Human Language Technology and where it’s headed

#nlproc

Jason Baldridge
@jasonbaldridge

Lillian Lee
(Google me)

Philip Resnik
@psresnik

Cornell University

Tuesday, March 13, 12
the promise
Why is this man smiling?

ALAN TURING AT 100

Alan Turing, born a century ago this year, is best known for his wartime code-breaking and for inventing the 'Turing machine' – the concept at the heart of every computer today. But his legacy extends much further: he founded the field of artificial intelligence, proposed a theory of biological pattern formation and speculated about the limits of computation in physics. In this collection of features and opinion pieces, Nature celebrates the mind that, in a handful of papers over a tragically short lifetime, shaped many of the hottest fields in science today.

Image credit: Andy Potts; Turing family

http://www.nature.com/nature/journal/v482/n7386/full/482440a.html
Why is this man smiling?

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Image credit: Andy Potts; Turing family

http://www.nature.com/nature/journal/v482/n7386/full/482440a.html
The Turing test: AI ≤ language use

In 1950 Alan Turing proposed that a machine could be termed "intelligent" if it could respond to queries in a manner that was completely indistinguishable from a human being.

And how are you feeling today? I think you should know I'm feeling very depressed.

Well, that's life I'm afraid.

"Life"? Don't talk to me about "Life"?

Turing predicted we'd be close in about 50 years.

Operators are standing by

http://www.openamplify.com/

http://www.desktopmates.com/main.html

http://www.openamplify.com/
Why isn’t this man smiling?
Why isn’t this man smiling?

It is the year 2000, but where are the flying cars? I was promised flying cars.

[http://www.youtube.com/watch?v=vzm6pvHPSGo]
Why isn’t this man smiling?

It is the year 2000, but where are the flying cars? I was promised flying cars.

[http://www.youtube.com/watch?v=vzm6pvHPSGo]

Instead we got 140 characters.

[http://www.foundersfund.com/the-future]
we take language-technology successes for granted
Crowding out spam

+ +

+ =

Tuesday, March 13, 12
Machine translation: it’s what’s for news
Siri

“I’m in the mood for Italian food in North Beach”

I found a number of Italian restaurants in North Beach:

- **Columbus Avenue**
  - The Stinking Rose
  - 5 stars, 1430 reviews

- **Kearny Street**
  - Tommaso Ristorante Italiano
  - 5 stars, 851 reviews

- **Green Street**
  - Sotto Mare

Ken Jennings, left, and Brad Rutter, right, pose after the episode of "Jeopardy!" that aired Wednesday, Feb. 16, 2011, when Watson, the IBM computer, beat the veteran champs with a total of $77,147 over two exhibition matches. Credit: AP Photo/Jeopardy Productions Inc.
Why is this man smiling?
what are **realistic expectations?**
All your meaning are belong to us (?)
All your meaning are belong to us (?)
All your meaning are belong to us (?)
ALPAC yer bags

LANGUAGE AND MACHINES

COMPUTERS IN TRANSLATION AND LINGUISTICS

A Report by the
Automatic Language Processing Advisory Committee
Division of Behavioral Sciences
National Academy of Sciences
National Research Council

Publication 1416
National Academy of Sciences National Research Council
Washington, D.C. 1966
It’s cold out there, after the hype
The Hype Cycle (Gartner)

- Peak of Inflated Expectations
- Plateau of Productivity
- Slope of Enlightenment
- Trough of Disillusionment
- Technology Trigger

TIME

VISIBILITY
The Hype Cycle (Gartner, 2011)
The Hype Cycle (Gartner, 2011)
The Hype Cycle (Gartner, 2011)
the challenges
Child’s play?
Child’s play?

What’s a difficult choice you’ve faced?
Child’s play?

What’s a difficult choice you’ve faced?

Clean my room or listen to my mother sing my least favorite song over and over.
Child’s play?

What’s a difficult choice you’ve faced?

Clean my room or listen to my mother sing my least favorite song over and over.
What’s a difficult choice you’ve faced?

Clean my room or listen to my mother sing my least favorite song over and over.

Bath or pink dress.
Child’s play?

What’s a difficult choice you’ve faced?

Clean my room or listen to my mother sing my least favorite song over and over.

Bath or pink dress.
Child’s play?

What’s a difficult choice you’ve faced?

Clean my room or listen to my mother sing my least favorite song over and over.

Bath or pink dress.

Beep.
What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.

verb

[http://casablancapa.blogspot.com/2010/05/fore.htm]
What does this sentence mean?

I saw her duck with a telescope.

verb
What does this sentence mean?

I saw her duck with a telescope.

verb
What does this sentence mean?

I saw her duck with a telescope.
I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.

[http://casablancapa.blogspot.com/2010/05/fore.htm]
[http://www.supercoloring.com/pages/duck-outline/]
I saw her duck with a telescope.
What does this sentence mean?

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What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I saw her duck with a telescope.
What does this sentence mean?

I [saw] her duck with a telescope.

verb  noun
What does this sentence mean?

I saw her duck with a telescope.

verb
noun
What does this sentence mean?

I saw her duck with a telescope.
Ambiguity is pervasive

the a are of I [Steve Abney]
Ambiguity is pervasive

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
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<td>a</td>
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</tr>
</tbody>
</table>

an “are” (100 m²)

the a are of l [Steve Abney]

another “are”
What about this?

我不会说中文的，我只是生成这个例子中，使用谷歌翻译（所以不要怪我，如果这样做没有任何意义）.
I’m sorry, Dave, I’m afraid I can’t do that.
I’m sorry, Dave, I’m afraid I can’t do that.

I’m afraid you might be right.
the **game-changers:**

- data-driven approaches
- models of language
You’ve come a long way, NLP

Enroll / Login Now
Enroll in this online class for free with a Coursera account

Professor Dan Jurafsky
Linguistics Department
Stanford University

Associate Professor
Chris Manning
Computer Science Department
Stanford University
You’ve come a long way, NLP
Text is pervasive
Metadata is plentiful
Learning and structure

![Diagram](image)

\[
\begin{align*}
&\text{waasgee} \\
&\text{those} \\
&\text{cookies-gee} \\
&\text{cookies-the} \\
&\text{7waadluwaan} \\
&\text{all} \\
&\text{hl} \\
&\text{I} \\
&\text{tlä.àw hålanw} \\
&\text{make-PA}
\end{align*}
\]

\[
\begin{align*}
&\text{np/np} \\
&\lambda w.\sigma z(z \subseteq w \land \text{at}(z, \text{loc})) \\
&\text{np} \\
&\sigma z(z \subseteq \sigma \text{cookies}(u)) \\
&\text{np} \\
&\sigma z(z \subseteq \sigma \text{cookies}(u) \land \text{at}(z, \text{loc})) \\
&\text{ip/(ip np)} \\
&\lambda Q. \forall y(y \in \sigma z(z \subseteq \sigma \text{cookies}(u) \land \text{at}(z, \text{loc})) \rightarrow Qy) \\
&\text{ip/np} \\
&\lambda t.\text{make}(I, t)
\end{align*}
\]
Watson architecture

All knowledge is extracted from pre-stored databases and free form text.
Extraction approach: paraphrase learning

Ex: Barzilay and Lee, NAACL 2003
surveys: http://www.jair.org/media/2985/live-2985-5001-jair.pdf,
http://www.mitpressjournals.org/doi/pdfplus/10.1162/coli_a_00002

Is Snooki on stork watch?
Extraction approach: paraphrase learning

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surveys: http://www.jair.org/media/2985/live-2985-5001-jair.pdf,
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http://www.mitpressjournals.org/doi/pdfplus/10.1162/coli_a_00002

Is Snooki on stork watch?

[All 8 results are from March 2011 or earlier]
Extraction approach: paraphrase learning

Is Snooki on stork watch?
Snooki and fiancé Jionni LaValle are expecting their first child together.

Bowie & Iman On Stork Watch
BY GEORGE RUSH DAILY NEWS COLUMNIST
Monday, February 14, 2000
Rock legend David Bowie and supermodel Iman said yesterday they're expecting their first child.

Angie Harmon on Stork Watch
By Marcus Errico
Angie Harmon's going from assistant district attorneying to diaper duty.
The former Law & Order legal dish is expecting her first child with football stud hubby Jason Sehorn, her publicist confirmed Tuesday.
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Is Snooki on stork watch? Snooki?!
onward: Where we’re headed
Meme me up
http://memetracker.org/
The pulse of the media

J. Leskovec, L. Backstrom, J. Kleinberg. Meme-tracking and the Dynamics of the News Cycle. ACM SIGKDD Intl. Conf. on Knowledge Discovery and Data Mining, 2009.
Why is this man smiling?


C. Danescu-Niculescu-Mizil et al. ACL 2012
Why is this man smiling?

Beyond situational effects, phrasing also affects memorability:

• memorable movie quotes (in aggregate) are unusual word choices built on a scaffolding of common part-of-speech patterns ◦ shown via language models

• carries over to ad slogans

C. Danescu-Niculescu-Mizil et al. ACL 2012
Using social interaction: Twitter sentiment

Obama is making the repubs look silly and petty
Using social interaction: Twitter sentiment

Obama is making the repubs look silly and petty

"Obama", "silly", "petty"

Papers: Speriosu et al. 2011; Tan et al. KDD 2011

Bird images from http://www.mytwitterlayout.com/

Tuesday, March 13, 12
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http://starwars.wikia.com/wiki/R2-D2
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is happy Obama is president

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Obama is making the repubs look silly and petty

“Obama”, “silly”, “petty”

is happy Obama is president

Obama’s doing great!

(hopefully)

Papers: Speriosu et al. 2011; Tan et al. KDD 2011

Bird images from http://www.mytwitterlayout.com/
Social interaction: who has the lead?

Communicative behaviors are “patterned and coordinated, like a dance” [Niederhoffer and Pennebaker, ‘02]
Social interaction: who has the lead?

Communicative behaviors are “patterned and coordinated, like a dance” [Niederhoffer and Pennebaker, ‘02]
Social interaction: who has the lead?

Communicative behaviors are “patterned and coordinated, like a dance” [Niederhoffer and Pennebaker, ‘02]

Those with less power tend to *immediately match* the function-word choices of those with more power. [C. Danescu-Niculescu-Mizil et al. WWW 2012]
Moderator asked what?
What does a word mean?
What does a word mean?
What does a word mean?
What does a word mean?
What does a word mean?
What does a word mean?
Where’s a word on Earth?
Where’s a word on Earth?
Where’s a word on Earth?
Where’s a word on Earth?
Where’s a word on Earth?
Where’s a word on Earth?
Where’s a word on Earth?

- beach
- mountain
- wine
Where’s a word on Earth?

beach

mountain

wine
Where’s a word on Earth?

- beach
- mountain
- wine
- barbecue
Where's a word on Earth?
Ur so kool so I know ur in Houston
Automatic geolocation

Realtime results for storm since:2009-08-26 near:78712 within:15mi

- nanomanpap: just danced in the rain, now drying off on the porch and watching the storm, the PERFECT birthday gift!!
  Austin, TX
  Aug 27, 2009 03:23 AM GMT · from TweetDeck · Reply · View Tweet

- jamiest: To South Austin PPL, get ready, this storm is rough but we needed the rain
  Austin, TX
  Aug 27, 2009 02:56 AM GMT · from Seaway · Reply · View Tweet

- jenniferbeck: And of course the storm dies as soon as I set up my camera
  Austin, TX
  Aug 27, 2009 02:40 AM GMT · from tftl · Reply · View Tweet

- craightonpap: @Buchanen007 the storm coming in is bringing cold weather
  Phone: 512-266-3989, 87-732-8284
  Aug 27, 2009 02:28 AM GMT · from TwitterForiPhone · Reply · View Tweet · Show Conversation

- sahara: At the showdown, er, little woodrow's on Guadalupe listening to the approaching storm, and weezie.
  Austin, Texas
  Aug 27, 2009 02:26 AM GMT · from Twitter · Reply · View Tweet

- louiefla: the storm is just skirring by every ranch, cool lightning though.
  Austin, TX
  Aug 27, 2009 02:25 AM GMT · from TweetDeck · Reply · View Tweet

- Chipah50: The rain storm knocked out my power
Automatic geolocation
## Mapping conflicts

<table>
<thead>
<tr>
<th>Time</th>
<th>Persons</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00:54</td>
<td>Yves</td>
<td>Could you please tell us your name?</td>
</tr>
<tr>
<td>00:00:55</td>
<td></td>
<td>My name is [redacted], during the war I was known as Gasharu ‘s/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kicina, Kicukiro secretary of uncle’s place and when the house we</td>
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<tr>
<td></td>
<td></td>
<td>were staying close by, and then the next day I left and walked,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>they brought us to a place that is close by.</td>
</tr>
<tr>
<td>00:01:36</td>
<td></td>
<td>They brought us, they attacked us, we were more than seven people</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and I passed between the dusty roads were Interahamwe, after that</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the next day I left and walked, closer to where I was staying.</td>
</tr>
<tr>
<td>00:02:11</td>
<td>Yves</td>
<td>Did you say that seven people were brought to my home?</td>
</tr>
<tr>
<td>00:02:15</td>
<td></td>
<td>More than seven people were brought to my house.</td>
</tr>
</tbody>
</table>

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## The Human Rights Documentation Initiative

The Human Rights Documentation Initiative is a project of the University of Texas Libraries. The initiative aims to document human rights abuses and their impact on individuals and communities. It includes research, analysis, and documentation of incidents of human rights violations and promotes awareness and advocacy for human rights.

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## Kigali Memorial Centre

The Kigali Memorial Centre, also known as the Kigali Genocide Memorial, is a memorial in Kigali, Rwanda, established in 1994 to commemorate the victims of the 1994 Rwandan genocide. It serves as a place for remembrance, reconciliation, and learning about the genocide's causes, consequences, and how to prevent such atrocities in the future.

---

## Amazina

- **Itariki ikiganiro cyafatiweho**: [Redacted]
- **Aho ikiganiro cyafatiwe**: Kicukiro

---

### Amagambo

<table>
<thead>
<tr>
<th>Time</th>
<th>Ubaza</th>
<th>Ubaza/Uubazwa</th>
<th>Amagambo</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00:54</td>
<td>Yves</td>
<td></td>
<td>Ushobora kutubwira amazina yanyu?</td>
</tr>
<tr>
<td>00:00:55</td>
<td></td>
<td></td>
<td>Njyewe n'itwa mbyo y'aintambara mu ntambara nari nywe hano mu kagali, mbere kari Gasharu ya kabiri ariko ubu ni Kicina, umurenge wa Kicukiro, akare ke Kicukiro. Nabora kwa maruruto nono intambara ibaye, turahunga tuva mu ru twabagamo turahunga twiyi mu yindi iki hira yayo, nono intambara zira zihita zidushoreza ziratuzana maruruto bamicira kuri etaje iki hira hano.</td>
</tr>
<tr>
<td>00:01:36</td>
<td></td>
<td></td>
<td>Baratuzana abandi twari kumwe babrica hano ndumwa bararengaga barindwi. Bamaze kubica ubwo nywe nahise mbackika, nyura hagati y'amuza hira aha ngera ku muhanda wa hano hepfo w'igita kuba ubwo intambara zirengaga nkicimi, zahise zimbohoza zimaze kumbohoza zirandara buracya ndagenda nsubira hepfo y'aho twabagamo.</td>
</tr>
<tr>
<td>00:02:11</td>
<td>Yves</td>
<td></td>
<td>Ahangana mwutwibywe ko haguye abantu barenga barindwi.</td>
</tr>
<tr>
<td>00:02:15</td>
<td>Serafina</td>
<td></td>
<td>Haguye abantu barenga barindwi.</td>
</tr>
</tbody>
</table>
Mapping conflicts

Kigali, Kigali, Rwanda

Stade Amahoro

Kicukiro, Kigali, Rwanda

Baratuzana abandi twari kumwe babicira hano ndumva bararengaga barindwi. Bamaze kubica ubwo njiye nahiše mbacika, nyura hagati y'amazu hiywa. aha ngera ku muhandwa wa hano hefo wigita. Ubwo interahamwe zeigenge bakicumi, zahise zimbohoza zimaze kumbohoza zirandarana buracasa ndagasa nsubira hefo y'aho twabaga.

Ahangana mwatubwiye ko hagwe abantu barenga barindwi.

Hagwe abantu barenga barindwi.
Mapping conflicts

Hôtel des Mille Collines

The Hôtel des Mille Collines is a large hotel in Kigali, the capital city of Rwanda. It became famous as the building in which more than a thousand people took refuge during the Rwandan Genocide of 1994. The story of the hotel and its manager at that time, Paul Rusesabagina, was used as the basis of the film Hotel Rwanda.

Full Article

All text is available under the terms of the GNU Free Documentation License.
Temporality of words, by hour
http://www.tweetolife.com/hour/
Temporality of words, by hour

http://www.tweetolife.com/hour/
Temporality of expressions, by day:
http://www.google.com/trends
Temporality of expressions, by day:

http://www.google.com/trends
He says, she says

http://www.tweetolife.com/gender/
public service announcement
Mistakes are consequential

http://davidrothman.net/2009/09/02/all-your-healthbase-are-belong-to-us-want-em-back/
Being right can be consequential too
Being right can be consequential too
Being right can be consequential too
Being right can be consequential too
Being right can be consequential too
Being right can be consequential too
Being right can be consequential too

Narayanan et al 2012: “On the Feasibility of Internet-Scale Author Identification”
Being right can be consequential too

Narayanan et al 2012: “On the Feasibility of Internet-Scale Author Identification”
People get language rong two

“The Onion” Strikes Again!

Planned Parenthood Opens $8 Billion Abortionplex
www.theonion.com
TOPEKA, KS—Planned Parenthood announced Tuesday the grand opening of its long-planned $8 billion Abortionplex, a sprawling abortion facility that will allow the organization to terminate unborn lives with an efficiency never before thought possible....

Planned Parenthood’s Auschwitz. Who would have thought!

An 8 BILLION DOLLAR ABORTIONPLEX??? This has to be stopped!!!!
wrapping up
Some final text (finally)

- Things are moving fast
  - learning
  - scalability, both data and computation
  - depth of representation
- An example - NLP for medical records in health care:
  - Philip Resnik today at 12:30pm, AT&T 2ND Floor Rm 204
  - “Language Technology and the Clinical Narrative”
We may hope that machines will eventually compete with men in all purely intellectual fields. But which are the best ones to start with? Even this is a difficult decision.... I do not know what the right answer is, but I think [different] approaches should be tried.
Why is this man smiling?

We may hope that machines will eventually compete with men in all purely intellectual fields. But which are the best ones to start with? Even this is a difficult decision.... I do not know what the right answer is, but I think [different] approaches should be tried.

We can only see a short distance ahead, but we can see plenty there that needs to be done.