

# The Hedonometer: A Remote-Sensor of Population Level Happiness

Computations in Science Seminar  
University of Chicago  
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Christopher M. Danforth  
Computational Story Lab

Department of Mathematics & Statistics }  
Vermont Complex Systems Center } University of Vermont  
Vermont Advanced Computing Core }



Measuring  
Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

Frame 1/50





Peter Dodds



Chris Danforth



Lewis Mitchell



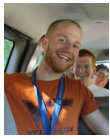
Nick Allgaier



Cathy Bliss



Jake Williams



Andy Reagan



Eitan Pechenik



Emily Cody



Morgan Frank



Lindsay Van Leir



Mike Foley



Ross Lieb-Lappen  
(Dartmouth)



Isabel Kloumann  
(Cornell)



Kameron Harris  
(Washington)



Paul Lessard  
(Colorado)



Tyler Gray  
(MIT)



Suma Desu



Eric Clark

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Alan Greenspan (September 18, 2007):



<http://wikipedia.org>

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“I’ve been dealing with these big mathematical models of forecasting the economy ...



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If I could figure out a way to determine whether or not people are more fearful or changing to more euphoric,



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Alan Greenspan (September 18, 2007):

“I’ve been dealing with these big mathematical models of forecasting the economy ...

If I could figure out a way to determine whether or not people are more fearful or changing to more euphoric,

I don’t need any of this other stuff.



<http://wikipedia.org>



Alan Greenspan (September 18, 2007):

“I’ve been dealing with these big mathematical models of forecasting the economy ...

If I could figure out a way to determine whether or not people are more fearful or changing to more euphoric,

I don’t need any of this other stuff.

I could forecast the economy better than any way I know.”



<http://wikipedia.org>

Greenspan continues:

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## Greenspan continues:

“The trouble is that we can’t figure that out. I’ve been in the forecasting business for 50 years.

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Greenspan continues:

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## Greenspan continues:

“The trouble is that we can’t figure that out. I’ve been in the forecasting business for 50 years. I’m no better than I ever was, and nobody else is.

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# Economics

## Greenspan continues:

“The trouble is that we can’t figure that out. I’ve been in the forecasting business for 50 years. **I’m no better than I ever was, and nobody else is.** Forecasting 50 years ago was as good or as bad as it is today.

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Frame 6/50

# Economics

## Greenspan continues:

“The trouble is that we can’t figure that out. I’ve been in the forecasting business for 50 years. **I’m no better than I ever was, and nobody else is.** Forecasting 50 years ago was as good or as bad as it is today. **And the reason is that human nature hasn’t changed.**”

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# Economics

## Greenspan continues:

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# Economics

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## Jon Stewart:

“You just bummed the @\*!# out of me.”



wildbluffmedia.com

- ▶ From the Daily Show (田) (September 18, 2007)

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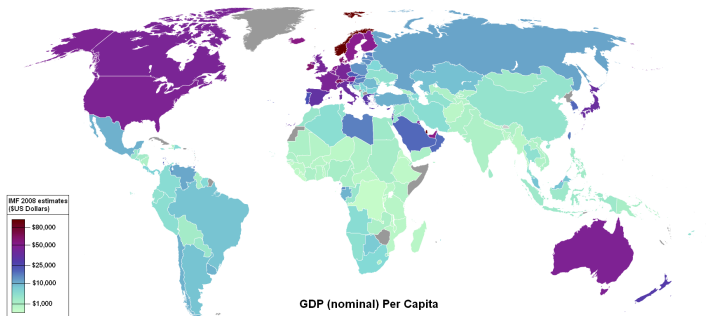
The Measurements: Twitter

Frame 6/50





# Lets Measure Some Stuff



## Measuring Happiness

Motivation

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# Lets Measure Some Stuff

## Measuring Happiness

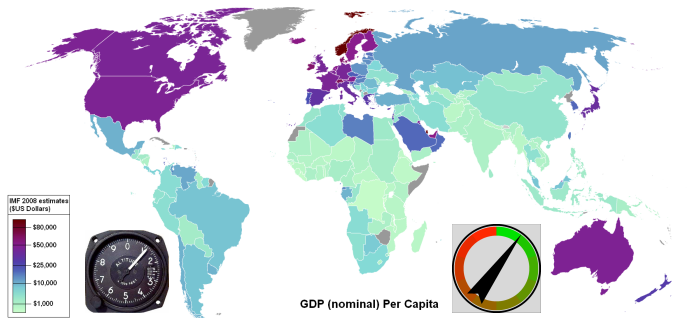
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1





1







1





1





1





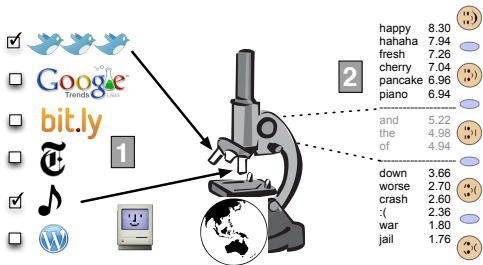
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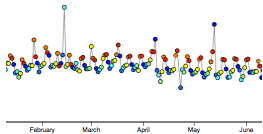




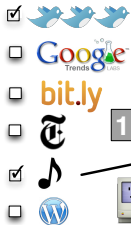




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the hedonometer



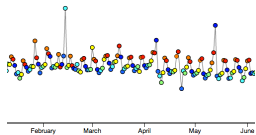
1



2

happy	8.30	😊
hahaha	7.94	😄
fresh	7.26	😊
cherry	7.04	😊
pancake	6.96	😊
piano	6.94	😊
and	5.22	😊
the	4.98	😐
of	4.94	😊
down	3.66	😞
worse	2.70	😞
crash	2.60	😞
:(	2.36	😞
war	1.80	😞
jail	1.76	😞

3



the hedonometer



1



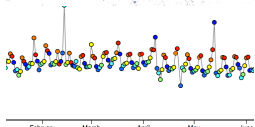
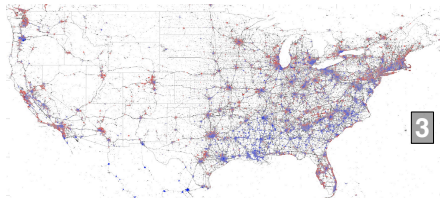
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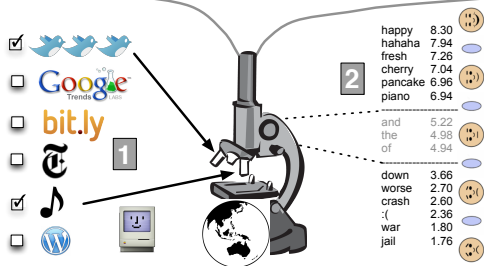
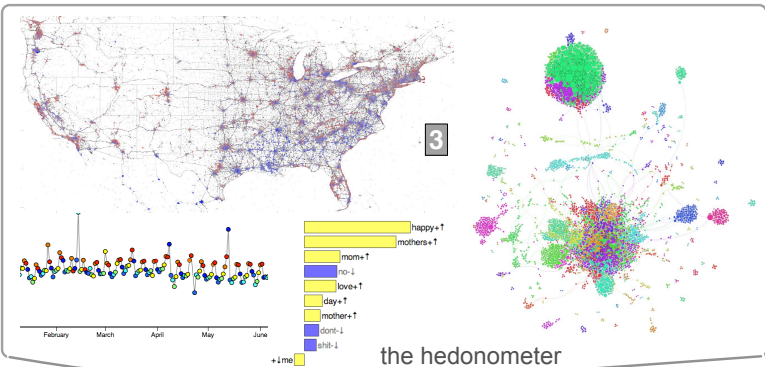


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# Lets make a list of "words"

---

**Corpus (Abbreviation):****Date range**

Twitter (TW)

9/9/2008 to 3/3/2010

Google Books Project, English (GB)

1520 to 2008

The New York Times (NYT)

1/1/1987 to 6/30/2007

Music lyrics (ML)

1960 to 2007

# language assessment by Mechanical Turk

## Mechanical Turk is a marketplace for work.

We give businesses and developers access to an on-demand, scalable workforce. Workers select from thousands of tasks and work whenever it's convenient.

**409,501 HITS** available. [View them now.](#)

## Make Money by working on HITS

HITS - *Human Intelligence Tasks* - are individual tasks that you work on. [Find HITS now.](#)

### As a Mechanical Turk Worker you:

- Can work from home
- Choose your own work hours
- Get paid for doing good work



## Get Results from Mechanical Turk Workers

Ask workers to complete HITS - *Human Intelligence Tasks* - and get results using Mechanical Turk. [Register Now](#)

### As a Mechanical Turk Requester you:

- Have access to a global, on-demand, 24 x 7 workforce
- Get thousands of HITS completed in minutes
- Pay only when you're satisfied with the results



# language assessment by Mechanical Turk

## Measuring the happiness of words

### Goal:

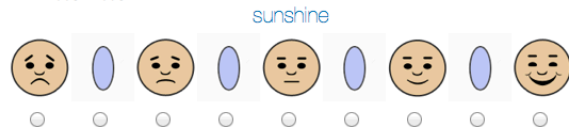
- Our overall aim is to assess how people feel about individual words.
- With this particular survey, we are focusing on the dual emotions of happiness and sadness.

### Time required:

- 6 to 8 minutes.

### Instructions and Example:

- You are to rate individual words on a 9 point unhappy-happy scale:



1. Read the word, ("sunshine" in the above example) and observe your emotional response.
2. Click on the face that best corresponds to your response.

## Measuring Happiness

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The Hedonometer

The Measurements: Lyrics

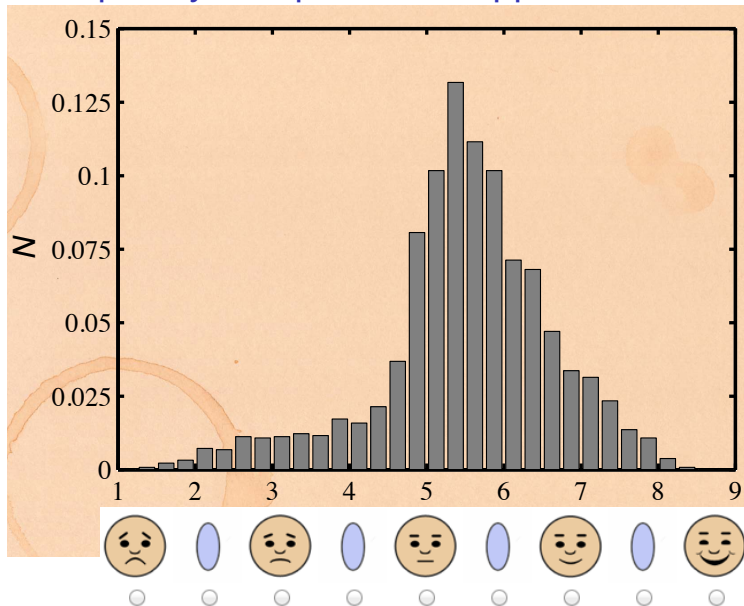
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The Measurements: Twitter





# A Frequency-Independent Happiness Bias



## Measuring Happiness

Motivation

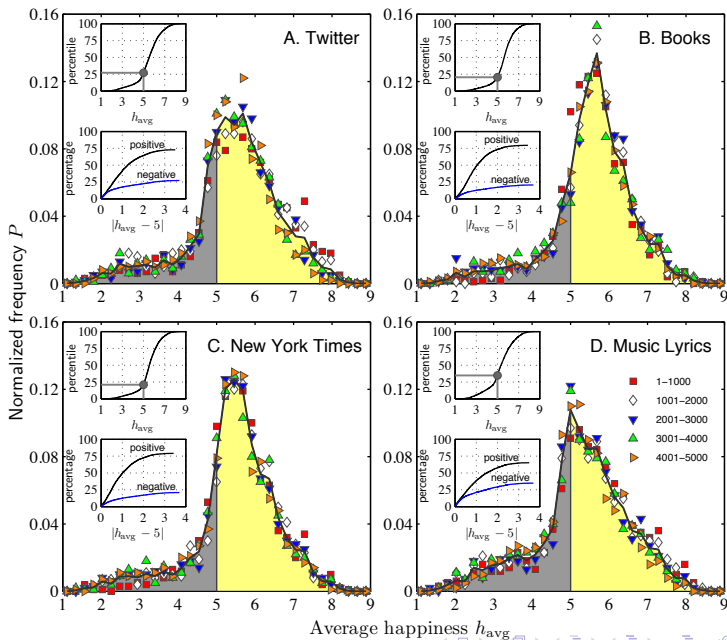
The Hedonometer

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# A Frequency-Independent Happiness Bias



Measuring  
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Motivation

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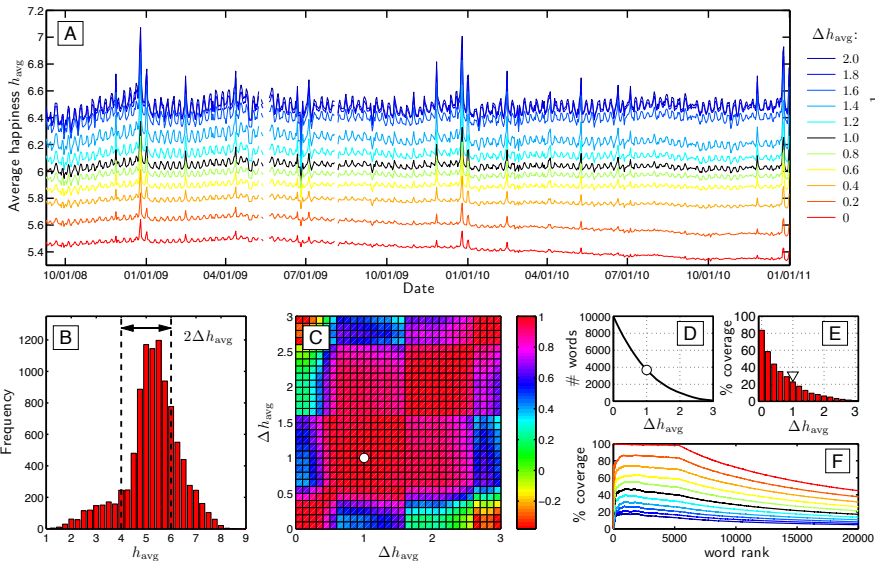
The Measurements: Blogs

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Frame 14/50



# A Tunable Hedonometer



# Unhappiness:

Some obvious problems/issues:

- ▶ Partial coverage of all words.

Measuring  
Happiness

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The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

Frame 16/50



# Unhappiness:

## Some obvious problems/issues:

- ▶ Partial coverage of all words.
- ▶ Context is ignored.

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Frame 16/50



# Unhappiness:

## Some obvious problems/issues:

- ▶ Partial coverage of all words.
- ▶ Context is ignored.
- ▶ Word evaluations distributed in space, time.

# Unhappiness:

## Some obvious problems/issues:

- ▶ Partial coverage of all words.
- ▶ Context is ignored.
- ▶ Word evaluations distributed in space, time.

## Clearly:

- ▶ Only suitable for large-scale texts.



# Total words in our study:

	Song lyrics	Song titles
Individuals	~ 20,000	~ 632,000
Songs	~ 100,000	~ 2,000,000
Total words	58,610,849	60,867,223

	Weblogs	Tweets
Individuals	~ 2,148,000	~150 million
Sentences	~ 10,000,000	~ 20 billion
Total words	148,231,294	~ 200 billion

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Measuring  
Happiness

Motivation

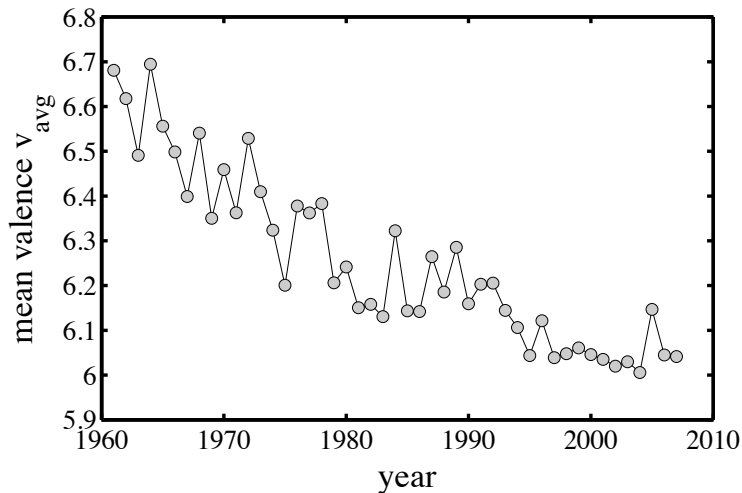
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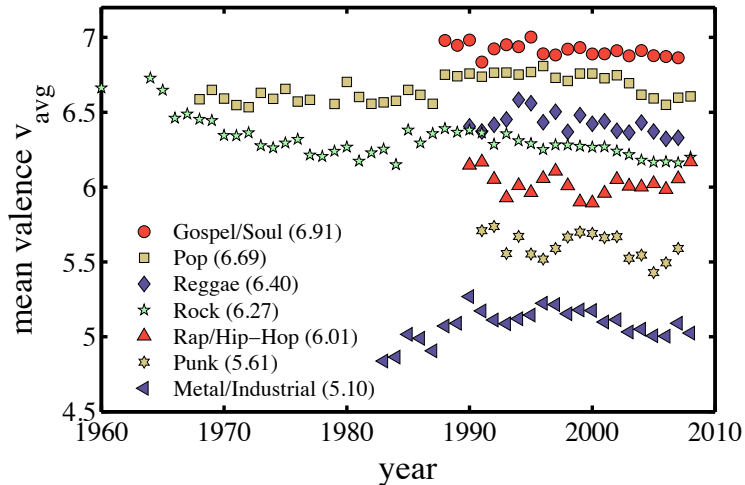
# Lyrics—average valence



## Measuring Happiness

- Motivation
- The Hedonometer
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## Lyrics—average valence of genres:



## Measuring Happiness

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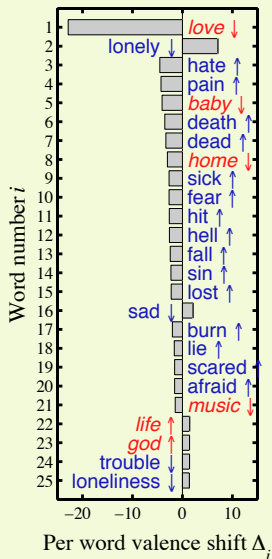
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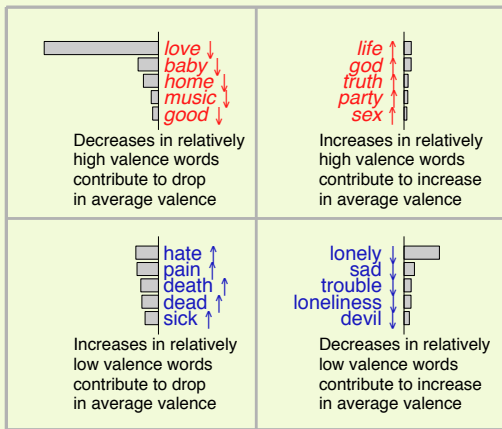
The Measurements: Twitter

# Happiness Word Shift Graph:

Per word drop in valence of lyrics from 1980–2007 relative to valence of lyrics from 1960



Key:



Top 16 of  $\approx 20,000$  artists:

Rank	Artist	Valence
1	All-4-One	7.15
2	Luther Vandross	7.12
3	S Club 7	7.05
4	K Ci & JoJo	7.04
5	Perry Como	7.04
6	Diana Ross & The Supremes	7.03
7	Buddy Holly	7.02
8	Faith Evans	7.01
9	The Beach Boys	7.01
10	Jon B	6.98
11	Dru Hill	6.96
12	Earth Wind & Fire	6.95
13	Ashanti	6.95
14	Otis Redding	6.93
15	Faith Hill	6.93
16	NSync	6.93

(criterion:  $\geq 50$  songs and  $\geq 1000$  ANEW words)

Measuring  
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Frame 22/50



Bottom 16 of  $\simeq 20,000$  artists:

Rank	Artist	Valence
1	Slayer	4.80
2	Misfits	4.88
3	Staind	4.93
4	Slipknot	4.98
5	Darkthrone	4.98
6	Death	5.02
7	Black Label Society	5.05
8	Pig	5.08
9	Voivod	5.14
10	Fear Factory	5.15
11	Iced Earth	5.16
12	Simple Plan	5.16
13	Machine Head	5.17
14	Metallica	5.19
15	Dimmu Borgir	5.20
16	Mudvayne	5.21

(criterion:  $\geq 50$  songs and  $\geq 1000$  ANEW words)

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**The Measurements: Blogs**

The Measurements: Twitter

Measuring  
Happiness

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## *An exploration of human emotion, in six movements*

*by Jonathan Harris and Sep Kamvar*

*Open We Feel Fine*

*Mission*  
*Movements*  
*Methodology*  
*Findings*  
*Creators*  
*Gallery*  
*News*  
*API*

Feeling	lover sick	Gender	Female	Age	20 - 29	Weather	Cloudy	Location	All	Date	Feb 14, 2006
All Feelings	Both Genders			All Ages			All Weather	All Locations	All Dates		
A	looser			0s 10s <b>20s</b> 30s 40s 50s 60s 70s 80s			afghanistan argentina australia bahamas bangladesh belarus belgium brazil brunei darussalam bulgaria cambodia canada chile china colombia croatia czech republic denmark dominican republic estonia finland france gambia germany greece hungary iceland india indonesia iraq ireland israel italy	2005 <b>2006</b>	Jan <b>Feb</b> Mar Apr	1 2 3 4 5 6 7 8 9 10 11 12 13 <b>14</b> 15 16 17 18 19 20 21 22 23 24 25 26 27 28	
B	lopsided										
C	loquacious										
D	lost										
E	loud										
F	lounging										
G	lousy										
H	lovable										
I	loveable										
J	loved										
K	loveless										
<b>L</b>	lovely										
M	loverly										
N	lovesick										
O	loving										
P	low										
Q	lower										
R	lowered										
S	lowering										
T	lowest										
U	lowly										
V	loyal										
W	lucid										
X	luckier										
Y	luckiest										
Z	lucky										



**Find Feelings**

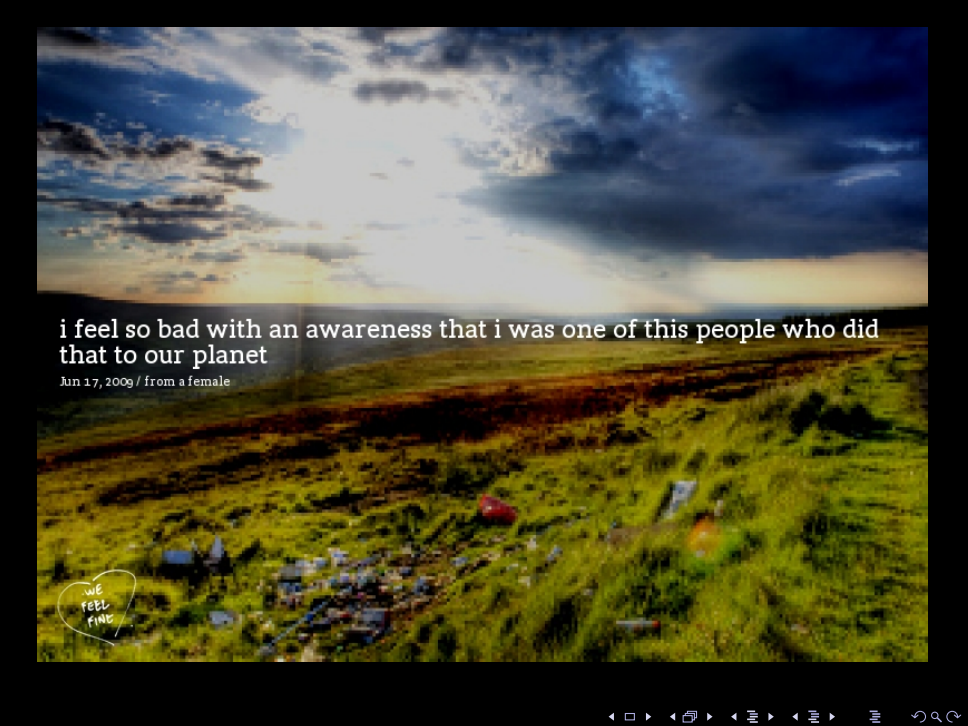
i feel so much of my dad alive in me that there isn't even room for me

October 17, 2005 / from someone in wheaton illinois united states



Save

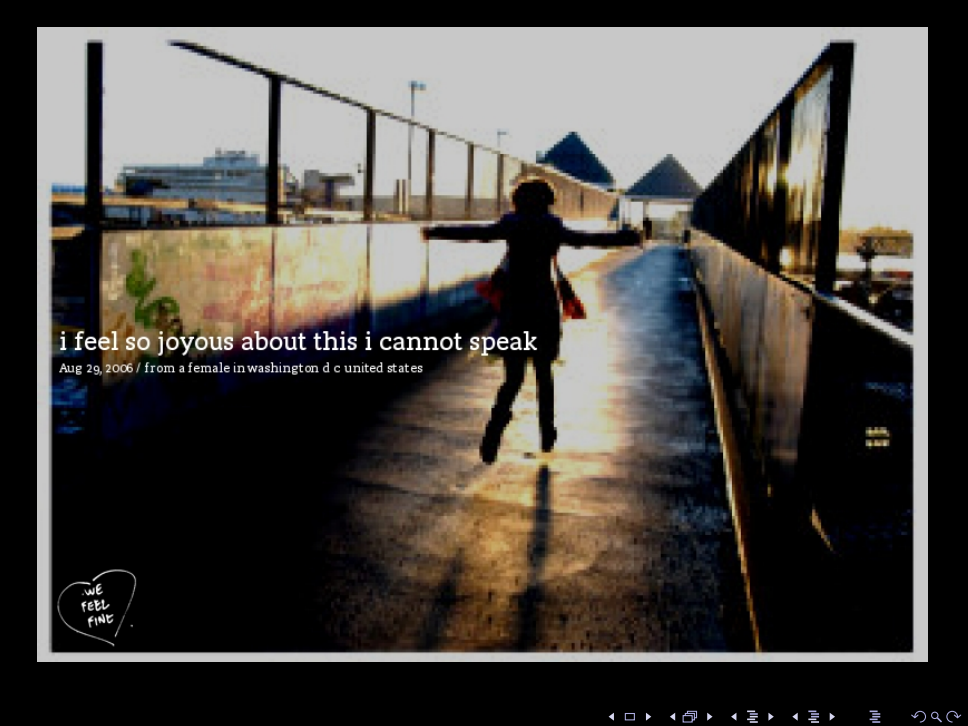




i feel so bad with an awareness that i was one of this people who did that to our planet

Jun 17, 2009 / from a female

WE  
FEEL  
FINE

A person is captured in silhouette, walking away from the camera on a paved walkway. Their arms are outstretched to the sides. The walkway is flanked by tall, dark metal fences. The scene is illuminated by a bright, low sun, creating a long shadow of the person on the ground and a strong glow. In the background, there are some buildings and a clear sky.

i feel so joyous about this i cannot speak

Aug 29, 2006 / from a female in washington d c united states



THE BEAUTY EXPERT

NOVEMBER 2009

# Shiny, Bouncy Hair

Easy, Speedy

i feel like i am doomed to be only attractive to weirdos

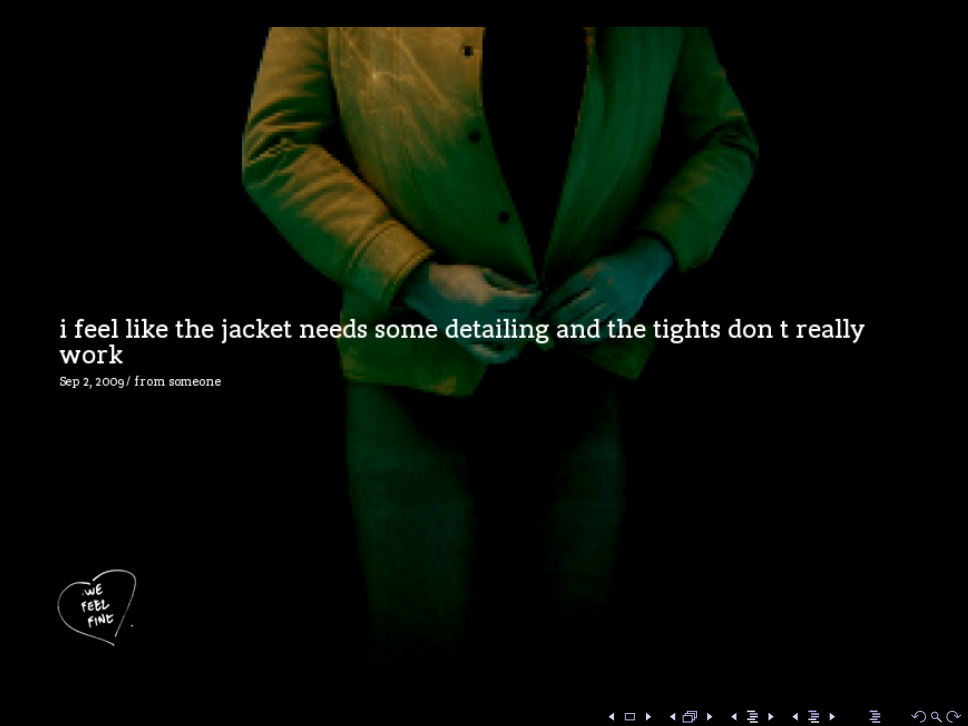
Nov 2, 2009 / from someone in united states

# Hollywood Skinny

13 Crazy Celebrity Diets

 THE SEXIEST

Kristen

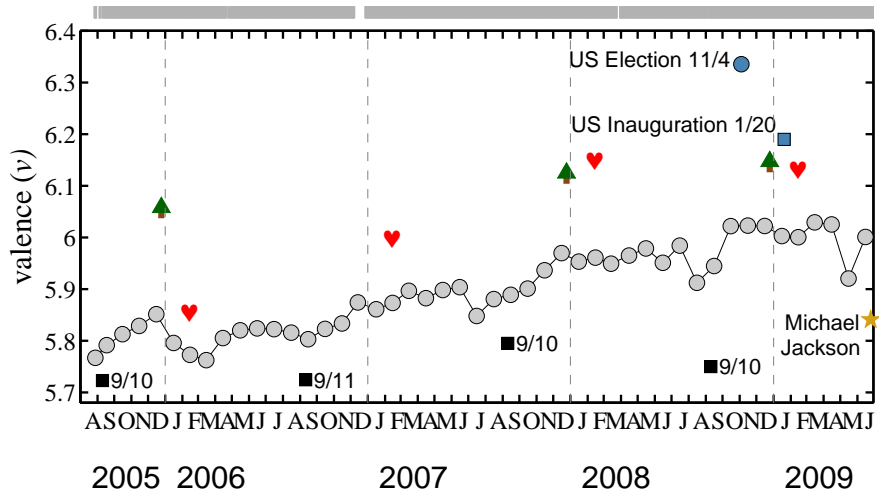


i feel like the jacket needs some detailing and the tights don t really work

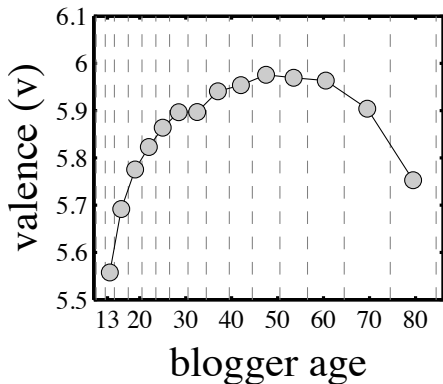
Sep 2, 2009 / from someone



# Blogs—Overall trend







- ▶ Average valence as a function of the age bloggers report they will turn in the year of their posting.

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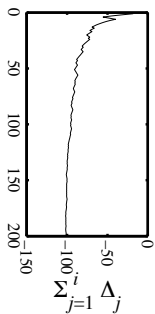
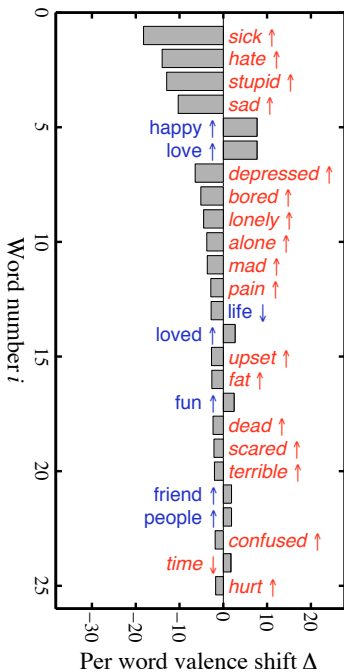
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# 14 year olds compared to born 1960–1969



Mean valence:  
5.55 vs. 5.96

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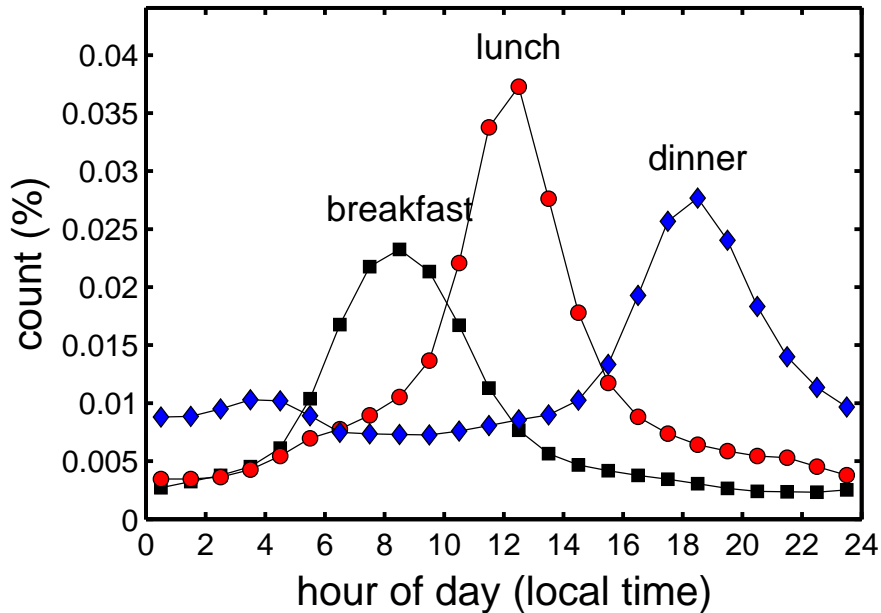
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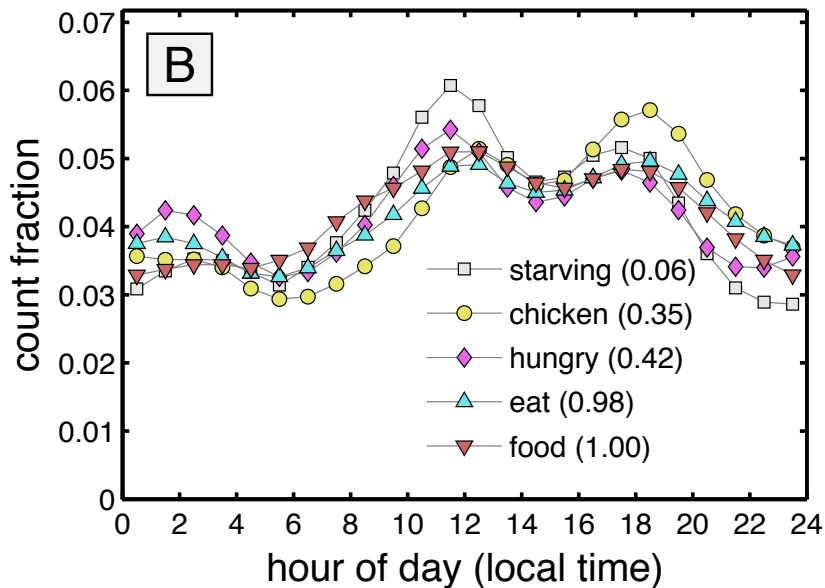
The Measurements: Twitter

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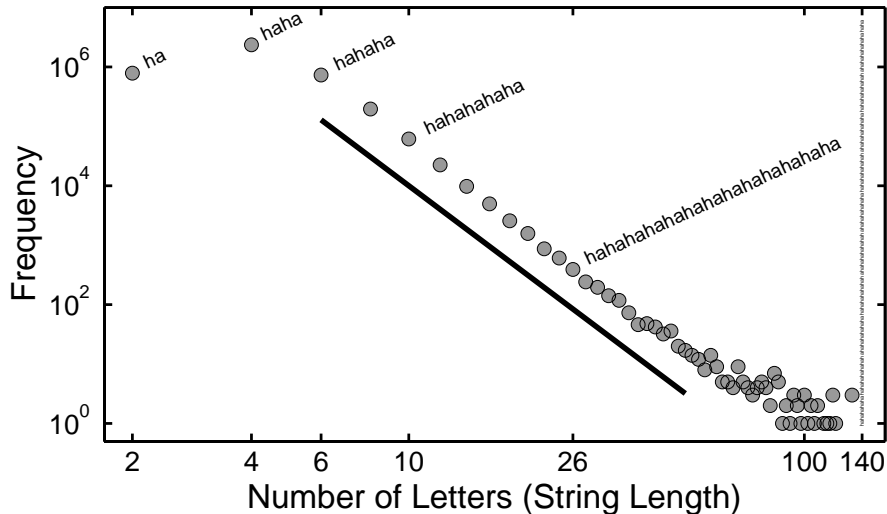
# Twitter—Spontaneous Bursts of Being



# Twitter—Spontaneous Bursts of Being

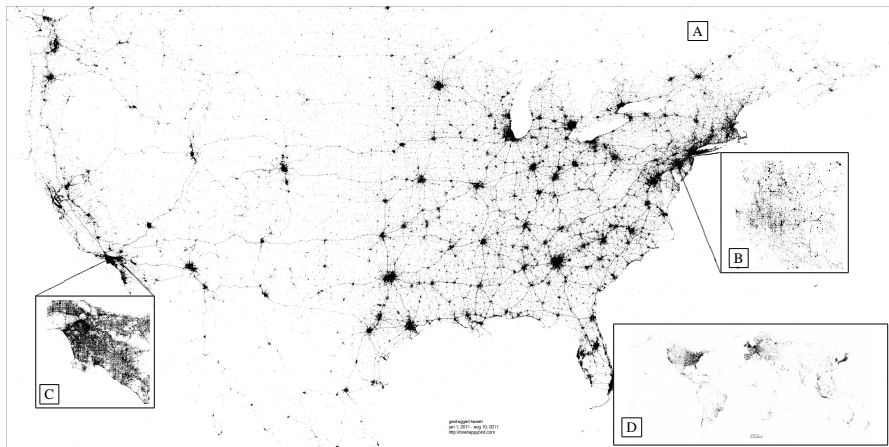


# Twitter—Spontaneous Bursts of Being



The Happiest Distribution...

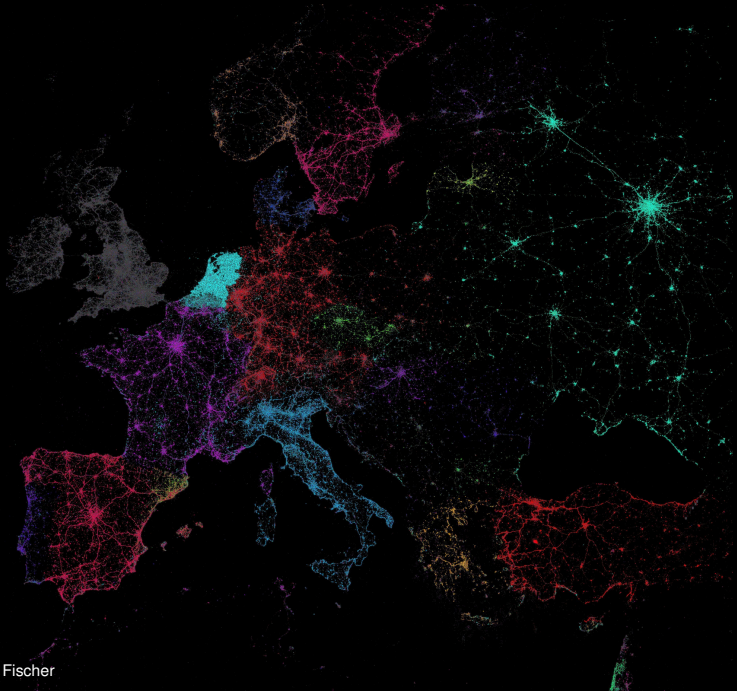
# Twitter—Cartography



onehappybird.com



- English
- Portuguese
- Indonesian
- Spanish
- Malay
- Japanese
- Dutch
- Korean
- Filipino
- Russian
- French
- Thai
- Italian
- German
- Turkish
- Arabic
- Swedish
- Danish
- Finnish
- Catalan
- Chinese
- Romanian
- Norwegian
- Lithuanian
- Slovak
- Czech
- Vietnamese
- Greek
- Hungarian
- Polish
- Afrikaans
- Slovenian
- Albanian
- Latvian
- Chinese (TW)
- Galician
- Swahili
- Hebrew
- Croatian
- Bulgarian



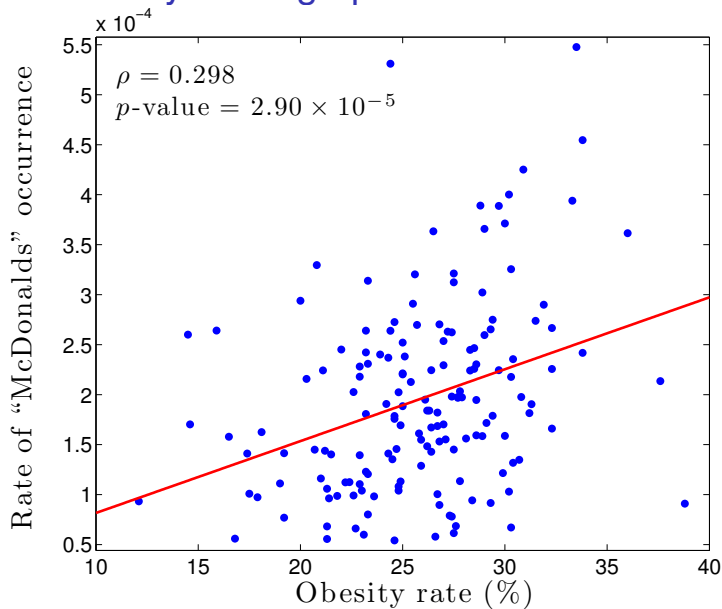
Credit: Eric Fischer



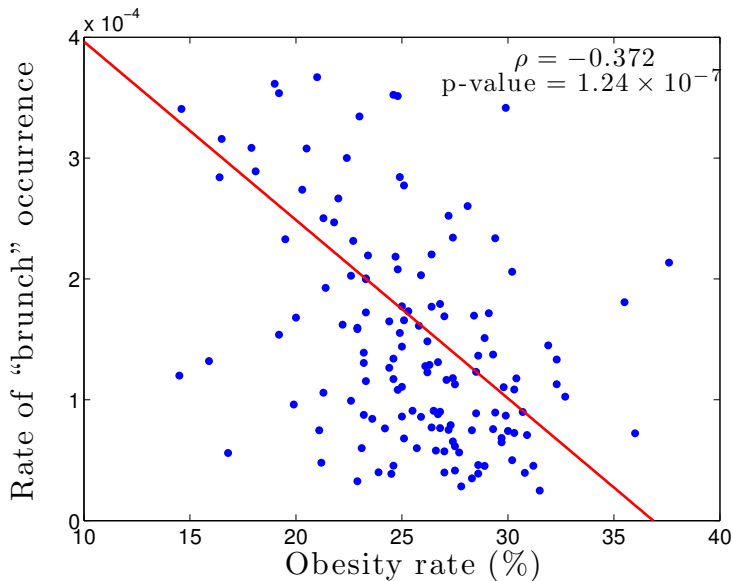
# Twitter—City Demographics

What can we learn about cities from words people use?

# Twitter—City Demographics



# Twitter—City Demographics



# Twitter—City Demographics

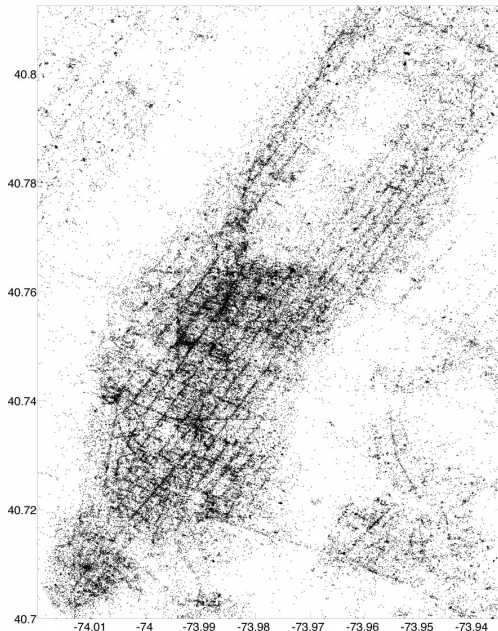
## “Skinny” words:

brunch  
banana  
bar  
barista  
delicious  
dinner  
coffee  
espresso  
booze  
wines  
cocktails  
mimosa  
chef  
tofu  
panini  
latte  
vegan  
bento

## “Obese” Words:

mcdonalds  
eat  
hungry  
wings  
salty  
ham  
spaghetti  
ihop  
noodles  
ketchup  
fat  
cook  
sprite  
cookin  
heartburn  
miller  
kool-aid  
pickles

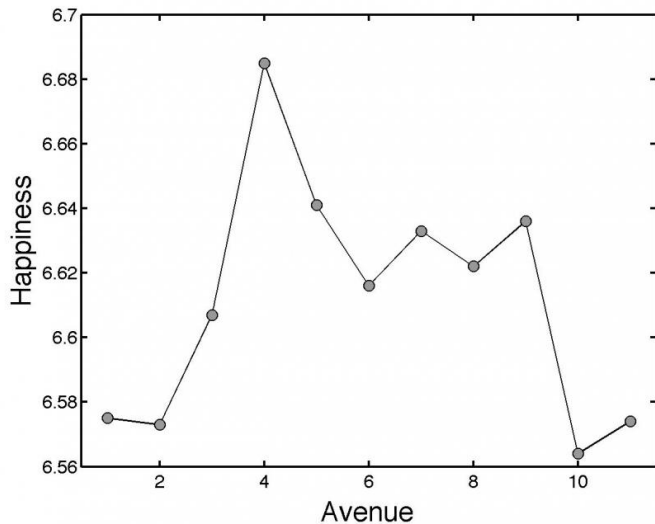
# Twitter—Manhattan Happiness



## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter

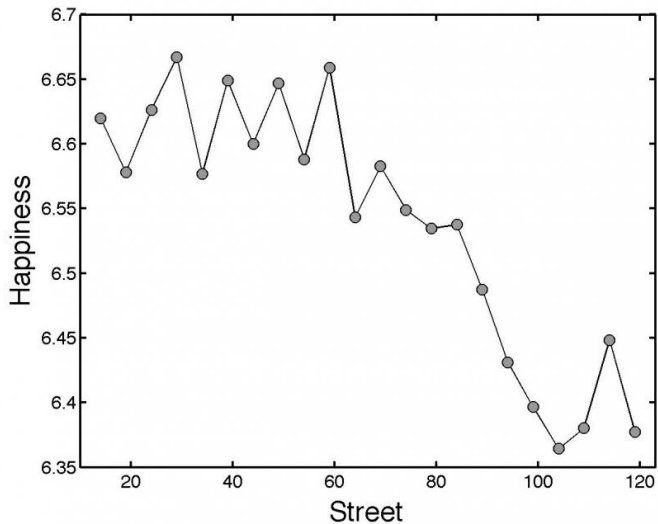
# Twitter—Manhattan Happiness



## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter

# Twitter—Manhattan Happiness

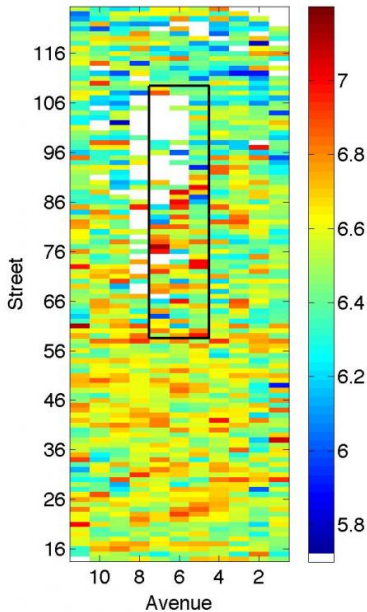


## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter



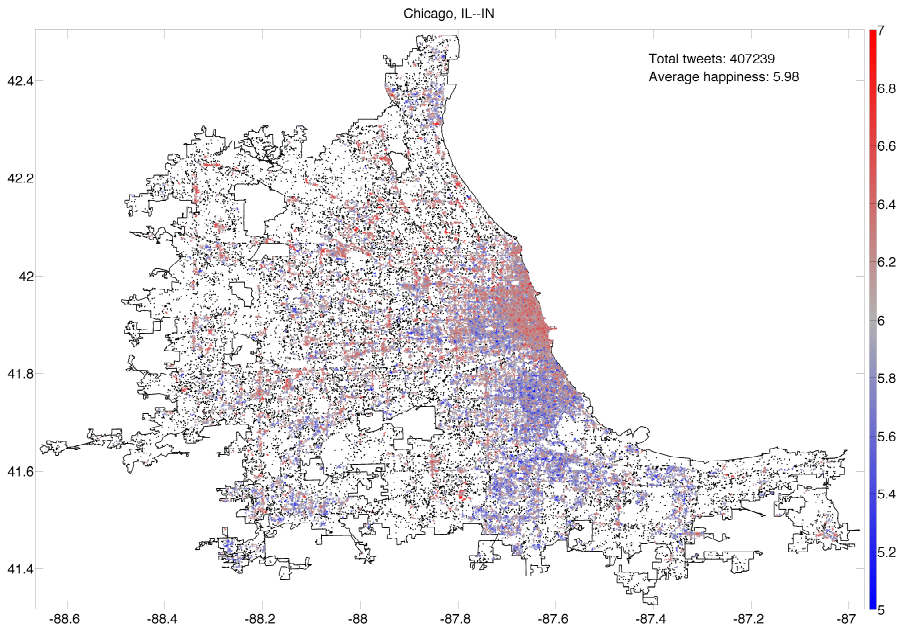
# Twitter—Manhattan Happiness



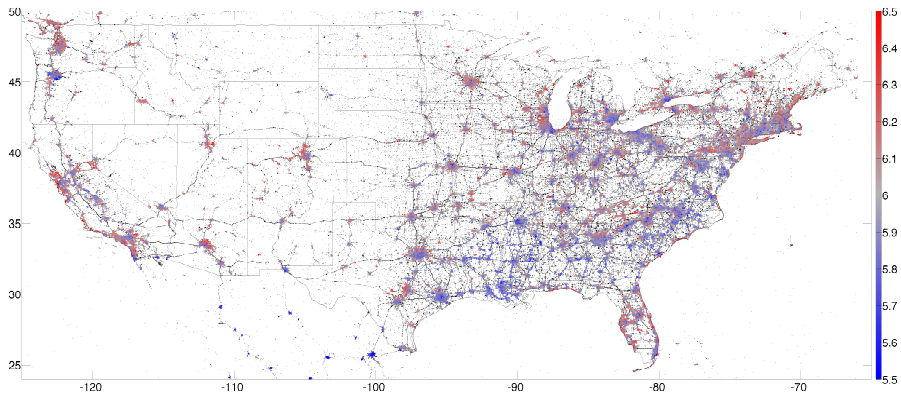
## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter

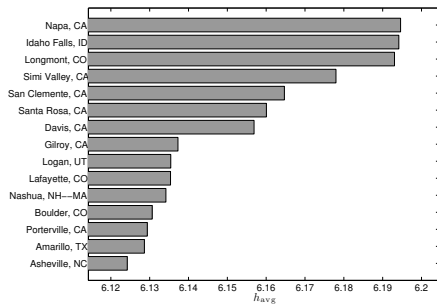
# Twitter—Cities



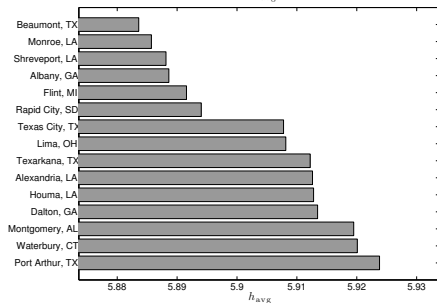
# Twitter—Cities



# Twitter—Cities

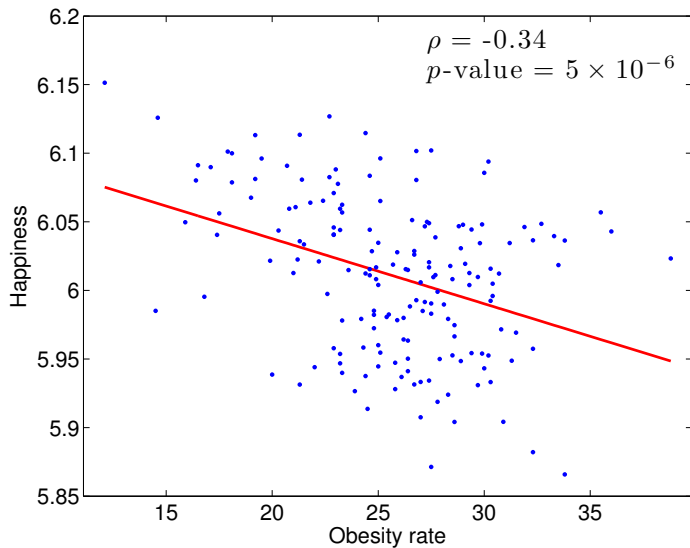


**Happiest Cities**

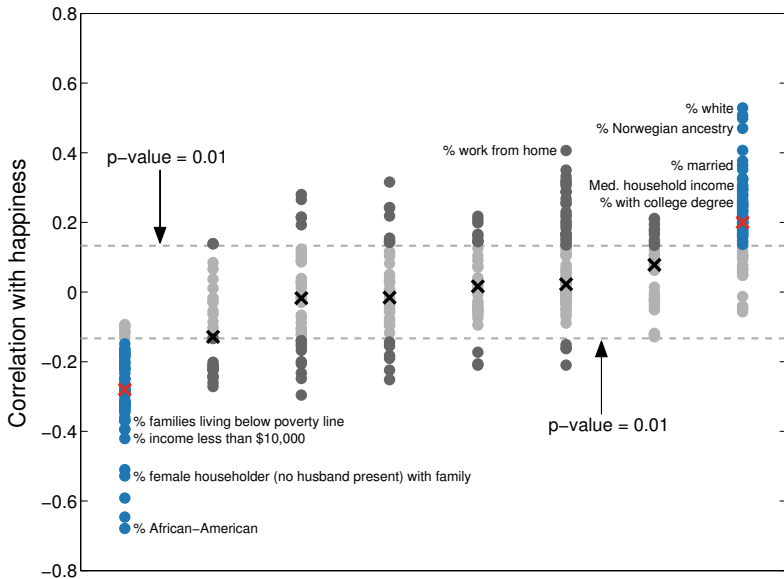


**Saddest Cities**

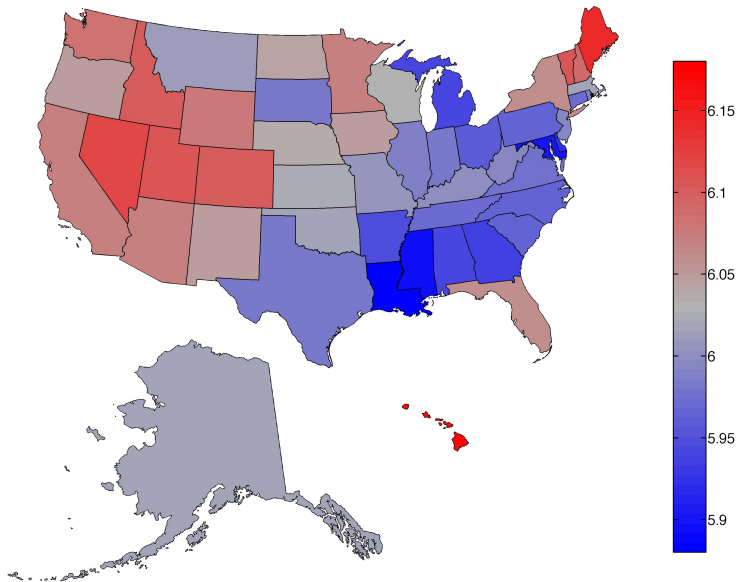
# Twitter—Demographics



# Twitter—Demographics



# Twitter—US Happiness—States



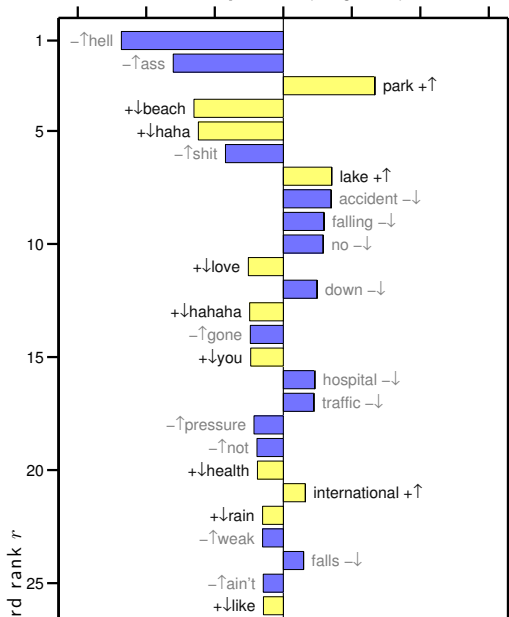
## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter

# Twitter—US Happiness—States

$T_{ref}$ : All USA ( $h_{avg}=6.00$ )

$T_{comp}$ : Illinois ( $h_{avg}=5.99$ )



## Measuring Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

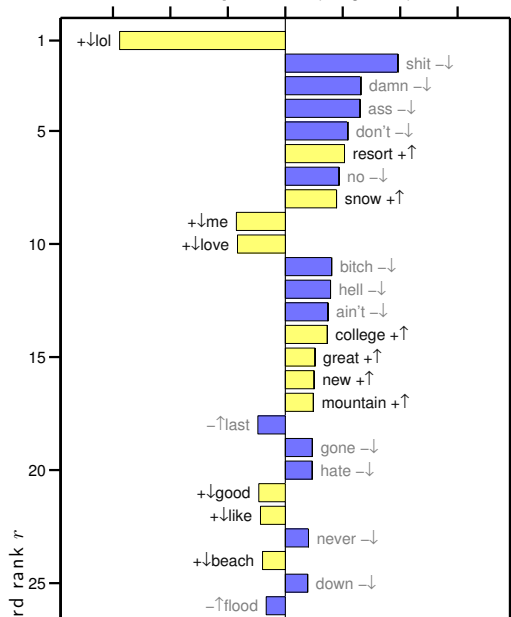
The Measurements: Twitter



# Twitter—US Happiness—States

$T_{ref}$ : All USA ( $h_{avg}=6.00$ )

$T_{comp}$ : Vermont ( $h_{avg}=6.11$ )



## Measuring Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

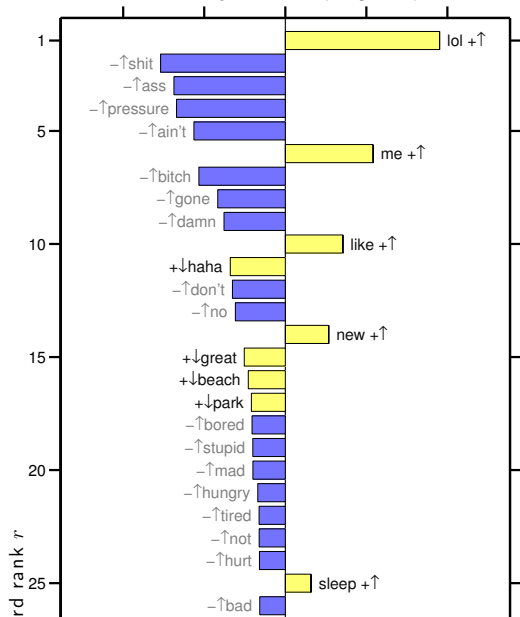
The Measurements: Blogs

The Measurements: Twitter

# Twitter—US Happiness—States

$T_{ref}$ : All USA ( $h_{avg}=6.00$ )

$T_{comp}$ : Louisiana ( $h_{avg}=5.88$ )



## Measuring Happiness

Motivation

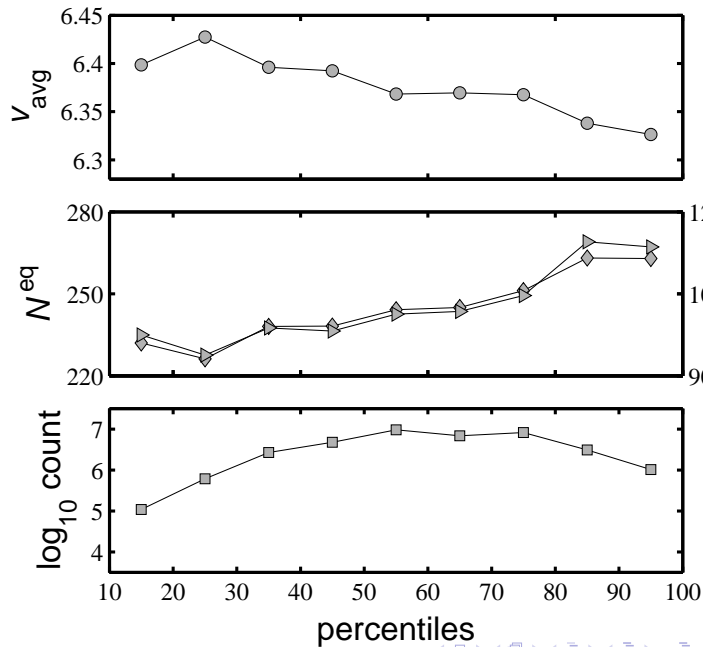
The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

# Twitter—Politics



## Measuring Happiness

Motivation

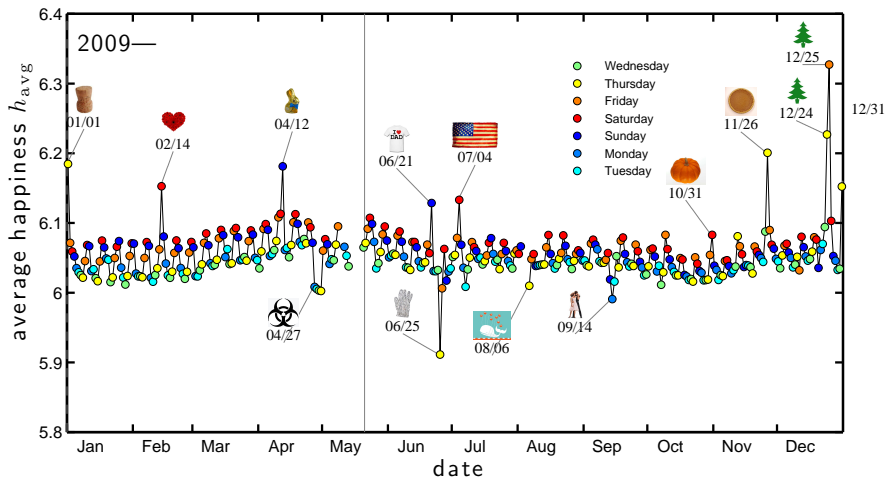
The Hedonometer

The Measurements: Lyrics

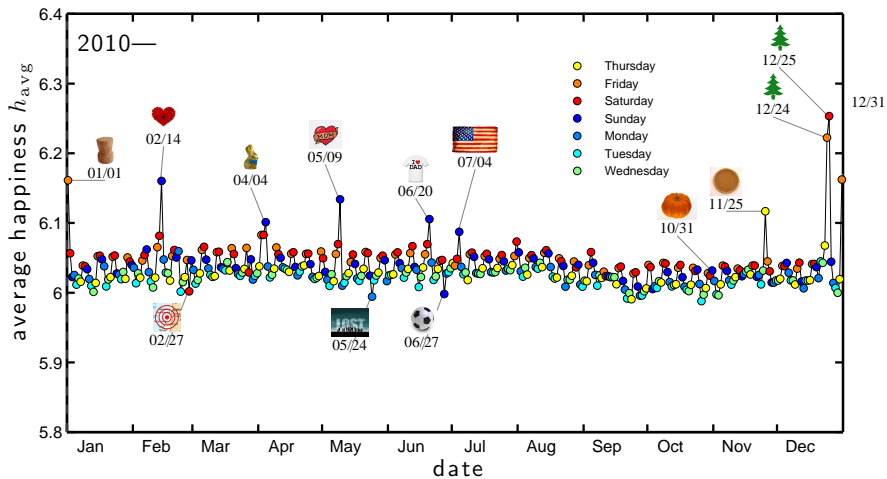
The Measurements: Blogs

The Measurements: Twitter

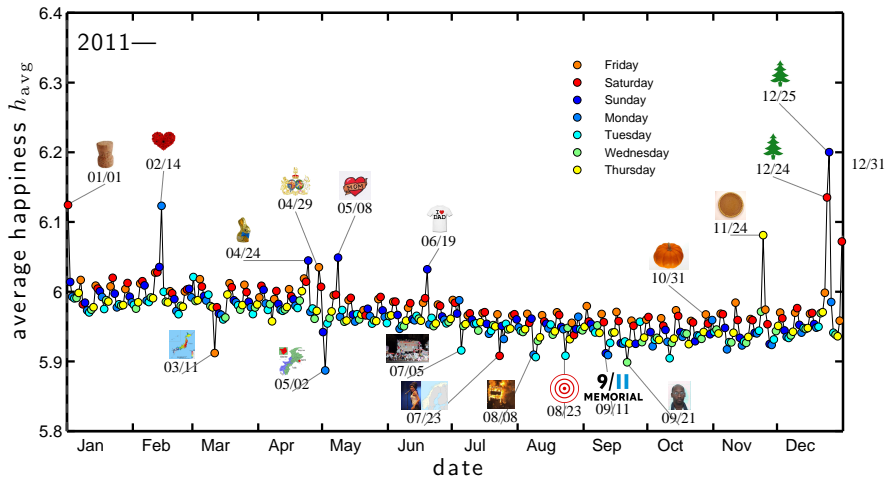
# Twitter happiness: January 01, 2009 to December 31, 2009

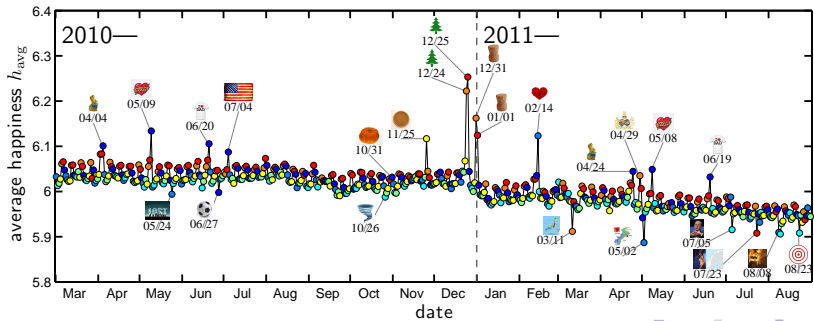
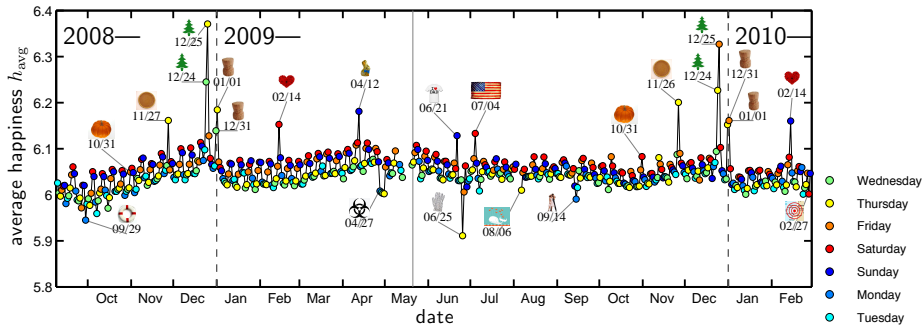


# Twitter happiness: January 01, 2010 to December 31, 2010

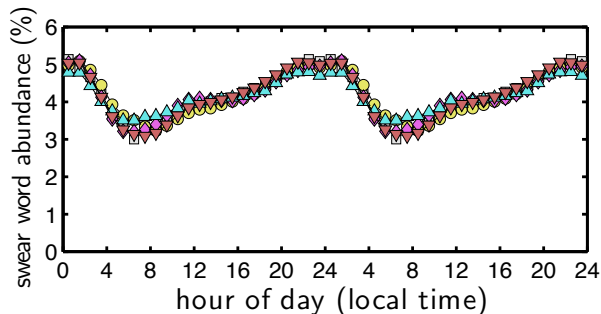
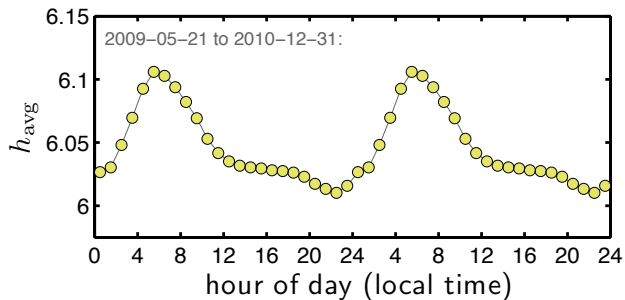


# Twitter happiness: January 01, 2011 to December 31, 2011





# The Daily Unravelling of the Human Mind



## Measuring Happiness

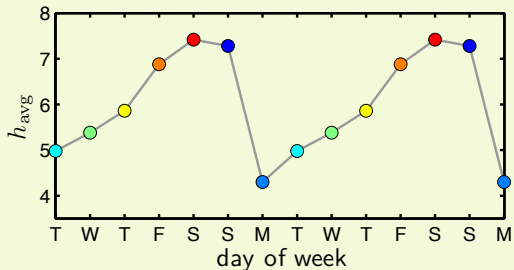
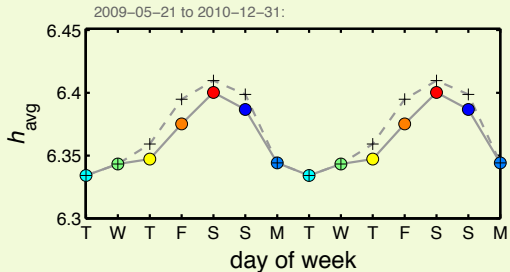
- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter

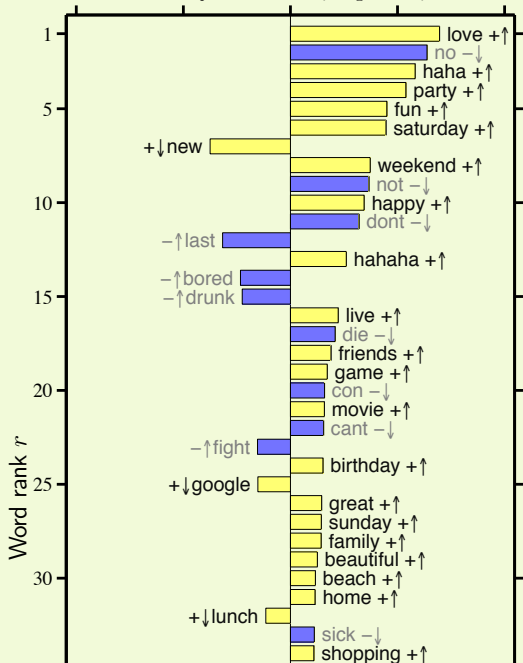


# Twitter—Weekly Rhythm

## Measuring Happiness

- Motivation
- The Hedonometer
- The Measurements: Lyrics
- The Measurements: Blogs
- The Measurements: Twitter



$T_{\text{ref}}$ : Tuesdays ( $h_{\text{avg}}=6.03$ ) $T_{\text{comp}}$ : Saturdays ( $h_{\text{avg}}=6.06$ )

## Measuring Happiness

Motivation

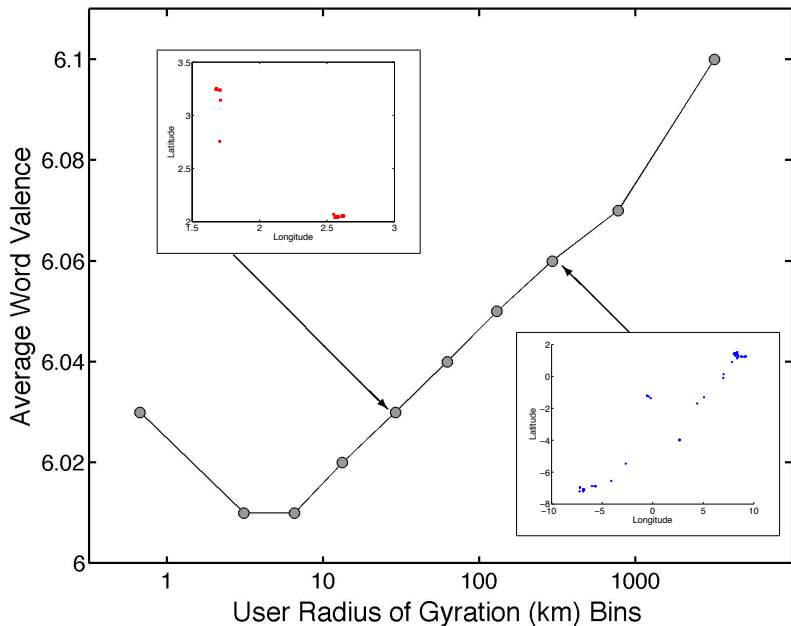
The Hedonometer

The Measurements: Lyrics

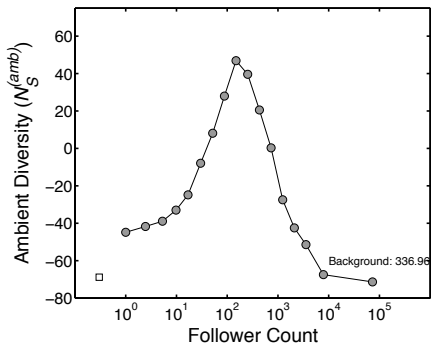
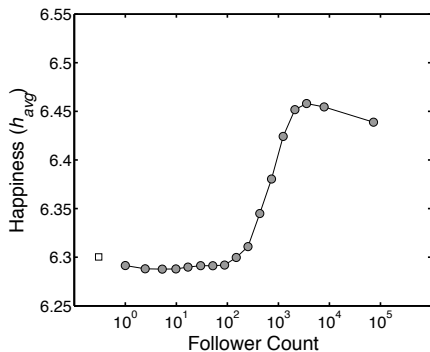
The Measurements: Blogs

The Measurements: Twitter

# Twitter—Happiness and Movement



# Twitter—Happiness and Sphere of Influence



- Dunbar's number  $\simeq 150$ .

# Twitter—Reciprocal Reply Networks:

Hedonometer

## Measuring Happiness

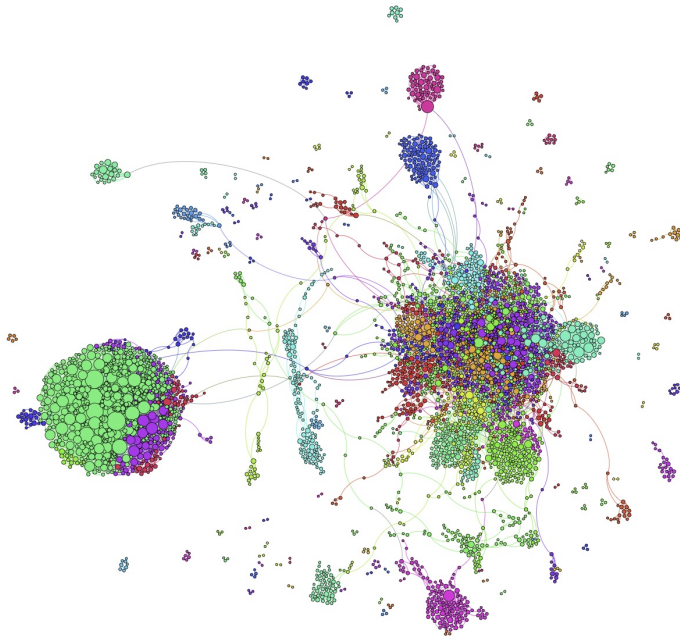
Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

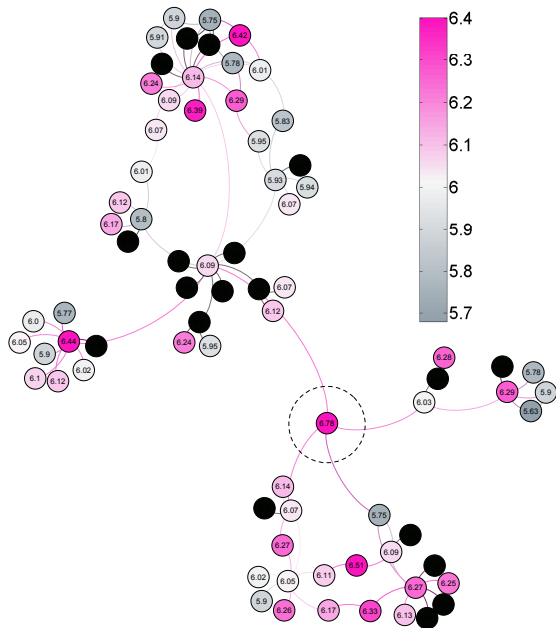
The Measurements: Twitter



Frame 46/50



# Twitter—Reciprocal Reply Networks:



## Measuring Happiness

Motivation

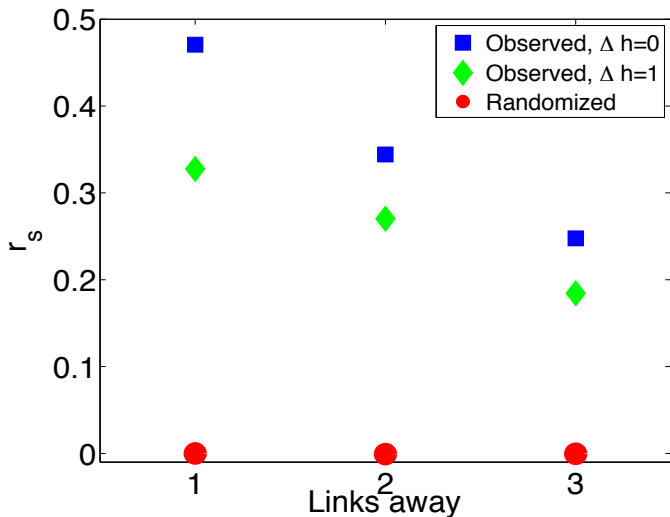
The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

## Twitter—Reciprocal Reply Networks:



Decay in happiness correlation.

Measuring  
Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

- ▶ 20 additional languages scored on Mechanical Turk



- ▶ 20 additional languages scored on Mechanical Turk
- ▶ Moving to phrases (n-grams)

## Measuring Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

- ▶ 20 additional languages scored on Mechanical Turk
- ▶ Moving to phrases (n-grams)
- ▶ How does happiness vary with proximity to nature? to farmers markets? to \_\_?

## Measuring Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

- ▶ 20 additional languages scored on Mechanical Turk
- ▶ Moving to phrases (n-grams)
- ▶ How does happiness vary with proximity to nature? to farmers markets? to \_\_?
- ▶ What is the largest outbreak of happiness?

## Measuring Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

- ▶ 20 additional languages scored on Mechanical Turk
- ▶ Moving to phrases (n-grams)
- ▶ How does happiness vary with proximity to nature? to farmers markets? to \_\_?
- ▶ What is the largest outbreak of happiness?
- ▶ Quantifying metaphor, narrative, story.

- ▶ 20 additional languages scored on Mechanical Turk
- ▶ Moving to phrases (n-grams)
- ▶ How does happiness vary with proximity to nature? to farmers markets? to \_\_?
- ▶ What is the largest outbreak of happiness?
- ▶ Quantifying metaphor, narrative, story.
- ▶ hedonometer.org

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.
- ▶ Kloumann et al., PLoS ONE, 2012.



- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.
- ▶ Kloumann et al., PLoS ONE, 2012.
- ▶ Bliss et al., Journal of Computational Science, 2012.

# References

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.
- ▶ Kloumann et al., PLoS ONE, 2012.
- ▶ Bliss et al., Journal of Computational Science, 2012.
- ▶ language assessment by Mechanical Turk (labMT 1.0)

Measuring  
Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

Frame 48/50



# References

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.
- ▶ Kloumann et al., PLoS ONE, 2012.
- ▶ Bliss et al., Journal of Computational Science, 2012.
- ▶ language assessment by Mechanical Turk (labMT 1.0)
- ▶ onehappybird.com

Measuring  
Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

Frame 48/50

# References

- ▶ Dodds & Danforth, Journal of Happiness Studies, 2009.
- ▶ Dodds et al., PLoS ONE, 2011.
- ▶ Kloumann et al., PLoS ONE, 2012.
- ▶ Bliss et al., Journal of Computational Science, 2012.
- ▶ language assessment by Mechanical Turk (labMT 1.0)
- ▶ onehappybird.com
- ▶ hedonometer.org funded by MITRE

Measuring  
Happiness

Motivation

The Hedonometer

The Measurements: Lyrics

The Measurements: Blogs

The Measurements: Twitter

Frame 48/50





Peter Dodds



Lewis Mitchell



Nick Allgaier



Cathy Bliss



Chris Danforth



Jake Williams



Andy Reagan



Eitan Pechenik



Emily Cody



Morgan Frank



Lindsay Van Leir



Mike Foley



Ross Lieb-Lappen  
(Dartmouth)



Isabel Kloumann  
(Cornell)



Kameron Harris  
(Washington)



Paul Lessard  
(Colorado)



Tyler Gray  
(MIT)



Suma Desu



Eric Clark

## Top-ranking phrases from the Lyrics corpus

rank	order=1	order=2	order=3	order=4	order=5	order=6
1	i	and i	i know you	if you want to	don't know what to do	at the end of the day
2	the	in the	you know i	let me tell you	all i wanna do is	who do you think you are
3	and	if you	and i know	tell me what you	one more chance at love	for the rest of my life
4	you	on the	this is then	don't want to be	you know what i mean	where do we go from here
5	a	to the	la la la	all i need is	all i want is you	can see it in your eyes
6	to	i know	don't want to	and i know that	i'll be there for you	what am i supposed to do
7	my	you know	if i could	what can i do	at the end of the	when i look into your eyes
8	i'm	but i	can't you see	want you to know	let me be the one	when i look in your eyes
9	it	when i	don't know what	all i want is	it's been a long time	tell me that you love me
10	that	when you	all the time	give it to me	it you want me to	throw your hands in the air
11	so	all the	why don't you	when it comes to	don't know what to say	i'm still in love with you
12	your	like a	as long as	how does it feel	there's nothing i can do	as far as i can see
13	me	this is	don't you know	you know that i	tryna get your EX DEL	what do you want from me
14	in	come on	there is no	don't you know that	that's the way it is	if you wanna be with me
15	no	to be	i know that	don't give a fuck	i'll never let you go	whole lot o' loving to do
25	love	don't know	but i can't	all the things that	way you make me feel	licks does it take till you
100	m	just like	in this world	woke up this morning	all the things you do	after telling everybody that i wasn't