The emotional content of large-scale texts: The happiness of bloggers, song lyrics, and presidents. Workshop on Challenges and Visions in the Social Sciences ETH Zurich, August 18–23, 2008

> Peter Dodds Chris Danforth

Department of Mathematics & Statistics Center for Complex Systems Vermont Advanced Computing Center

University of Vermont

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not for

everyone

Prediction

References

Outline

Measuring emotional content

Data sets

Analysis

Songs Blogs SOTU

Winning: it's not for everyone

Prediction

References

Happiness

Measuring emotional content

Data sets

Analysis

Blog

Winning: it's not fo

Prediction

References

Frame 2/65

◆□▶ ◆□▶ ◆目▶ ◆目▶ 目 のへぐ

## Happiness:



http://wikipedia.org

 Greek philosophers held Eudaimonia as highest good. <sup>[9]</sup>

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

- ~ flourishing, well-being, pleasure, ...
- Socrates, Plato, Aristotle, Epicurus, ...

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not for everyone

Prediction

References

Frame 3/65

## Happiness:



http://wikipedia.org

#### Bentham's hedonistic calculus:

"[t]he greatest happiness of the greatest number is the foundation of morals and legislation"<sup>[17]</sup>

(日) (個) (E) (E) (E)

Priestly, John Stuart Mill, ...

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not fo everyone

Prediction

References

Frame 4/65

## United States' Declaration of Independence:



http://wikipedia.org

"We hold these truths to be sacred & undeniable; that all men are created equal & independent, that from that equal creation they derive rights inherent & inalienable, among which are the preservation of life, & liberty, & the pursuit of happiness;"

< 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < 回 > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > <

Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

winning: it's not to everyone

Prediction

References

Frame 5/65

## Happiness:

- Even the odd modern economist likes happiness:
- "Happiness" by Richard Layard<sup>[11]</sup>



(ロ)、(型)、(E)、(E)、 E、のQの

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not

Prediction

References

Frame 6/65 日 りへへ What makes us happy?

Layard's summary:

### Dominant factors:

- Family relationships
- Financial situation
- Work
- Community and Friends

- Health
- Personal Values
- Personal Freedom

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's no

Prediction

References

What makes us happy?

Layard's summary:

### Dominant factors:

- Family relationships
- Financial situation
- Work
- Community and Friends

## Unimportant factors:

- Age
- Gender
- Education

- Health
- Personal Values
- Personal Freedom

・ロット (雪) ・ (目) ・ (日)

- Inherent intelligence
- Looks

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's

everyone

Prediction

References

### Desiring happiness—not just for boffins:

 Average people routinely report being happy is what they want most in life<sup>[11, 12]</sup> Measuring emotional content

Data sets

Analysis

Song Blogs

Winning: it's not for

Prediction

References

Frame 8/65

・ロ・・御・・声・・声・ ゆくぐ

### Desiring happiness—not just for boffins:

 Average people routinely report being happy is what they want most in life<sup>[11, 12]</sup>

National indices of well-being:

- Bhutan
- France
- Australia

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winnina: it's not

everyone

Prediction

References

Frame 8/65

#### So how does one measure

- 1. happiness?
- 2. levels of other emotions?

Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog: SOTI

> Winning: it's not fo everyone

Prediction

References

◆□▶ ◆□▶ ◆目▶ ◆目▶ 目 のへぐ

So how does one measure

- 1. happiness?
- 2. levels of other emotions?

Just ask people how happy they are.

Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not for everyone

Prediction

References

Frame 9/65

◆□▶ ◆□▶ ◆目▶ ◆目▶ 目 のへぐ

### So how does one measure

- 1. happiness?
- 2. levels of other emotions?

### Just ask people how happy they are.

- Experience sampling<sup>[4, 6, 5]</sup> (Csikszentmihalyi et al.)
- Day reconstruction<sup>[10]</sup> (Kahneman et al.)

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not foi everyone

Prediction

References

Frame 9/65

とうてい いいちょう ふしゃ ふしゃ

### So how does one measure

- 1. happiness?
- 2. levels of other emotions?

### Just ask people how happy they are.

- Experience sampling<sup>[4, 6, 5]</sup> (Csikszentmihalyi et al.)
- Day reconstruction<sup>[10]</sup> (Kahneman et al.)

### But self-reporting has drawbacks...

- relies on memory and self-perception
- induces misreporting<sup>[13]</sup>
- costly

Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs

Winning: it's not for everyone

Prediction

References

### We'd like to build an hedonometer:

 An instrument to 'remotely-sense' emotional states and levels, in real time or post hoc.



Measuring emotional content

Data sets

Analysis

Song

BIOG

Winning: it's not for

Prediction

References

▲□▶▲□▶▲□▶▲□▶ □ のへで

### We'd like to build an hedonometer:

 An instrument to 'remotely-sense' emotional states and levels, in real time or post hoc.

### Ideally:

- Transparent
- Fast
- Based on written expression
- Uses human evaluation

- Non-reactive
- Complementary to self-reported measures

▲□▶▲□▶▲□▶▲□▶ □ ● ● ●

Improvable

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

SOT

Winning: it's not fo

everyone

Prediction

References

### We'd like to build an hedonometer:

 An instrument to 'remotely-sense' emotional states and levels, in real time or post hoc.

### Ideally:

- Transparent
- Fast
- Based on written expression
- Uses human evaluation

### Some possibilities:

- Natural language processing (e.g., OpinionFinder)
- Declared mood levels in blogs (e.g., Livejournal)<sup>[14]</sup>

#### Non-reactive

 Complementary to self-reported measures

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

Improvable

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

SOT

Winning: it's not for evervone

Prediction

References

Frame 10/65 日・クへへ

 Idea: Gauge emotional content of an entity through human assessment via semantic differentials. Happiness

Measuring emotional content

Data sets

Analysis

Song Blogs

SOT

Winning: it's not for everyone

Prediction

References

Frame 11/65 日 のへへ

▲□▶▲□▶▲□▶▲□▶ □ のへで

- Idea: Gauge emotional content of an entity through human assessment via semantic differentials.
- Examples:
  - hate  $\leftrightarrow$  love
  - $\blacktriangleright \ rough \leftrightarrow smooth$
  - $\blacktriangleright \quad up \leftrightarrow down$

Happiness

Measuring emotional content

Data sets

Analysis

Song Blog

SOT

Winning: it's not fo everyone

Prediction

References

・ロ・・御・・声・・声・ ゆくぐ

- Idea: Gauge emotional content of an entity through human assessment via semantic differentials.
- Examples:
  - hate  $\leftrightarrow$  love
  - $\blacktriangleright \ rough \leftrightarrow smooth$
  - $\blacktriangleright \quad up \leftrightarrow down$
- Osgood et al. (1957)<sup>[15]</sup> identified a basis of 3 semantic differentials:
  - Valence: bad  $\leftrightarrow$  good
  - ► Dominance: weak ↔ strong
  - ► Arousal: passive ↔ active

(also often: Evaluation, Potency, and Activity)

Happiness

Measuring emotional content

Data sets Analysis

> Songs Blogs SOTU Winning: it's not

everyone

Prediction

References

## ANEW study

#### ANEW = "Affective Norms for English Words"

Measuring emotional content

Data sets

Analysis

Song

BIOG

Winning: it's not for everyone

Prediction

References

◆□▶ ◆□▶ ◆目▶ ◆目▶ 目 のへぐ

## ANEW study

ANEW = "Affective Norms for English Words"

- Study: participants shown lists of isolated words
- Asked to grade each word's valence, arousal, and dominance level
- Integer scale of 1–9

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

5010

Winning: it's not for

Prediction

References

・ロ・・ 日・・ 日・・ 日・ うくぐ

## ANEW study

ANEW = "Affective Norms for English Words"

- Study: participants shown lists of isolated words
- Asked to grade each word's valence, arousal, and dominance level
- Integer scale of 1–9
- N =1034 words—previously identified as bearing emotional weight
- Participants = College students (\*cough\*)
- Results published by Bradley and Lang (1999)<sup>[2]</sup>

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs

Winning: it's not fo everyone

Prediction

References

▲□▶▲□▶▲□▶▲□▶ = のへで

## ANEW study—three 1–9 scales:

#### valence:



Happiness

Measuring emotional content

Data sets

Analysis

Blogs

SOT

Winning: it's not for everyone

Prediction

References

▲□▶ ▲□▶ ▲□▶ ▲□▶ ▲□ ● ● ●

## ANEW study—three 1–9 scales:

#### valence:





#### dominance:



#### Happiness

Measuring emotional content

Data sets

Analysis

Song: Blogs

SOT

Winning: it's not fo everyone

Prediction

References

## ANEW words—examples



Happiness

Measuring emotional content

Data sets

Analysis Songs Biogs SOTU Winning: it's not for everyone Prediction

References

Frame 14/65 日 のへへ

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

Analysing text:

Simplest measure for a text:

$$\theta_{\mathrm{avg}} = \sum_{i=1}^{N} p_i \theta_i$$

where  $p_i$  is fractional abundance of word *i* and  $\theta$  is average valence, arousal, or dominance for word *i*.

- Focus on valence,  $\theta = v$ .
- Average valence typically falls between 5 and 7.

#### Happiness

Measuring emotional content

Data sets Analysis

Songs Blogs SOTU Winning: it's not

everyone

Prediction

References

Some obvious problems/issues:

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

Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not fo everyone

Prediction

References

・ロ・・一部・・日・・日・ つくぐ

Some obvious problems/issues:

- Partial coverage of all words.
- Context is ignored.
- You just don't like it.

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not for everyone

Prediction

References

・ロ・・一部・・日・・日・ つくぐ

Some obvious problems/issues:

- Partial coverage of all words.
- Context is ignored.
- You just don't like it. Really.

Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not for everyone

Prediction

References

・ロ・・一部・・日・・日・ つくぐ

### Some obvious problems/issues:

- Partial coverage of all words.
- Context is ignored.
- You just don't like it. Really.

### Clearly:

Only suitable for large-scale texts.

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not for everyone

Prediction

References

Frame 16/65 日 のへで

## Data sets:

#### Texts:

- 1. Song lyrics (1960-2007)
- 2. Song titles (1960-2008)
- 3. State of the Union (SOTU) Addresses (1790-2008)

### Sources:

- ► hotlyrics.com (⊞)
- ▶ <u>freedb.com</u> (⊞)
- ► American Presidency Project: www.presidency.ucsb.edu (⊞).

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's n

Winning: it's not fo everyone

Prediction

References

## Data sets:

# 4 Blog phrases beginning with "I feel..." or "I am feeling" taken from wefeelfine.org (⊞) (2005–2008)



#### Created by Jonathan Harris and Sep Kamvar

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not for everyone

Prediction

References

## wefeelfine.org:

Feeling lonely	Gender Both	Age All	Weather All	Location All	Date All	Measuring
						emotional co
						Data sets
	<ul> <li>I feel very lonely a just cant quite ge</li> </ul>	Apolygia				
		Analysis				
	i feel lonely recer	the				Blogs
	March 30, 2006 / from so	meone in georgia united state				SOTU
	<ul> <li>i feel lonely thing</li> </ul>	Winning: it's				
						everyone
	<ul> <li>i feel really lonely</li> </ul>	Prediction				
						rrediction
	<ul> <li>i feel really lonely</li> </ul>	References				
	i feel so lonely ins	ide				
	i feel soooooo lo	nely sometimes				
	i feel lonely					
wE FORT						
FINE .						

#### Happiness

ntent

Frame 19/65 ð

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ● □ ● ● ● ●

## wefeelfine.org:

Feeling lovesick	Gender Female	Age 20 - 29	Weather Cloudy	Location All	Date Feb 14, 2006
All Feelings					All Dates
lopsided     lopsided     loquacious     loquarious     loqua		Os 1Os <b>20s</b> 3Os 4Os 5Os 6Os 7Os 8Os	*	afgennistan argenthan australia balarun balarun brigarin brund darussalam brund darussalam brund darussalam brund darussalam brund darussalam brund darussalam brund darussalam brund darussalam brund darussalam canada ca	2005 Ann 1 2006 Feb 2 Apr 4 5 6 7 8 8 9 9 10 11 12 12 13 14 15 16 17 17 19 19 20 20 21 22 23 24 25 25 25 26
				F	ind Feelings

#### Happiness

Measuring emotional content

Data sets

songs Blogs SOTU Vinning: it's not for veryone

Prediction

References

Frame 20/65 日 クへへ

◆□▶ ◆□▶ ◆臣▶ ◆臣▶ 三臣 - のへで

## Some demographics for blog sentences:

Breakdown by # of sentences:

Country	Percentage		
United States	82.3		
Canada	6.1		
United Kingdom	4.8		
Australia	3.7		
Philippines	0.4		
Germany	0.2		

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not for

Prediction

References
### Some numbers:

Counts	Song lyrics	Song titles
All words	58,610,849	60,867,223
ANEW words	3,477,575 (5.9%)	5,612,708 (9.2%)
Individuals	$\sim$ 20,000	$\sim$ 632,000

Counts	Weblogs	SOTU	
All words	148,231,294	1,796,763	
ANEW words	8,176,669 (5.5%)	61,926 (3.5%)	
Individuals	$\sim$ 2,148,000	43	

#### Happiness

Measuring emotional content

Data sets

Analysis <sup>Songs</sup> Blogs SOTU Alianing: it'o

everyone

Prediction

References

Frame 22/65

◆□▶ ◆□▶ ◆□▶ ◆□▶ ▲□ ◆ ◆ ◆

🗗 ୬ ଏ ୯

# Most frequent ANEW words:

Rank	Song lyrics	Song titles
1	love (7.37%)	love (7.39%)
2	time (4.18%)	time (4.19%)
3	baby (2.75%)	baby (2.75%)
4	life (2.59%)	life (2.60%)
5	heart (2.14%)	heart (2.15%)

Rank	Weblogs	SOTU
1	good (4.89%)	people (5.49%)
2	time (4.72%)	time (4.09%)
3	people (3.94%)	present (3.45%)
4	love (3.31%)	world (3.10%)
5	life (3.13%)	war (2.98%)

#### Happiness

Measuring emotional content

Data sets

Songs Blogs SOTU Winning: it's not fo everyone

Prediction

References

◆□▶ ◆□▶ ◆ □▶ ◆ □▶ ○ □ ○ ○ ○ ○

## Outline

Measuring emotional content

Data sets

### Analysis Songs Blogs

SOTU

Winning: it's not for everyone

Prediction

References

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs

Winning: it's not fo everyone

Prediction

References

Frame 24/65 බ නෙදෙ

◆□▶ ◆□▶ ◆ □▶ ◆ □▶ ○ □ ○ ○ ○ ○

### Lyrics—average valence



Happiness

## Lyrics—measurement robustness



Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's r

Prediction

References

▲ロト▲舂 ▶ ▲ 臣 ▶ ▲ 臣 ▶ → 臣 → の � !

### Lyrics—average valence of genres:



Happiness

Measuring emotional content

Data sets

Analysis Songs

Prediction

References

## Valence shift details:

### Given two texts *a* and *b*:

• Measure difference in average valence:  $v_{avg}^{(b)} - v_{avg}^{(a)}$ 

Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's r

Prediction

References

Frame 28/65

### Valence shift details:

### Given two texts *a* and *b*:

- Measure difference in average valence:  $v_{avg}^{(b)} v_{avg}^{(a)}$
- Break difference down by contributions from individual words:

$$\Delta_i = 100 imes [p_{i,b} - p_{i,a}] rac{[v_i - v_{avg}^{(a)}]}{[v_{avg}^{(b)} - v_{avg}^{(a)}]} \ \sum_i \Delta_i = v_{avg}^{(b)} - v_{avg}^{(a)}$$

► Rank words by |∆<sub>i</sub>|

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not to everyone

Prediction

References

▲□▶▲圖▶▲≣▶▲≣▶ ≣ ∽9.00



## Top 50 of $\simeq$ 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)

Happiness

Measuring emotional content Data sets Analysis Songs Blogs SOTU Winning: it's not for everyone Prediction

References

Frame 30/65

◆□▶ ◆□▶ ◆目▶ ◆目▶ ●目 ● のへで

# Bottom 50 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)

Happiness

Measuring emotional content Data sets Analysis Songs Blogs SOTU

Winning: it's not to everyone

Prediction

References

◆□▶ ◆□▶ ◆ □▶ ◆ □▶ ○ □ ○ ○ ○ ○

## Outline

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not for everyone

Prediction

References

#### Happiness

Measuring emotional content

Data sets

Analysis

Blogs

SOT

Winning: it's not fo everyone

Prediction

References

◆□▶ ◆□▶ ◆ □▶ ◆ □▶ ○ □ ○ ○ ○ ○

## Blogs—Overall trend



・ロト ・ 雪 ト ・ ヨ ト ・ ヨ ト

Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not everyone

Prediction

References





Happiness





Happiness



### Self-report studies find little variation in happiness with age<sup>[7, 8]</sup>

Happiness

Measuring emotional content

Data sets

Analysis

Son

Blogs

SOT

Winning: it's not fo everyone

Prediction

References

Frame 37/65

・ ロ ・ 4 酉 ・ 4 亘 ・ 4 亘 ・ 9 へ ()

- Self-report studies find little variation in happiness with age<sup>[7, 8]</sup>
- Surprising: Expect a rise and fall.



Measuring emotional content

Data sets

Analysis

Son

Blogs

SOT

Winning: it's not fo everyone

Prediction

References

Frame 37/65

- Self-report studies find little variation in happiness with age<sup>[7, 8]</sup>
- Surprising: Expect a rise and fall.
- A 'challenge' for theory...

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

Blogs

SOTI

Winning: it's not fo everyone

Prediction

References

Frame 37/65

- Self-report studies find little variation in happiness with age<sup>[7, 8]</sup>
- Surprising: Expect a rise and fall.
- A 'challenge' for theory...
- Related to the Easterlin Paradox: Money doesn't buy happiness

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

Blogs

SOTI

Winning: it's not fo everyone

Prediction

References

Frame 37/65

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

- Self-report studies find little variation in happiness with age<sup>[7, 8]</sup>
- Surprising: Expect a rise and fall.
- A 'challenge' for theory...
- Related to the Easterlin Paradox: Money doesn't buy happiness
- But maybe it does a little bit—Veenhoven & Hagerty (2003) and Wolfers & Stevenson (2008).

#### Happiness

Measuring emotional content

Data sets

Analysis

Sor

Blogs

Winning: it's not for everyone

Prediction

References

▲□▶▲□▶▲□▶▲□▶ = のへで

## Blogs



イロト 不得 トイヨト イヨト

3

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

Frame 38/65



14 year olds compared to born 1960-1969

# Blogs—Latitude



### Near equator—social factors

- Increase in 'sad', 'bored', 'lonely', 'stupid', 'guilty'
- Decrease in 'good' and 'people'

Near poles social/psychological/climate

- Increase in 'sick', 'guilty', 'cold', 'depressed', and 'headache' and decrease of 'love' and 'life.'
- Offset by decrease in 'hurt' and 'pain.'
- More 'bed' and 'sleep.'

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not to everyone

Prediction

References

Frame 40/65 日 クへへ

## Blogs—day of the week

Very gentle weekly cycle:



Monday is not so bad for bloggers...

#### Happiness

Measuring emotional conten

Data sets Analysis

Songs Blogs SOTU Winning: it's not for

Prediction

References

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●



## Outline

Measuring emotional content

Data sets

### Analysis

Songs Blogs SOTU

Winning: it's not for everyone

Prediction

References

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOTU

Winning: it's not fo everyone

Prediction

References

Frame 43/65

◆□▶ ◆□▶ ◆ □▶ ◆ □▶ ○ □ ○ ○ ○ ○

## Presidential happiness:



#### Happiness

Measuring emotional content

Data sets

Songs Blogs soru Winning: it's not for everyone Prediction References

Frame 44/65

**日** りへで

◆□▶★舂▶★≧▶★≧▶ 差 のの

# Measuring Emotional Content

### Goal: Improve on ANEW study

- Perform survey as an online game.
  - Local: university level
  - Intermediate: representative groups
  - Global: open on the Web

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOTU

Winning: it's not for everyone

Prediction

References

Frame 45/65

# Measuring Emotional Content

### Goal: Improve on ANEW study

- Perform survey as an online game.
  - Local: university level
  - Intermediate: representative groups
  - Global: open on the Web

### Measure emotional content of

- Many more words
- Phonemes and letters
- Sentences

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOTU

Winning: it's not for everyone

Prediction

References

Frame 45/65

# Where do superstars come from?

Rosen (1981): "The Economics of Superstars" Examples:

- Full-time Comedians ( $\approx$  200)
- Soloists in Classical Music
- Economic Textbooks (the usual myopic example)
- Highly skewed distributions (again)...

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

Biog

Winning: it's not for everyone

Prediction

References

### Superstars

### Rosen's theory:

- Individual quality q maps to reward R(q)
- R(q) is 'convex' (d<sup>2</sup>R/dq<sup>2</sup> > 0)
- Two reasons:
  - 1. Imperfect substitution:

A very good surgeon is worth many mediocre ones

2. Technology:

Media spreads & technology reduces cost of reproduction of books, songs, etc.

No social element—success follows 'inherent quality'

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

BIOD

Winning: it's not for everyone

Prediction

References

### Superstars

Adler (1985): "Stardom and Talent"

Assumes extreme case of equal 'inherent quality'

Happiness

Winning: it's not for

everyone Prediction

References

Frame 48/65

▲□▶▲□▶▲□▶▲□▶ □ ● ● ●

Measuring emotional Data sets Analysis

- Argues desire for coordination in knowledge and culture leads to differential success
- Success is then purely a social construction

## **Dominance hierarchies**

Chase et al. (2002): "Individual differences versus social dynamics in the formation of animal dominance hierarchies" <sup>[3]</sup>

The aggressive female  $\underline{Metriaclima \ zebra}$  ( $\boxplus$ ):



Pecking orders for fish...

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

Бюу

SOTU

Winning: it's not for everyone

Prediction

References

## **Dominance hierarchies**

Fish forget—changing of dominance hierarchies:



 22 observations: about 3/4 of the time, hierarchy changed

イロト 不得 トイヨト イヨト

3

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

Biogs

Winning: it's not for everyone

Prediction

References

# Music Lab Experiment



48 songs 30,000 participants



multiple 'worlds' Inter-world variability

Salganik, Dodds, and Watts (2006) "An experimental study of inequality and unpredictability in an artificial cultural market"<sup>[18]</sup>

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not for

everyone

Prediction

References

Frame 51/65 日 のへで
- 🤗 🕜 😭 M http://w	🞯 💿 😚 M http://www.musiclab.columbia.edu/me/songs					
	# of down loads	[Help] [Log off]	# of down loads		≢ of down loads	
HARTSFIELD: "enough is enough"	20	GO MOREDCAI: "It does what its tok!"	12	UNDO: "while the world passes"	24	
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "she said"	47	UP FOR NOTHING: "In sight of"	13	
THE THRIFT SYNDICATE: "2003 a tragedy"	20	MISS OCTOBER: "pink agression"	27	SILVERFOX: "gnaw"	17	
THE BROKEN PROMISE: "the end in friend"	19	POST BREAK TRAGEDY: "florence"	14	STRANGER: "one drop"	10	
THIS NEW DAWN: "the belief above the answer"	12	FORTHFADING: "fear"	24	FAR FROM KNOWN: "ioute 9"	18	
NOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peel"	20	STUNT MONKEY: "inside out"	46	
MORAL HAZARD: "waste of my life"	8	52METRO: "lockdown"	17	DANTE: "Hes mystery"	14	
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "went with the count"	16	FADING THROUGH: "wish me luck"	10	
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "tell me"	38	UNKNOWN CITIZENS: "falling over"	34	
ART OF KANLY: "seductive intro, melodic breakdown"	10	THE FASTLANE: "til death do us part (i dont)"	31	BY NOVEMBER: "If i could take you"	20	
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "miseries and misacles"	17	DRAWN IN THE SKY: "tap the ride"	12	
EMBER SKY: "this upcoming winter"	25	SUM RANA: "the bolshevik boogie"	15	SELSIUS: "stars of the city"	22	
SALUTE THE DAWN: "iam emo?"	13	CAPE RENEWAL: "baseball warlock v1"	12	SIBRIAN: "eye patch"	14	
RYAN ESSMAKER: "detour_ibe still"	14	UP FALLS DOWN: "a brighter burning star"	11	EVAN GOLD: "robert downey j"	10	
BEERBONG: "father to son"	12	SUMMERSWASTED "a plan behind destruction"	17	BENEFIT OF A DOUBT: "run away"	38	
HALL OF FAME:	19	SILENT FILM "all iteres to say"	61	SHIPWRECK UNION:	16	

### Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog

SOT

Winning: it's not for everyone

Prediction

References

◆□▶ ◆□▶ ◆臣▶ ◆臣▶ 臣 のへで

### Experiment 1

Tes de Dessero Tess	1514				
🕂 🚫 🖸 🕅 Hitps/w	we musiclab				
		(Help) (Log.off)			1
MATSPELS "enough"	17	CO-MINECCAL "E doors what in: 6-67	32	UNDE	14
DEEP ENDUCIN TO DIE: "for the sky"	10	PARKER THEORY	4	UP FOR ROTHING	10
THE THEFT ENGLISH THE '2000 a mapping'	20	MULOCIDEER "Jak aparator"	27	LANDRON .	w
THE BROKEN PROMISE 'the end in band'	19	POST BREAK TRACEON "Resor"	34	CTRANCED: 'Cree day'	*
"the behalizations the process"	15	roemenang "Not	24	FAR FREAKINGHER	
NOONER AT NINE		THE CALENCTER		STENT MONICOT	<u>e</u> .
MORAL INZIARS		12HETRO "Relation"	17	CHOTE "Bru mysleng"	ж
MOTINGS BORDLAND "as versions change"	27	EAPLY MINTING "wore with the scene"	-	PADING TWICKER	
SECRETARY Note your eyes on the talking?	5	STAR GUIGER	38	UNLINOWS CITIZENS "Eding and"	34
ARTOFRANCY: "solution may, makely brankdows"	39	THE FASTLANC: "If death-sto as post 2 dowt?"	23	OF MOVEMBER. "Transid late you"	
NYDRALK SHIDNCK	77	A BLINDING SALENCE: "reporter and results"		CRAME IN THE SAUT.	32
EMERY SKY	25	12M RABA. "Me holderek kengie"	28	SECON Team of the city'	22
CALLETE THE CANAD	10	OPE NEW AND	10	Edit Date:	ж
Errin ESSANDIN TODOL DE UNE	34	UP FALLS ODWN To Stighter Surving utor	33	CAAS GOLD	
BEERBONG "Software to some"	12	Simmersonas with	32	DEMERTOR A BOURT.	
NALL OF FAME	- 19	SLEWF FEM	03	Service of United	

### Experiments 2-4



▲□▶ ▲□▶ ▲ □▶ ▲ □▶ ▲ □ ● ● ● ●

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog

SOT

Winning: it's not for everyone

Prediction

References

Frame 53/65 ළ රාදු ර







#### Happiness

Measuring emotional content

Data sets

Analysis

Son

Blog

SOT

Winning: it's not for everyone

Prediction

References

Frame 54/65



Inequality as measured by Gini coefficient:

$$G = rac{1}{(2N_s - 1)} \sum_{i=1}^{N_s} \sum_{j=1}^{N_s} |m_i - m_j|$$

#### Happiness

Measuring emotional content

Data sets

Analysis <sup>Songs</sup> Blogs SOTU

Winning: it's not for everyone

Prediction

References

ション・ 山田・ 山田・ 山田・ 山田・



Unpredictability

$$U = \frac{1}{N_{\rm s} \binom{N_{\rm w}}{2}} \sum_{i=1}^{N_{\rm s}} \sum_{j=1}^{N_{\rm w}} \sum_{k=j+1}^{N_{\rm w}} |m_{i,j} - m_{i,k}|$$

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

ыод

Winning: it's not for everyone

Prediction

References

Frame 56/65

◆□▶ ◆□▶ ◆目▶ ◆目▶ 目 のへぐ

## Sensible result:

 Stronger social signal leads to greater following and greater inequality.



Measuring emotional content

Data sets

Analysis

Song

Blog

Winning: it's not for everyone

Prediction

References

Frame 57/65

・ロ・・御・・声・・声・ ゆくぐ

## Sensible result:

 Stronger social signal leads to greater following and greater inequality.

### Peculiar result:

 Stronger social signal leads to greater unpredictability. Measuring emotional content

Data sets

Analysis

Song

BIOU

Winning: it's not for everyone

Prediction

References

Frame 57/65

・ロ・・御・・声・・声・ ゆくぐ

## Sensible result:

 Stronger social signal leads to greater following and greater inequality.

## Peculiar result:

 Stronger social signal leads to greater unpredictability.

## Very peculiar observation:

The most unequal distributions would suggest the greatest variation in underlying 'quality.'

### Happiness

Measuring emotional content

Data sets

Analysis

Son

EIUU EOT

Winning: it's not for everyone

Prediction

References

## Sensible result:

 Stronger social signal leads to greater following and greater inequality.

## Peculiar result:

 Stronger social signal leads to greater unpredictability.

## Very peculiar observation:

- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through following.

### Happiness

Measuring emotional content

Data sets

Analysis

Son

SOT

Winning: it's not for everyone

Prediction

References

## Sensible result:

 Stronger social signal leads to greater following and greater inequality.

## Peculiar result:

 Stronger social signal leads to greater unpredictability.

## Very peculiar observation:

- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through following.
- 'Payola' leads to poor system performance.

#### Happiness

Measuring emotional content

Data sets

Analysis

Son

EIUU

Winning: it's not for everyone

Prediction

References

シック・ボート (中下・日本)

# Music Lab Experiment—Sneakiness



Inversion of download count

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog

SOT

Winning: it's not for everyone

Prediction

References

Frame 58/65

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

# Music Lab Experiment—Sneakiness



- Inversion of download count
- The 'pretend rich' get richer ...

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog

SOT

Winning: it's not for everyone

Prediction

References

Frame 58/65

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

# Music Lab Experiment—Sneakiness



- Inversion of download count
- ▶ The 'pretend rich' get richer ...
- ... but at a slower rate

Happiness

Measuring emotional content

Data sets

Analysis

Song

Blog

SOT

Winning: it's not for everyone

Prediction

References

Frame 58/65

▲□▶ ▲□▶ ▲□▶ ▲□▶ □ ● ●

## Alan Greenspan (September 18, 2007):



http://wikipedia.org

▲□▶ ▲□▶ ▲ □▶ ▲ □▶ ▲ □ ● ● ● ●

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not to everyone

Prediction

References

Frame 59/65 日 クへへ

## Alan Greenspan (September 18, 2007):

"I've been dealing with these big mathematical models of forecasting the economy ...



http://wikipedia.org

▲□▶ ▲□▶ ▲目▶ ▲目▶ 三回 めんぐ

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

winning: it's not to everyone

Prediction

References

### 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,



http://wikipedia.org

・日本・「中本・日本・日本・日本・日本

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Wipping: it<sup>2</sup>

everyone

Prediction

References

## 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

・日本・「中本・日本・日本・日本・日本

### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

everyone

Prediction

References

## 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

・ロ・・ 日・・ 日・・ 日・ うくぐ

### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

winning: it's not fo everyone

Prediction

References

Greenspan continues:

Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not fo everyone

Prediction

References

### Greenspan continues:

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

#### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not fo everyone

Prediction

References

Frame 60/65

### 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,

#### Happiness

Measuring emotional content

Data sets

Analysis <sup>Songs</sup> Blogs SOTU

Winning: it's not to everyone

Prediction

References

Frame 60/65

### 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.

#### Happiness

Measuring emotional content

Data sets

Analysis <sup>Songs</sup> Blogs SOTU

Winning: it's not fo everyone

Prediction

References

Frame 60/65

### 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. Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not fo everyone

Prediction

References

Frame 60/65

4 日 > 4 日 > 4 日 > 4 日 > 4 日 > 4 日 > 9 4 0

### 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. Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not fo everyone

Prediction

References

Frame 60/65

### 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. We can't improve ourselves."

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not fo everyone

Prediction

References

Frame 60/65

## 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. We can't improve ourselves."

Jon Stewart:

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



wildbluffmedia.com

► From the Daily Show (⊞) (September 18, 2007)

Measuring

Data sets

Analysis Songs Blogs SOTU

Winning: it's not fo everyone

Prediction

References

## References I

M. Adler.

### Stardom and talent.

American Economic Review, pages 208–212, 1985. pdf  $(\boxplus)$ 

### M. Bradley and P. Lang.

Affective norms for english words (anew): Stimuli, instruction manual and affective ratings. Technical report c-1, University of Florida, Gainesville, FL, 1999. pdf (⊞)

### I. D. Chase, C. Tovey, D. Spangler-Martin, and M. Manfredonia.

Individual differences versus social dynamics in the formation of animal dominance hierarchies.

*Proc. Natl. Acad. Sci.*, 99(8):5744–5749, 2002. pdf (⊞)

### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not fo everyone

Prediction

References

Frame 61/65 日 つくへ

## **References II**

T. Conner Christensen, L. Feldman Barrett,
E. Bliss-Moreau, K. Lebo, and C. Kaschub.
A practical guide to experience-sampling procedures.
2003, 4:53–78, Journal of Happiness Studies.

M. Csikszentmihalyi. Flow. Harper & Row, New York, 1990.

M. Csikszentmihalyi, R. Larson, and S. Prescott. The ecology of adolescent activity and experience. *Journal of Youth and Adolescence*, 6:281–294, 1977.

R. A. Easterlin.

Income and happiness: towards a unified theory. The Economic Journal, 111:465–484, 2001. pdf  $(\boxplus)$ 

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU

Winning: it's not to everyone

Prediction

References

# References III

## R. A. Easterlin. Explaining happiness. *Proc. Natl. Acad. Sci.*, 100:11176–11183, 2003.

pdf (⊞)

- W. T. Jones. The Classical Mind. Harcourt, Brace, Jovanovich, New York, 1970.
- D. Kahneman, A. B. Krueger, D. A. Schkade, N. Schwarz, and A. A. Stone.
  A survey method for characterizing daily life experience: The day reconstruction method. *Science*, 306(5702):1776–1780, 2004. pdf (H)

R. Layard. Happiness.

The Penguin Press, London, 2005.

### Happiness

Measuring emotional content

Data sets

Analysis

Song

SOT

Winning: it's not for everyone

Prediction

References

ション 小田 マイビット ビット ション

## **References IV**

- S. Lyubomirsky. The How of Happiness. The Penguin Press, New York, 2007.
- C. Martinelli and S. W. Parker. Deception and misreporting in a social program. forthcoming in Journal of the European Economic Association, 2007.
- G. Mishne and M. de Rijke. Capturing global mood levels using blog posts. AAAI 2006 Spring Symposium on Computational Approaches to Analysing Weblogs, 2005.
- C. Osgood, G. Suci, and P. Tannenbaum. *The Measurement of Meaning.* University of Illinois, Urbana, IL, 1957.

#### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs SOTU Winning: it's not

everyone

Prediction

References

## References V

## S. Rosen.

The economics of superstars. *Am. Econ. Rev.*, 71:845–858, 1981. pdf (⊞)

### B. Russell. A History of Western Philosophy. Allen & Unwin, London, 1961.

M. J. Salganik, P. S. Dodds, and D. J. Watts. An experimental study of inequality and unpredictability in an artificial cultural market. *Science*, 311:854–856, 2006. pdf (⊞)

### Happiness

Measuring emotional content

Data sets

Analysis Songs Blogs

Winning: it's not fo everyone

Prediction

References

Frame 65/65