Lifestyle Segmentation from Mobile Location & Call Data

Tony Jebara

Sense Networks

Founded 2006, $9m from Intel & Javelin, 15 Staff

Greg Skibiski, CEO
Co-founder. Mgt Board, Backweb (BWEB), Principal Software Architect & Director of relationships with SAP, IBM, MSFT

Christine Lemke, COO
Co-founder. 3i Group, Microsoft, Co-founder Channel Velocity

Tony Jebara, CTO
Co-founder. Director of the Columbia University Machine Learning Lab

Alex "Sandy" Pentland, Chief Privacy Advocate
Co-founder. Academic head of MIT Media Lab, current Head of Human Dynamics at MIT

Mikki Nasch, EVP Business Development
Fair Isaac, XDL Ventures, Brightspark Ventures, multiple start ups, Backweb (BWEB)

Mining mobile data

Collaborative Filtering

Marketing

Advertising

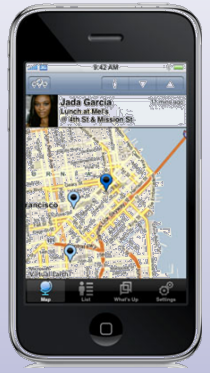
Search

Social Recommendation

SENSE NETWORKS

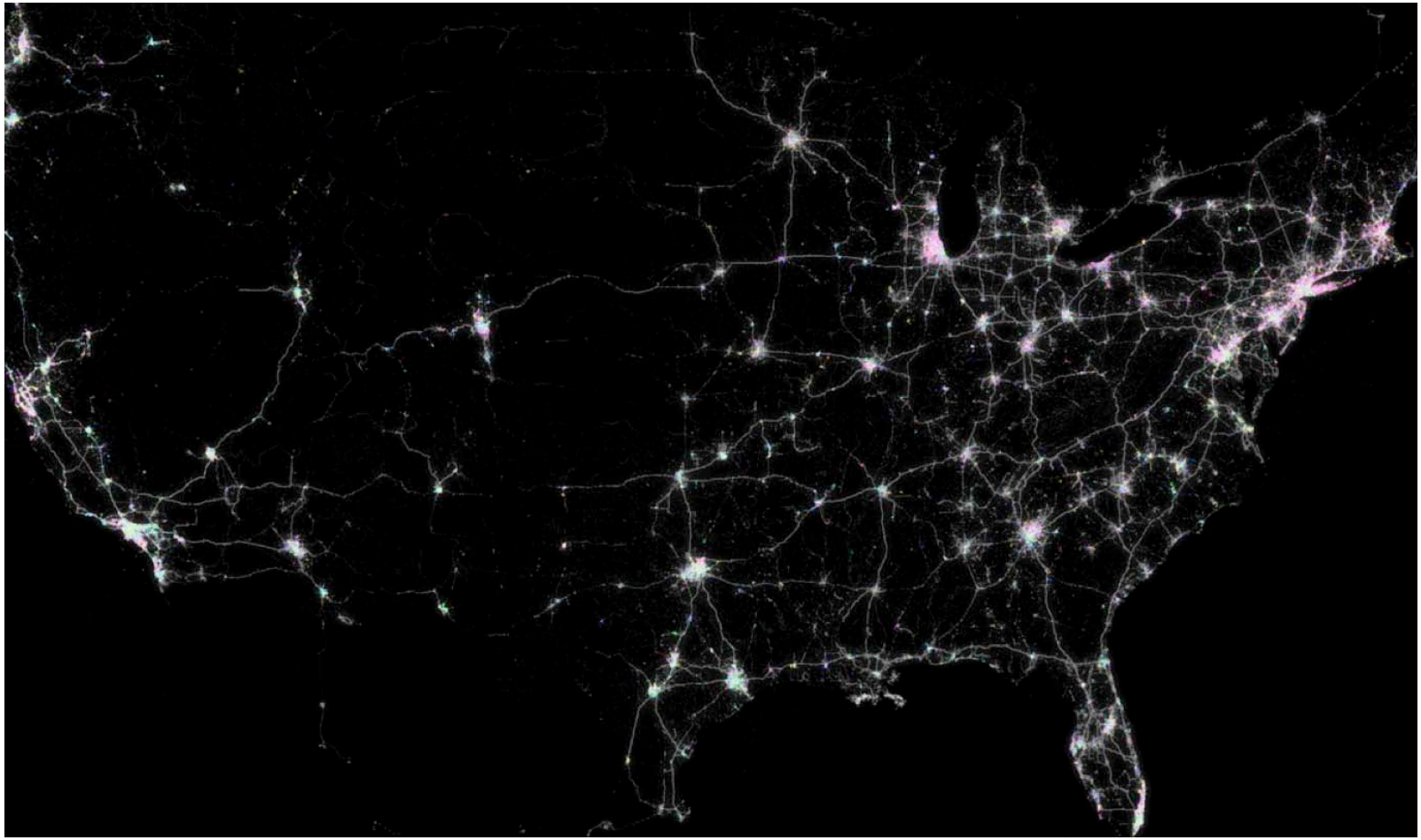
ANALYSIS, NETWORKS OF PLACES & PEOPLE, SEGMENTATION

Mobile Call & Location Data



VEHICLES APPS INFRA CARRIERS

Mobile call & location data



10s million devices giving (lat,long,time,acc)... lingua franca

CitySense: where is everyone

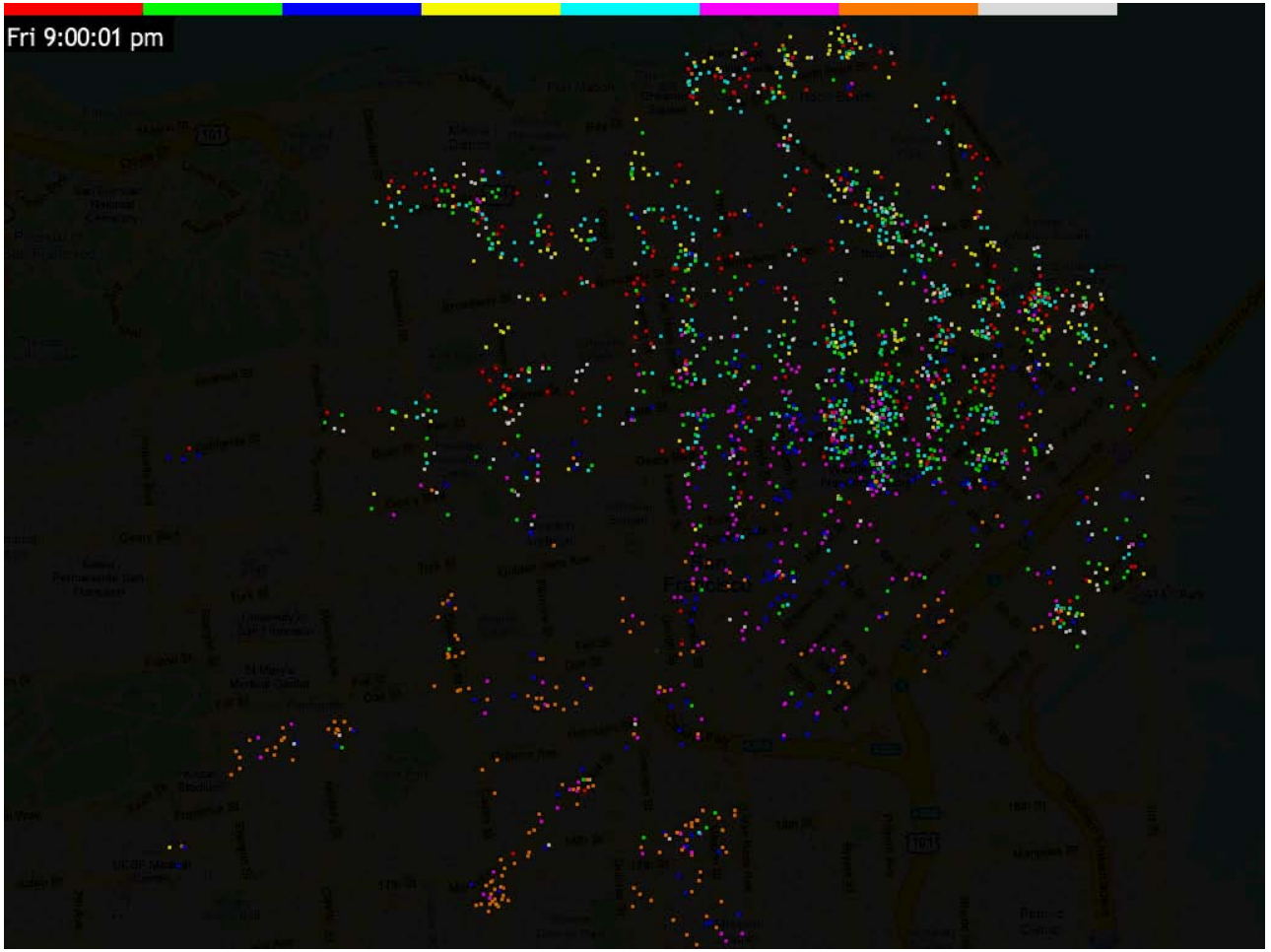
- Citysense: real-time density of users at every street corner
- Poisson models find most active social areas

Next: where's everyone like me

Need to have a network of people

Each dot is a user

Dot's color is user's social cluster



MacroSense Segmentation

- Sense Networks' solution:
  Convert per-user call/location data → lifestye segmentation

Location & Call Data

SOURCE	MONTHS	PINGS	USERS
	18	10b	1.4m
	4	8b	4m
	12	7b	18m

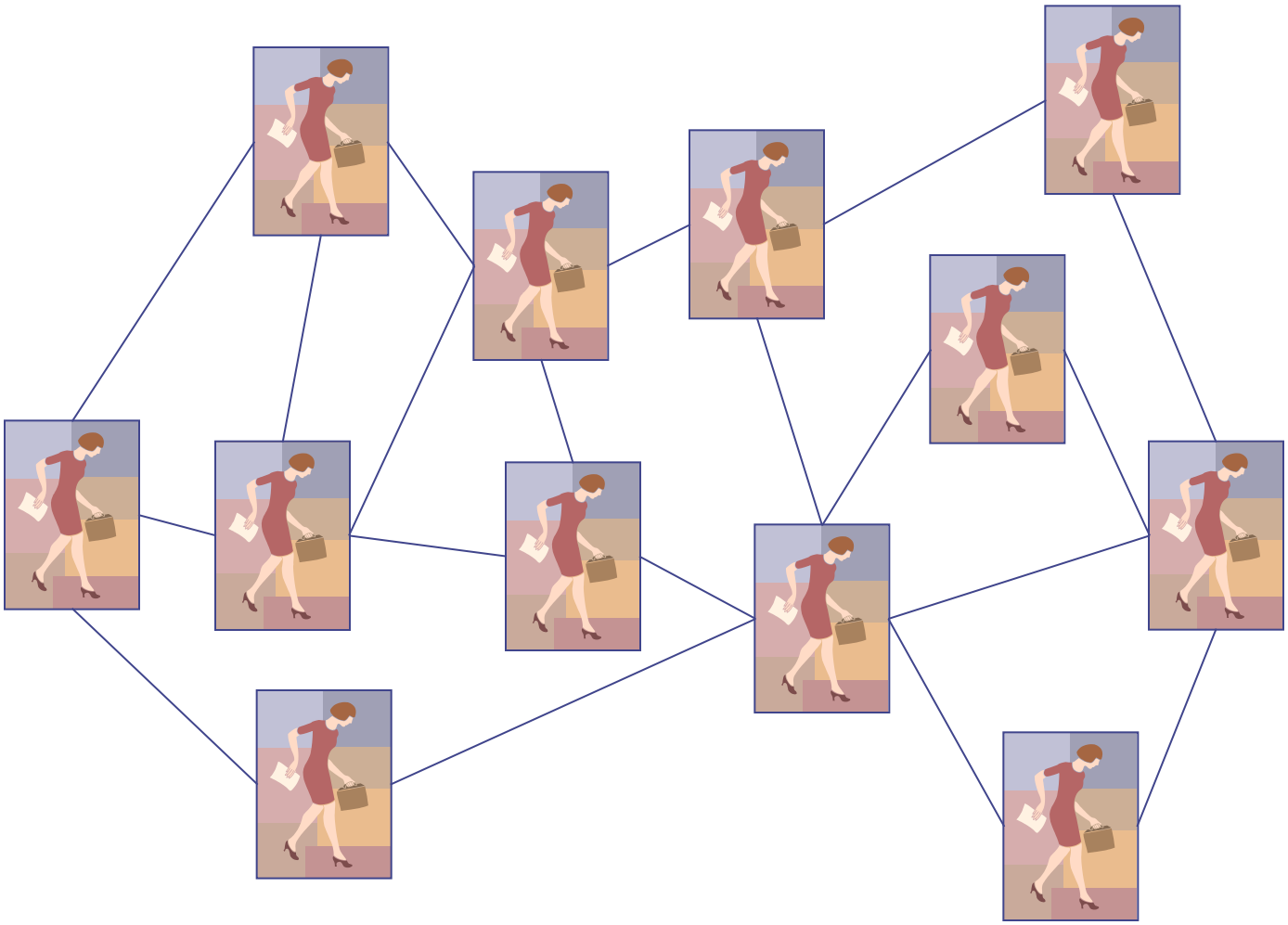
Sense Networks MacroSense

Segmentation

MDN	WEALTH	AGE	CHURN	TRAVELER
6462123442	200,000	46	6%	30%
9174341434	35,000	43	4%	20%
6468762413	150,000	31	11%	85%

Network of People

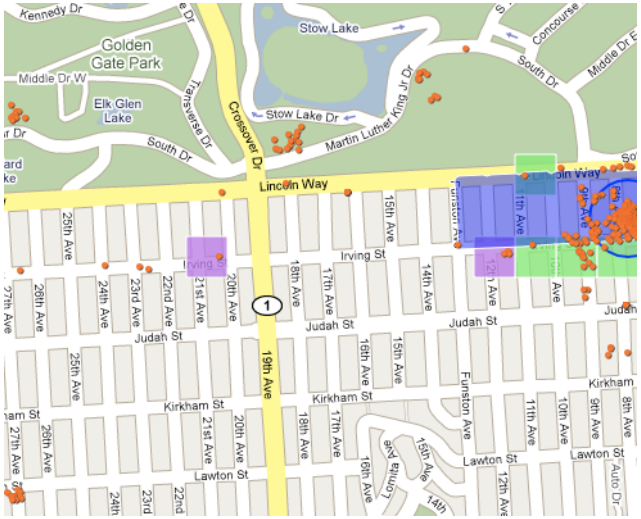
who is like whom? who co-locates with whom?



Encoding Lifestyle

For each user, convert location into matrix of probabilities for week hour probability of being in

1) flow cluster
2) commercial cluster
3) demographic cluster



Week Hour	FLO 1	FLO 2	…	FLO2 0	SIC 1	SIC 2	…	SIC 97	DEM 1	DEM 2	…	DEM 78
1	.03	.31		.14	.03	.05		.41	.11	.04		.01
2	.14	.34		.02	.04	.05		.52	.01	.01		.00
…												
168	.07	.34		.51	.02	.06		.48	.02	.01		.00

Encoding a Person's Lifestyle

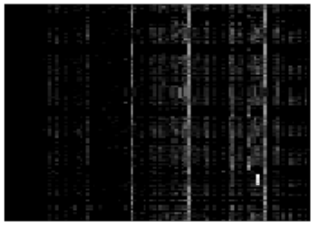
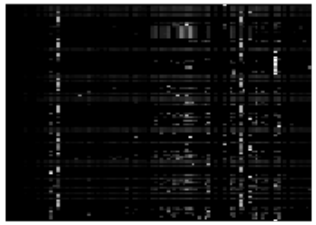
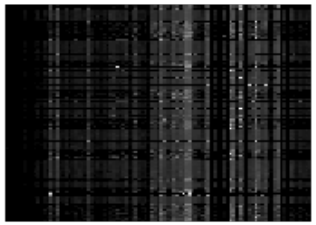
9 example users' lifestyle matrices

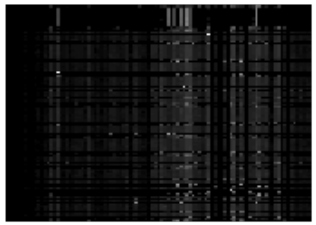
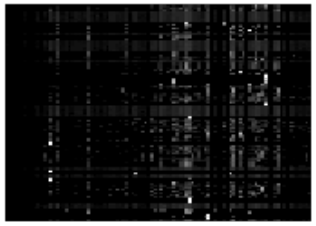
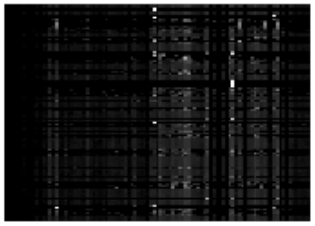
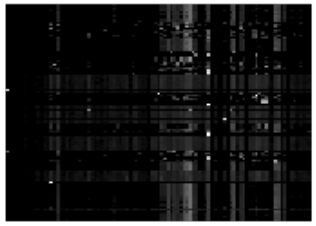
no PII information

compute pair-wise similarity from matrices

=

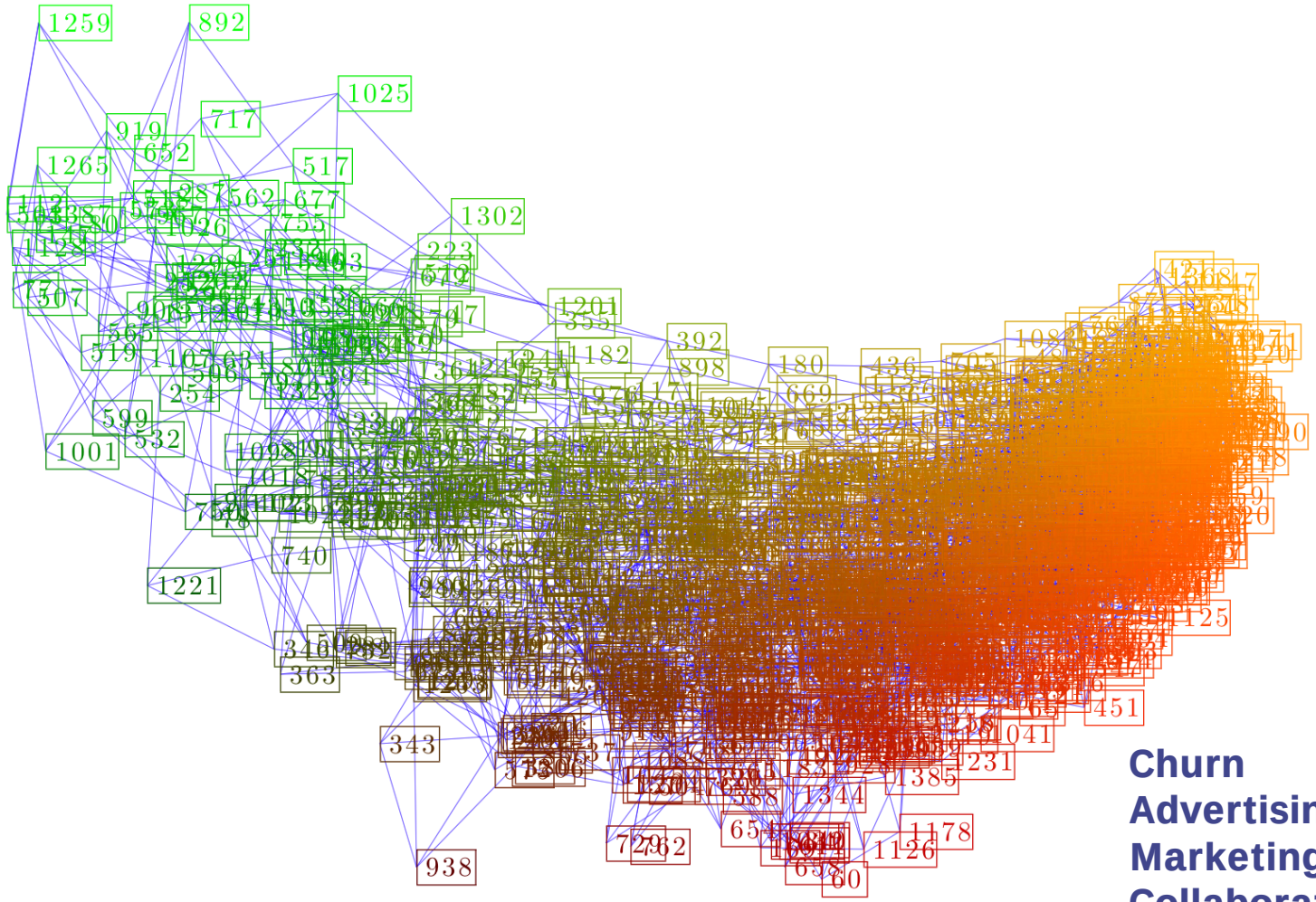
how much two people co-locate semantically

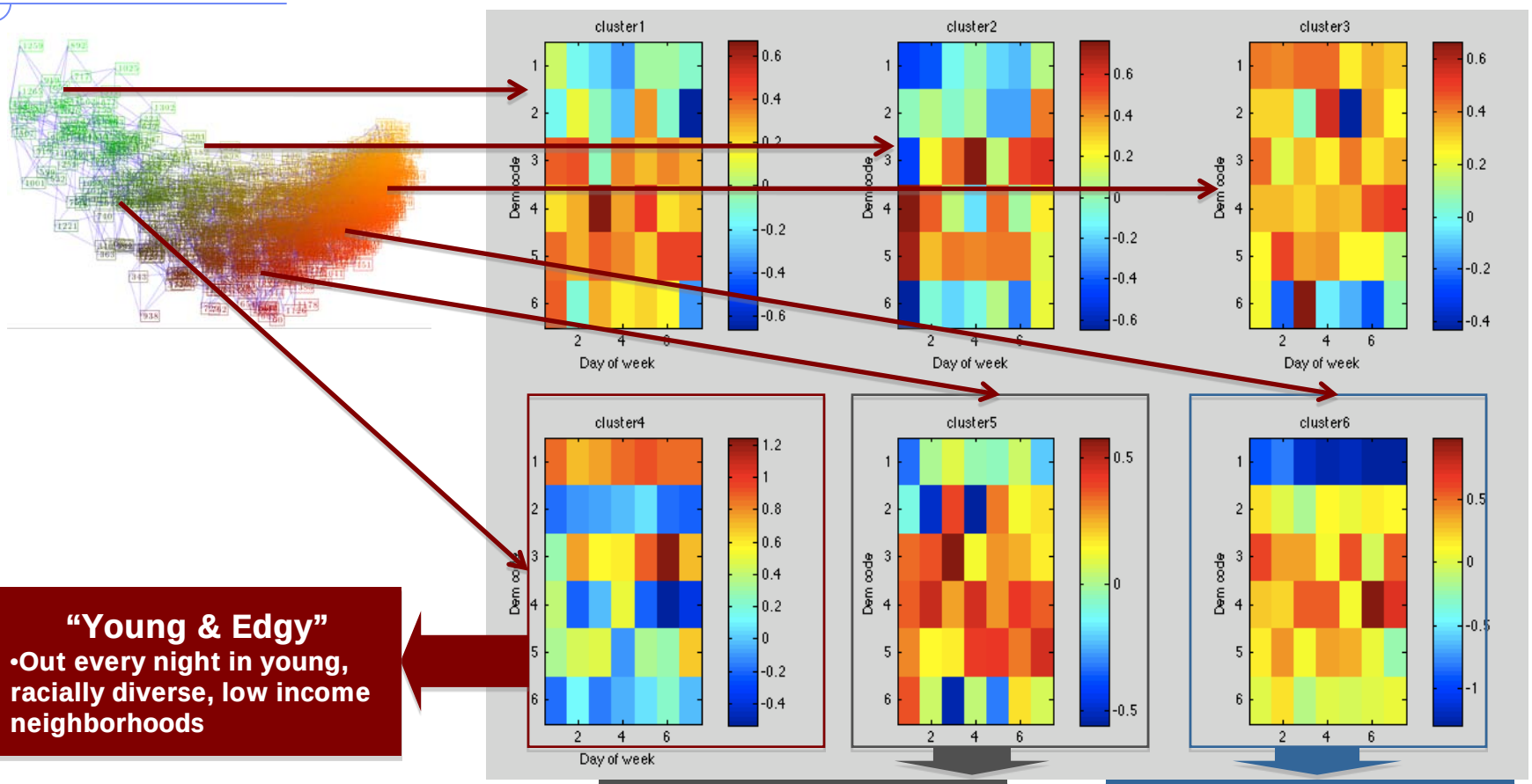
... can then use machine learning to segment, predict, etc.

People Network Segmentation



Churn
Advertising
Marketing
Collaborative Filtering
Demographics++

Network of People: Segments

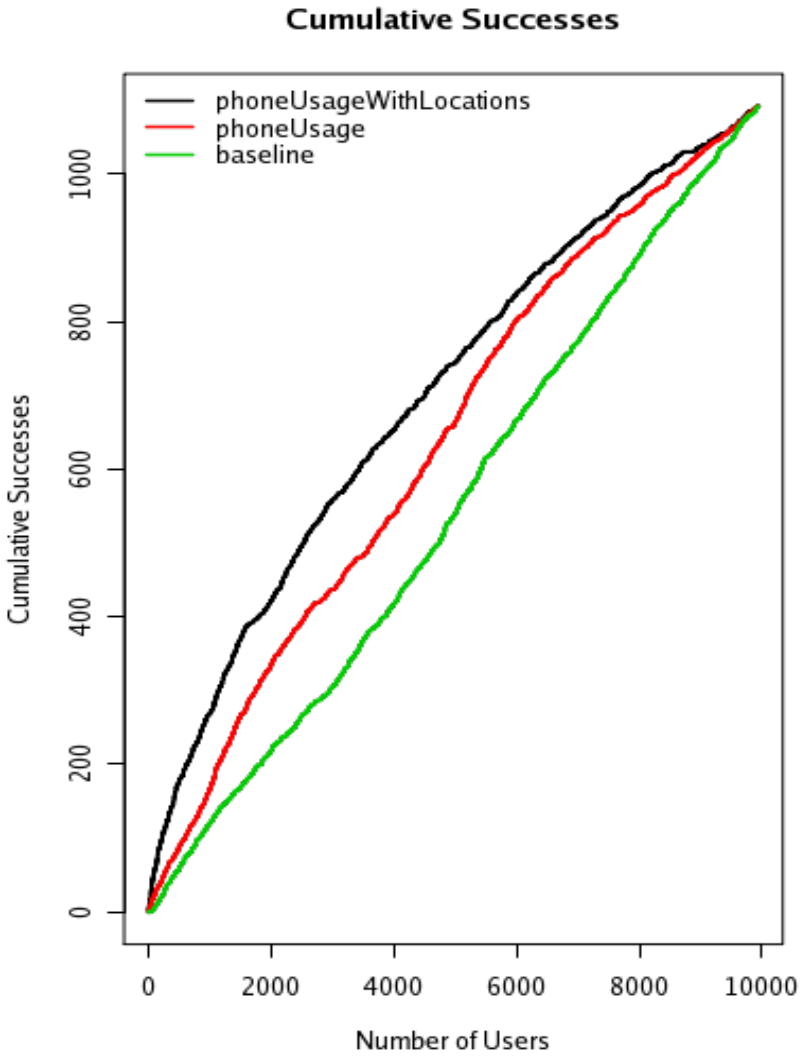


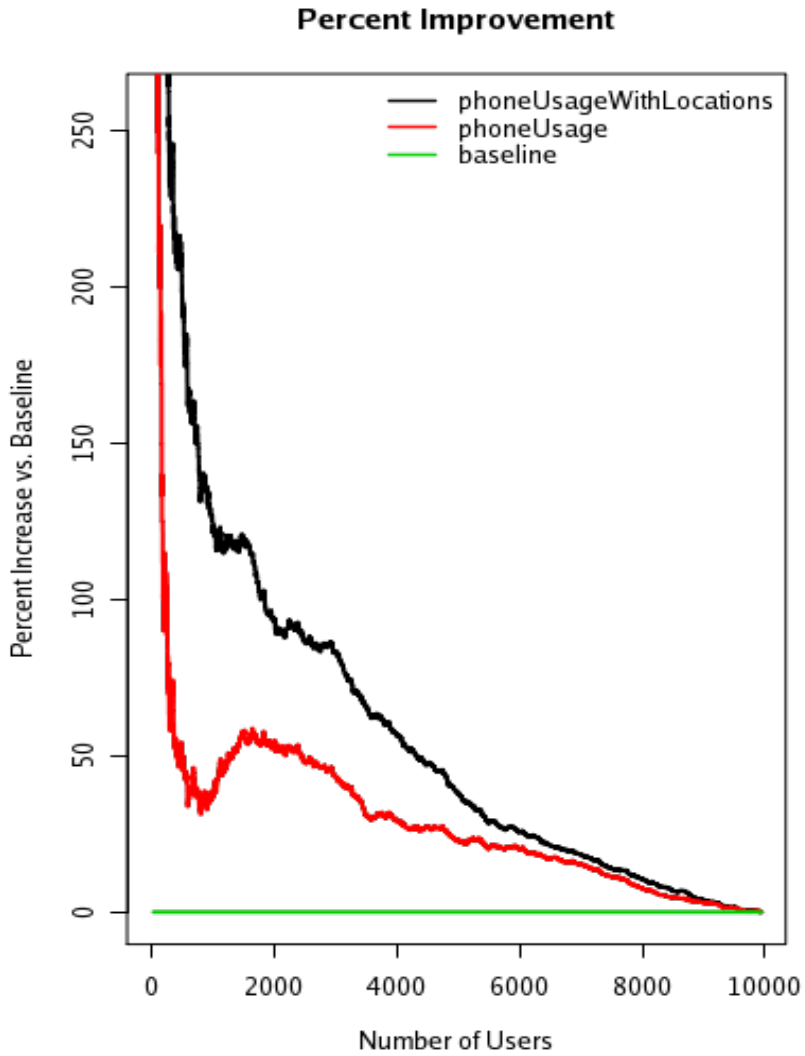
"Young & Edgy"
- Out every night in young, racially diverse, low income neighborhoods

"Weekend Mole"
- Out occasionally on weeknights, typically middle-aged, Latino, middle-income neighborhoods

"Mature Homebody"
- Rarely goes out, typically spends nights in mature, white, higher income neighborhoods

Case Study: Churn





The Next Net

(Stephen Baker, BusinessWeek)

The McGraw-Hill Companies

MARCH 9, 2009 | BUSINESSWEEK.CO

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THE NEXT NET: HOW IT COULD BOOST BUSINESS

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CRUNCH TIME FOR BANKS: WHO TAKES THE HIT?

042

THE NEXT NET

By Stephen Baker

Illustrations by Bryan Christie

Companies may soon know where customers are likely to be every minute of the day

IN DEPTH 043

THE FUTURE OF TECH

Imagine that your business had a complete log of your customers' wanderings—every trip to the grocery store, every work commute, every walk with the dog. What could you learn about them? Armed with that knowledge, what sorts of goods and services might you try to sell them? Just as important, if you made your best pitch—relevant and timely, of course—would customers concerned about privacy tell you to get lost? This isn't science fiction. A nascent industry extending from the laboratories of Google and Nokia to a host of data-fueled startups is wrestling with these very questions.

On a snowy winter evening in New York's SoHo neighborhood, a small team of analysts at a startup called Sense Networks is poring over the movements of nearly 4 million cell-phone users over the course of a year. They have been tracked by global positioning systems, by cell towers that catch their signals, or by local Wi-Fi networks that detect their presence. As far as the Sense analysts can see, these people have no names: They are simply dots moving across the maps on Sense's computers. (The data trove comes from a company New York-based Sense will not name.)

Much can be learned, it turns out, from the patterns of those dots moving across the maps. It's possible to see clusters grow around a popular restaurant or retail store. It's also easy to learn about each dot. Business travelers tend to congregate in certain spots in each city. The newly unemployed often shift from the clocklike routine of work to far more random movements. And Sense can flesh out these digital stick figures with additional data. By noting where dots appear to sleep, the company can assign an average neighborhood income to each one. It then becomes easier to predict whether those spending time near car lots are in the market for luxury brands or economy models.

LABORATORY OF HUMANITY

After a few weeks of monitoring one dot, the Sense computer usually has enough data to place it into a tribe—a group of people with common behaviors. One tribe comprises night owls who explore bars and restaurants into the wee hours. Sense founder Greg Skibiski and his chief scientist, Tony Jebara, who is also a Columbia University computer science professor, call them "Young & Edgy." Another group seems at first to overlap with the Young & Edgy. These people, though, stay true to a single establishment and return home at more regular hours. "Barflies," says Jebara.

With every step they take, the members of Sense's tribes are helping to create a new laboratory of humanity on the go. This emerging phenomenon, powered by Web phones and an explosion of new mobile-software applications, is the long-awaited Next Net. "The phone in your hand is the bridge between the virtual and real worlds," says Michael Halbherr, vice-president of Nokia's gate5 mobile Web unit.

Sense, led by the 35-year-old Skibiski, is a mere gnat in this market. It's a services shop powered by five PhDs and a slew of algorithms. Phone companies and advertisers provide