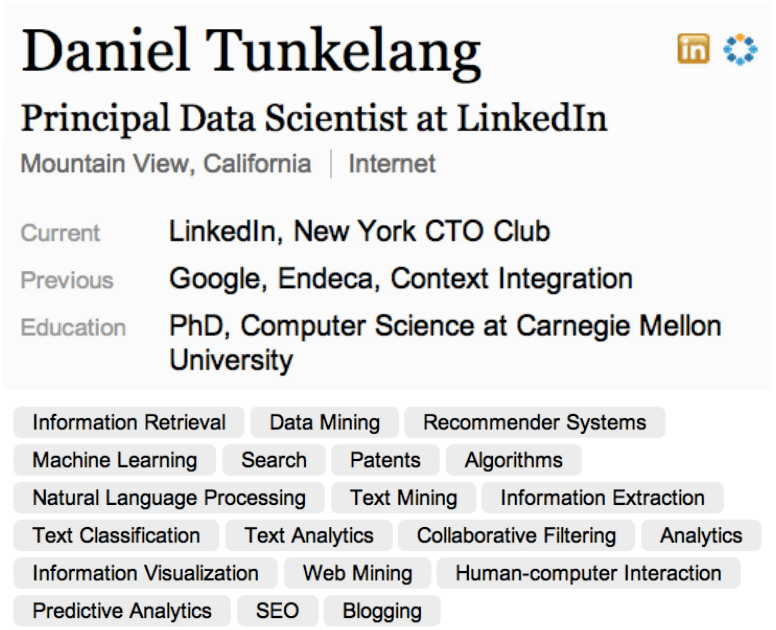
Example: Related Searches

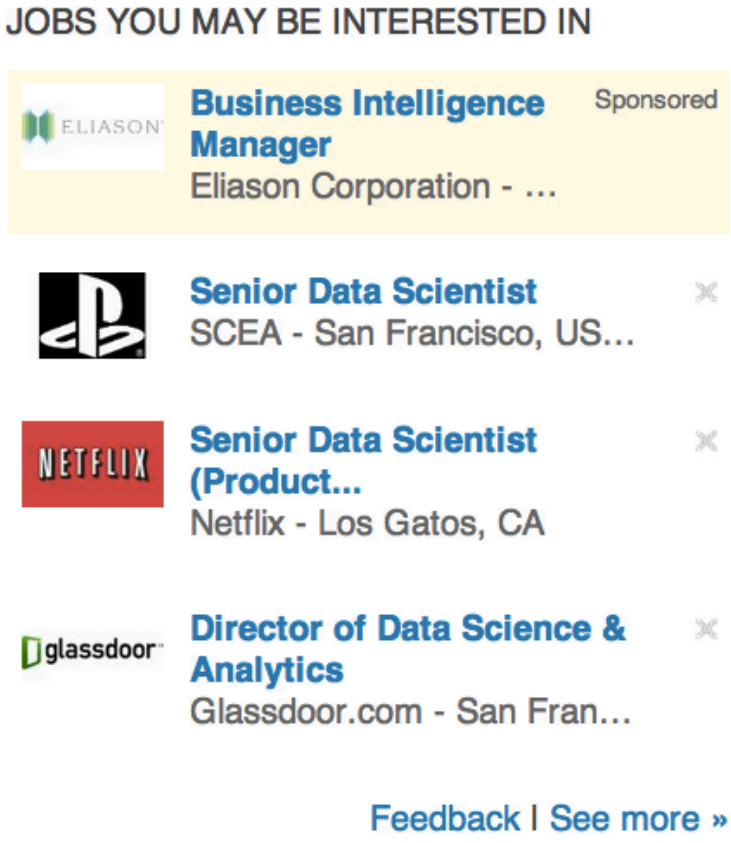


Collaborative Filtering as Content Signal

- Use temporal locality within sessions.
- Find queries with clicks on similar results.
- Look for query overlap.
- Learn more at CIKM! [Reda et al, 2012]

Example: Jobs You Might Be Interested In





Content Signals Dominate Social Signals

Job

title
geo
company
industry
description
functional area
…

User Base

Filtered

Candidate

General
expertise
specialties
education
headline
geo
experience

Current Position
title
summary
tenure length
industry
functional area
…

derived

Matching

Binary
Exact matches:
geo, industry,
…

Soft
transition probabilities,
similarity,
…

Text

$$w_{t,d} = \mathrm{tf}_t \cdot \log \frac{|D|}{|\{t \in d\}|}$$

$$\cos\theta = \frac{\mathbf{v_1} \cdot \mathbf{v_2}}{\|\mathbf{v_1}\| \, \|\mathbf{v_2}\|}$$

Corpus Stats

Transition probabilities
Connectivity
yrs of experience to reach title
education needed for this title
…

Similarity
(candidate expertise, job description)
0.56

Similarity
(candidate specialties, job description)
0.2

Transition probability
(candidate industry, job industry)
0.43

Title Similarity
0.8

Similarity (headline, title)
0.7

.
.
.

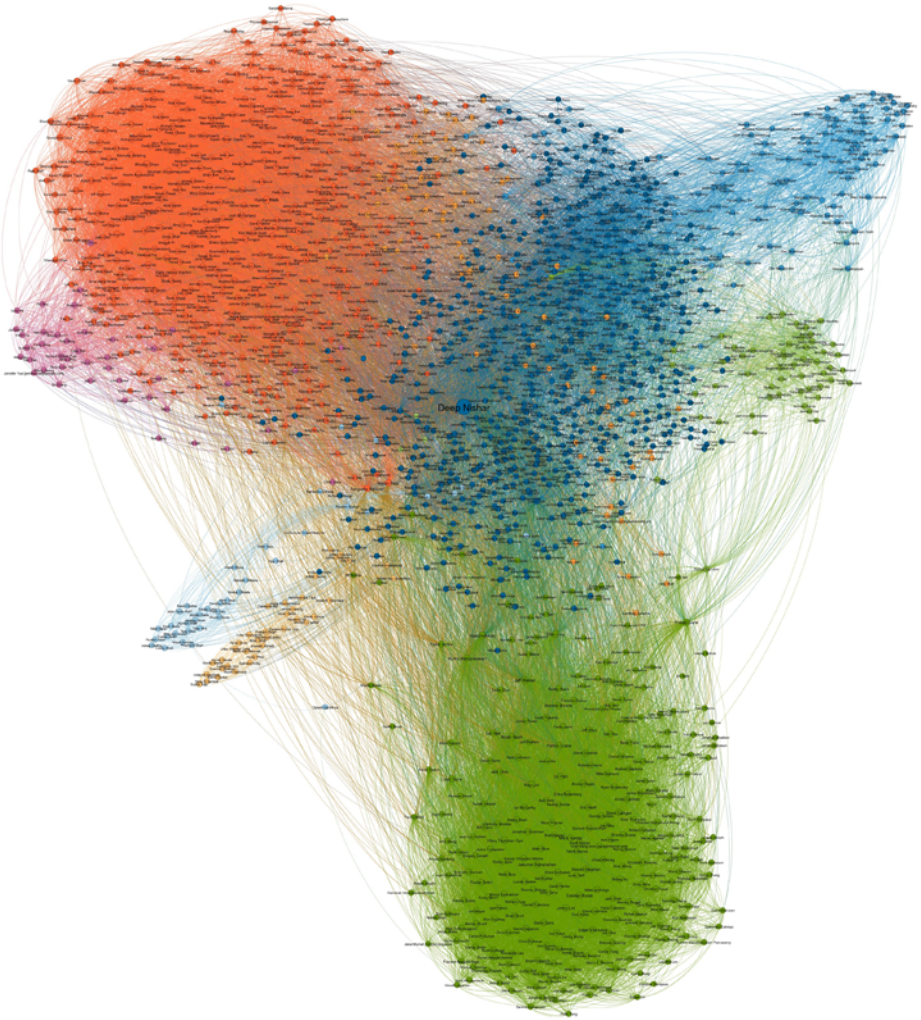
Summary

Provide relevant content

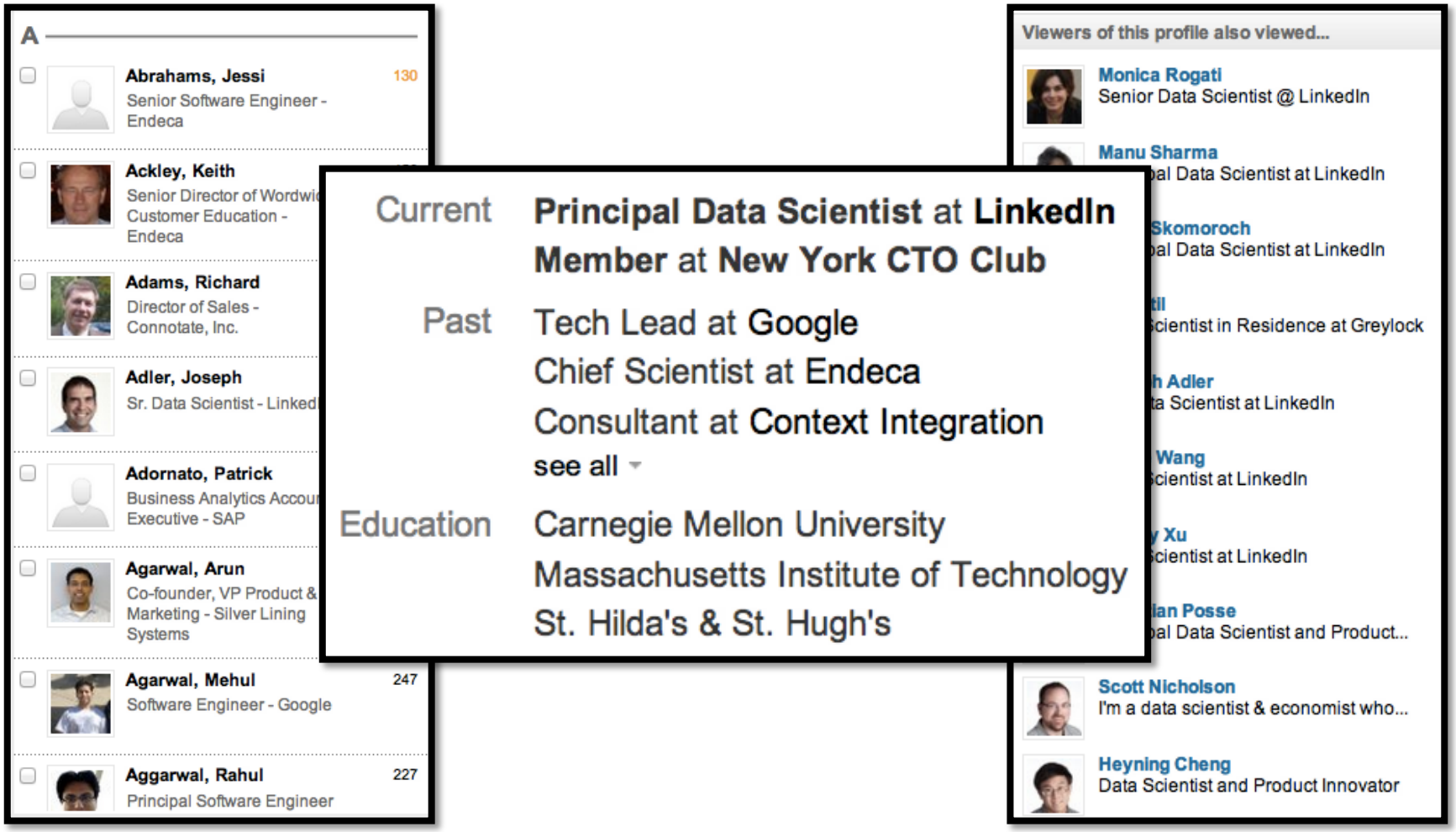
and establish social connections

in appropriate context.

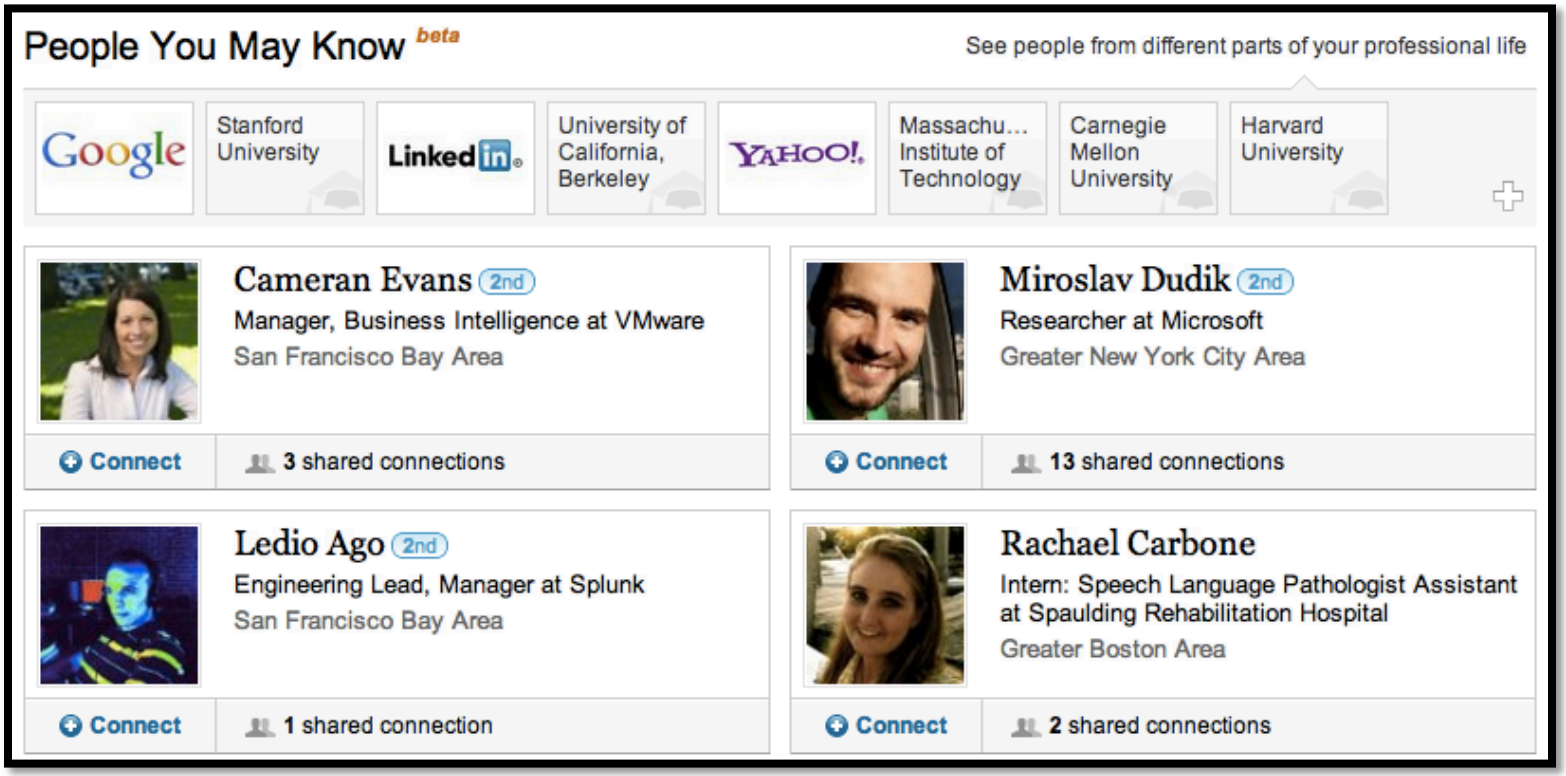
Connections



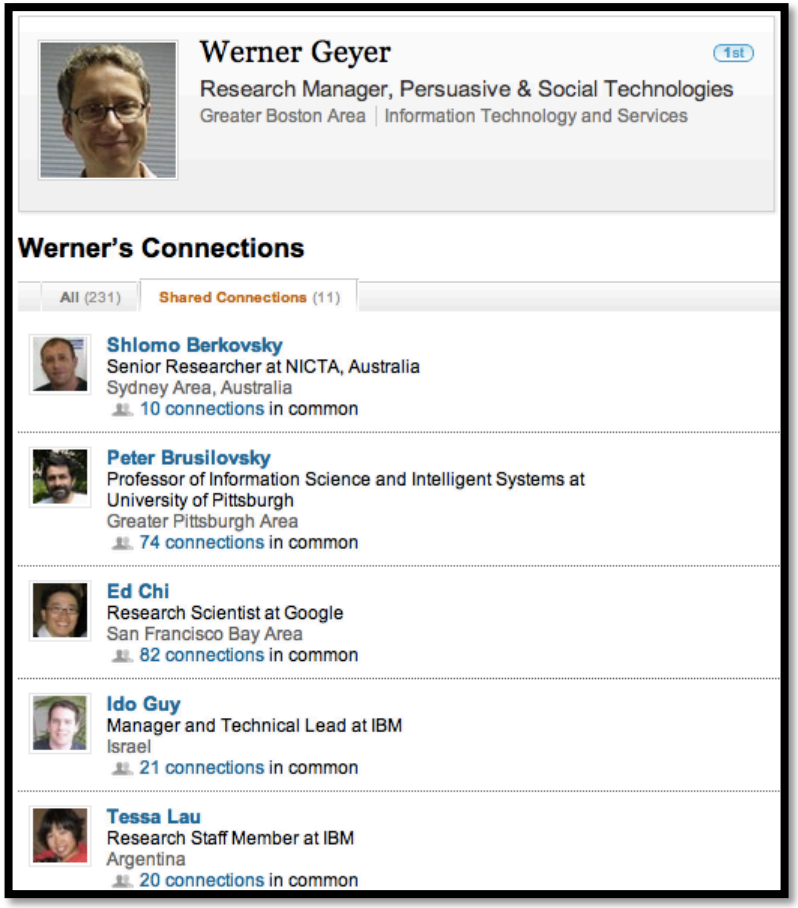
Connections are Social Dimensions

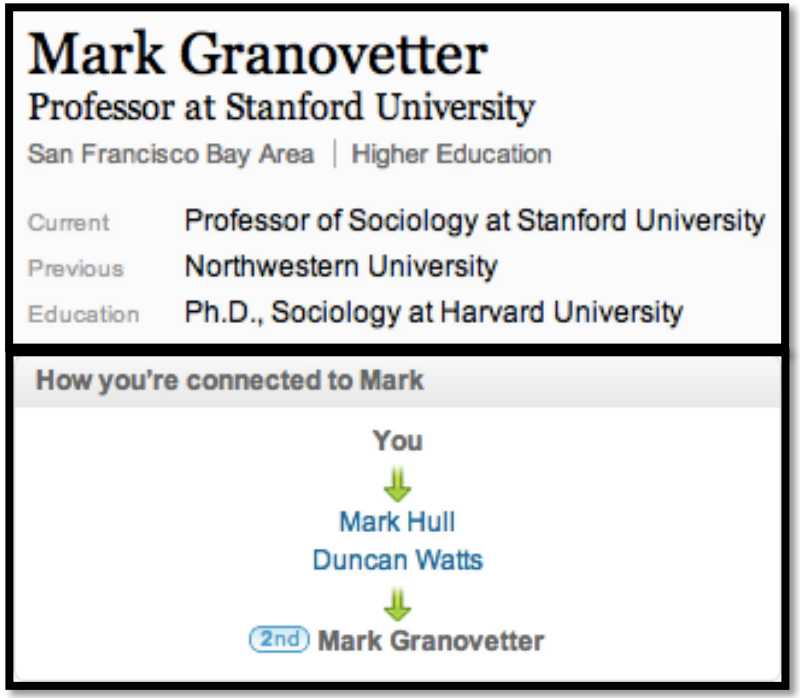


Example: People You May Know

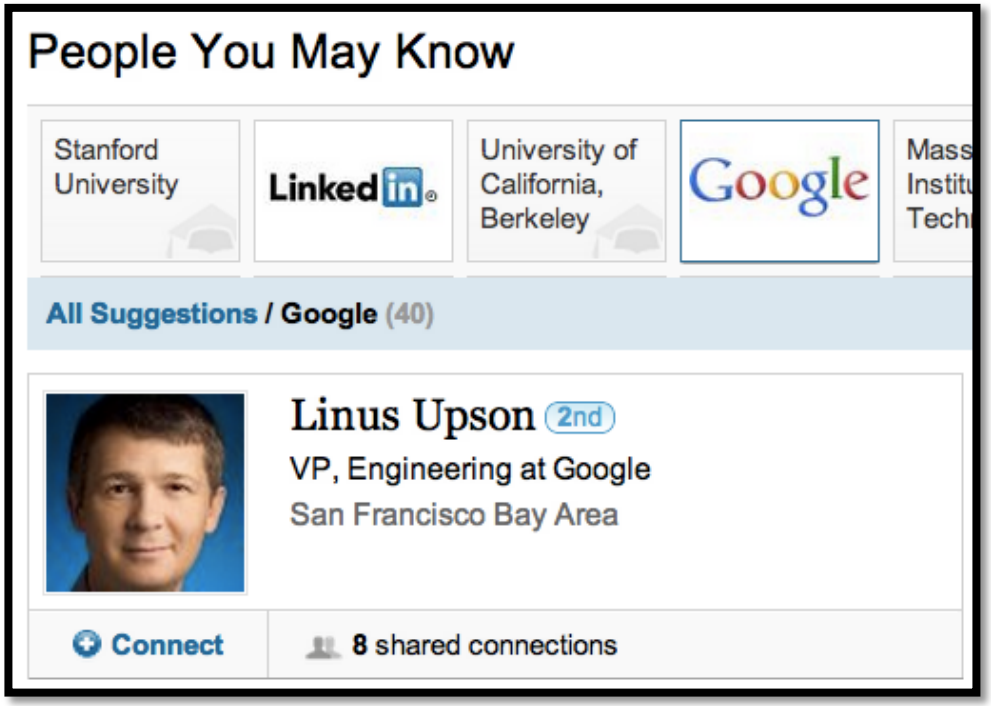


Relationships are Social

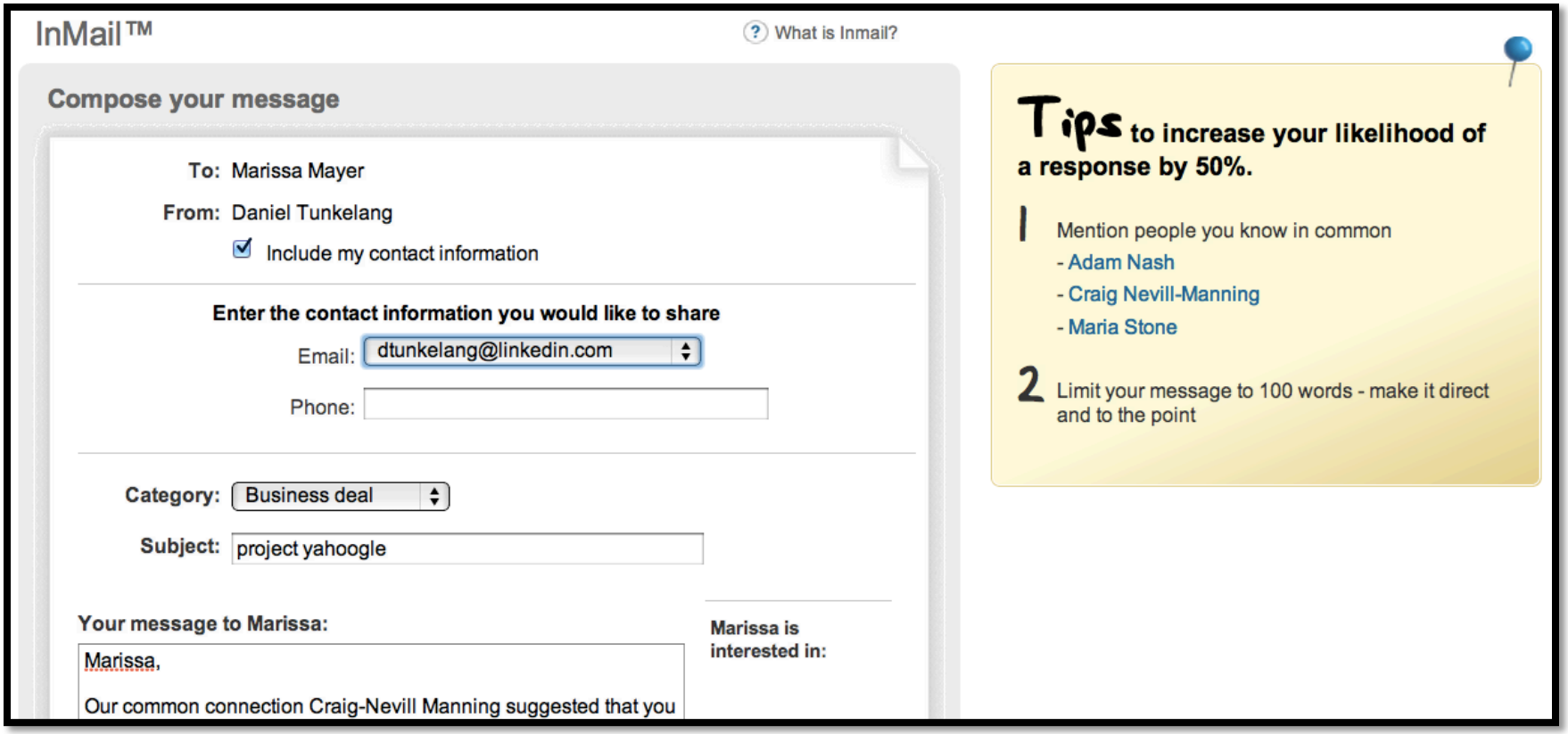




Shared Connections as a Signal



The Power of Social Proof



Beyond Triadic Closure

- Triads suggest and affect relationships. [Simmel, 1908], [Granovetter, 1973]
- Triangle closing is a Big Data problem. [Shah, 2011]
- Use machine learning to rank candidates.

Summary

Provide relevant content

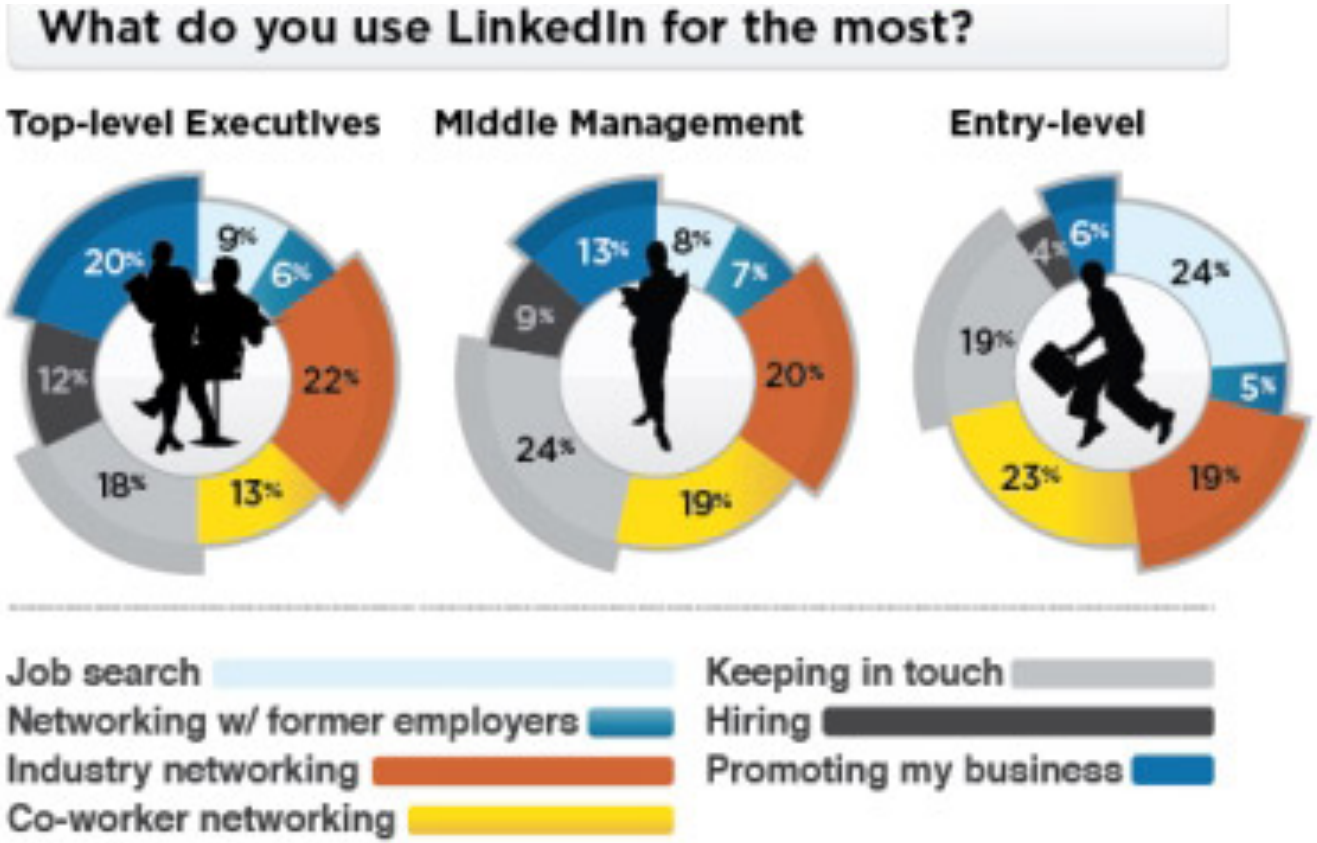
and establish social connections

in appropriate context.

Context

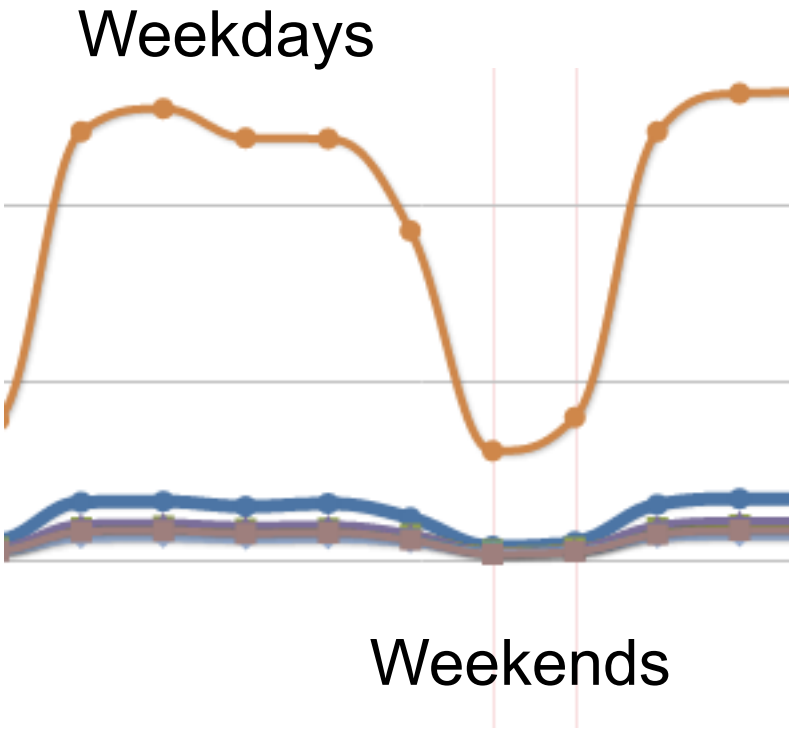
"to every thing there is a season”
[Ecclesiastes 3:1]

One Platform, Many Users, Many Needs



http://blog.lab42.com/the-linkedin-profile

No Weekend Meetings!

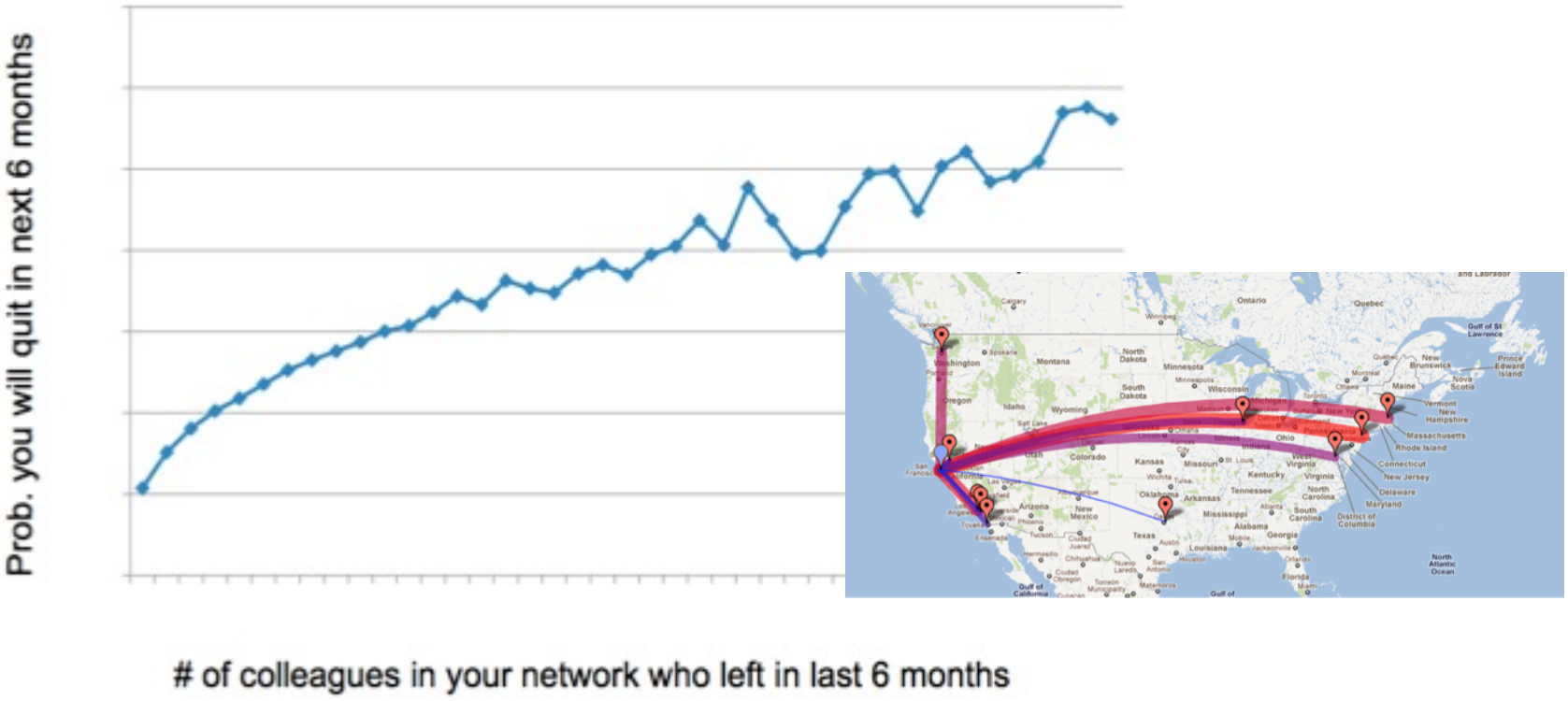


navigational queries

exploratory queries

Different Devices for Different Needs

Time and Place for a Career Change



Active vs. Passive Job Seekers

[Rodriguez et al, 2012]

Summary

Provide relevant content

and establish social connections

in appropriate context.

Recap

Content is king.

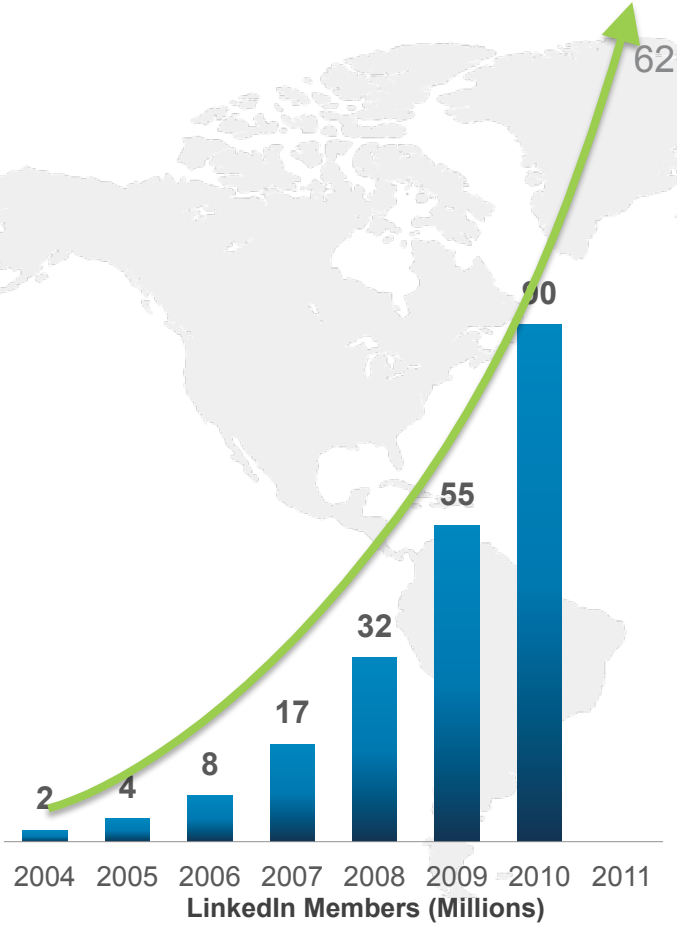
Connections provide social dimension.

Context determines where and when a recommendation is appropriate.

Thank You!

175M+

62% non U.S.



We're Hiring!

2/sec

25th

Most visit website worldwide (Comscore 6-12)

>2M

Company pages

85%

Fortune 500 Companies use LinkedIn to hire

Learn more at http://data.linkedin.com/