

# Sarcasm and Subtlety:

Social language, human behavior and  
sentiment

UC Santa Cruz

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Linguistics & Computer Science



VOTER NEWS SERVICE



YOUR ANSWERS ARE  
CONFIDENTIAL

DEMOCRATIC PRIMARY

[A] Are you:

1 ☐ Male 2 ☐ Female

[H] To which age group do you belong?

1 ☐ 17-24 5 ☐ 45-49

2 ☐ 25-29 6 ☐ 50-59

[B] Are you:



"I'm not as much undecided as I am totally disgusted."

3 ☐ Other Christian 6 ☐ None

[G] Do you approve or disapprove of the way  
Hillary Rodham Clinton is handling her role as  
first lady?

1 ☐ Approve 2 ☐ Disapprove

2 ☐ \$15,000-\$29,999 5 ☐ \$75,000-\$99,999

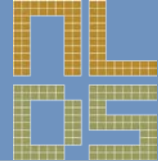
3 ☐ \$30,000-\$49,999 6 ☐ \$100,000 or more

Please fold the questionnaire and put it in the box. Thank you.

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NEW HAMPSHIRE (D-G-96)

# The Modern Soapbox



- 100Ks of discussions
- Millions of posts
- Any conceivable topic

About Open Debates Competitive Debates King of the H

A New Way to Argue  
Debate online, Vote online



Most Popular OPEN Debates  
Ninjas versus Pirates

Topic	IAC	CD	Total
Evolution	43,191	433	43,624
Gun Control	36,194	1,908	38,102
Abortion	37,358	0	37,358
Gay Marriage	19,843	2,582	22,425
Existence of God	7,071	4,304	11,375
Death Penalty	3,003	2,280	5,283
Climate Change	2,712	724	3,436

# #deathpenalty

Top

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**#SilentWitness** @snaomi1998 · 29m

[kspr.com/content/news/A...](https://kspr.com/content/news/A...)

#SilentWitness #TimeForChanges #JusticeReform #USA #AbolishDeathPenalty  
#DeathRow #deathpenalty #EndDeathPenalty



In reply to Lucas



**C19H28O2 + C18H**

@lenlucas46 @Lea  
penalty for the guilt



**Andrew Novak** @a

#Uganda: Governm  
#deathpenalty alla



**Khabar** @KhabarEU · 2h

Corruption cases involving 3 million yuan (\$463,000) or more may incur

#deathpenalty

#China

Read:



**China sets death penalty threshold - Khabar.eu**

Corruption cases involving three million yuan (\$463,000) or more may incur the death penalty in future, Chinese authorities ruled Monday.

[khabar.eu](https://khabar.eu)



protest the death

[View conversation](#)

Death Penalty

[:a](#)

[View summary](#)

# How can we learn what someone feels from what they say?

Introducing  
**sysomos** SCOUT

Get early access to Sysomos Scout (Beta)

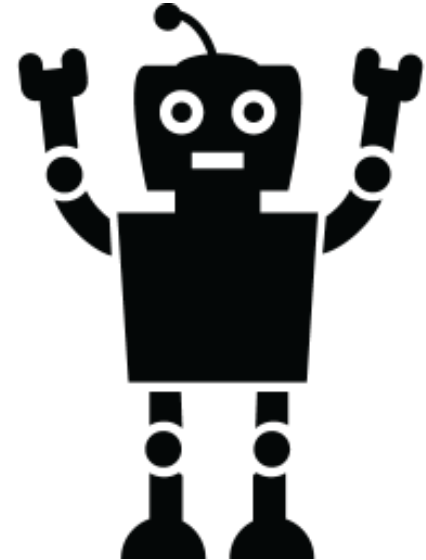
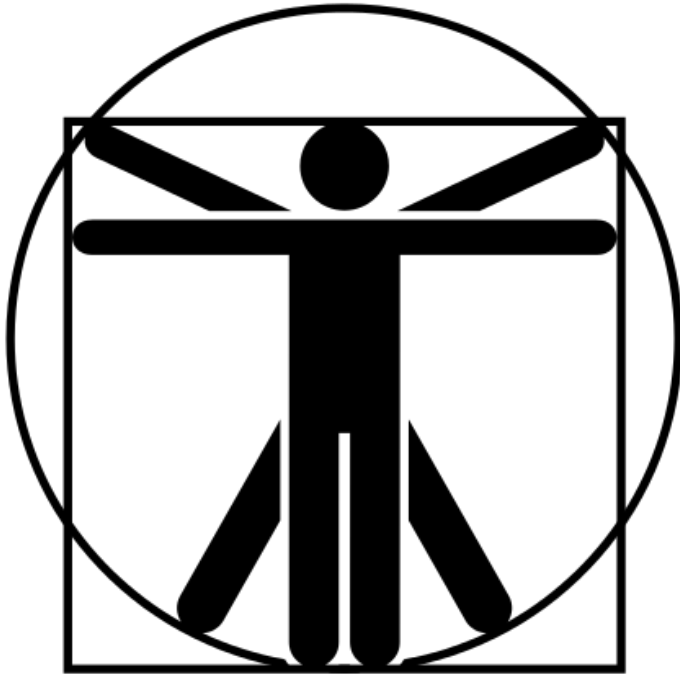
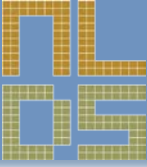
and access Facebook and Twitter before



GeneralSentiment

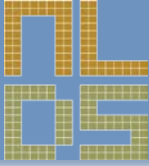
Simply Measured

# Language of opinions, thoughts and feelings





# Language of opinions, thoughts and feelings



- Rich and subtle
- Creative
- High level representation of thought





I'm out of gas

*Please help me get gas*

It's cold in here!

*Please close the window*

I'm not happy

*I'm unhappy*

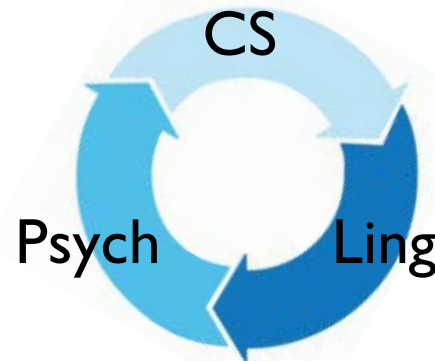
France is a hexagon

*France resembles a hexagon*

If you *now* the lawn, I'll give you \$5.

*If you don't mow the lawn, I won't.*

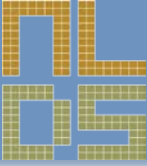
Can't capture rich and subtle  
language by being pragmatically  
poor.



# The research potential

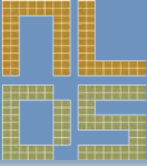
- Language of social media has unique properties: e.g. social, dialogic, emotional, informal
- Never had this scale/variety of data for building and testing models of dialogue
- Many open research problems
- **NSF IIS-1302668: Collaborative Research: RI: Processing Opinion Sharing Dialogue in Social Media** (Walker, Anand, Fox Tree, Whittaker @UCSC)

# Our research agenda

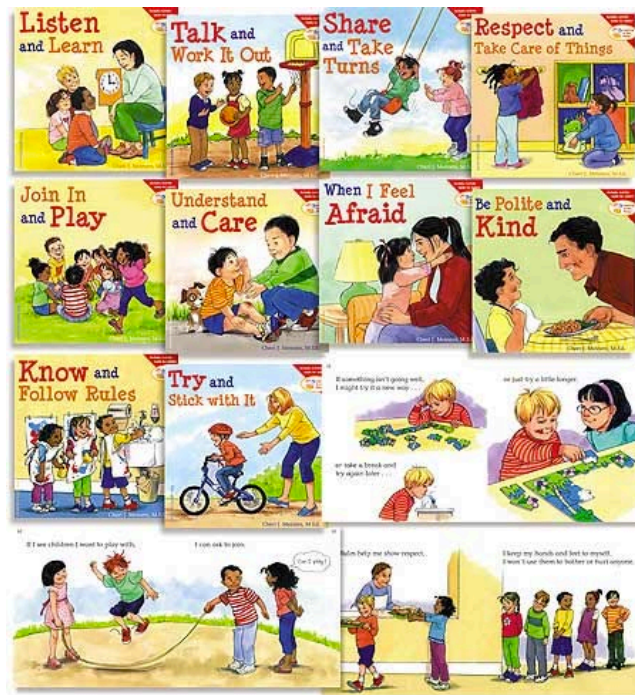


- Build classifiers for dialogue categories
  - Agreement/Disagreement
  - Factual vs. Emotional Arguments
  - Author mood/affect
  - Sarcasm
- Build corpora of dialogue and informal language (<https://nlds.soe.ucsc.edu>)
- Build theoretical insight about pragmatics of informal dialogue

# Our research approach



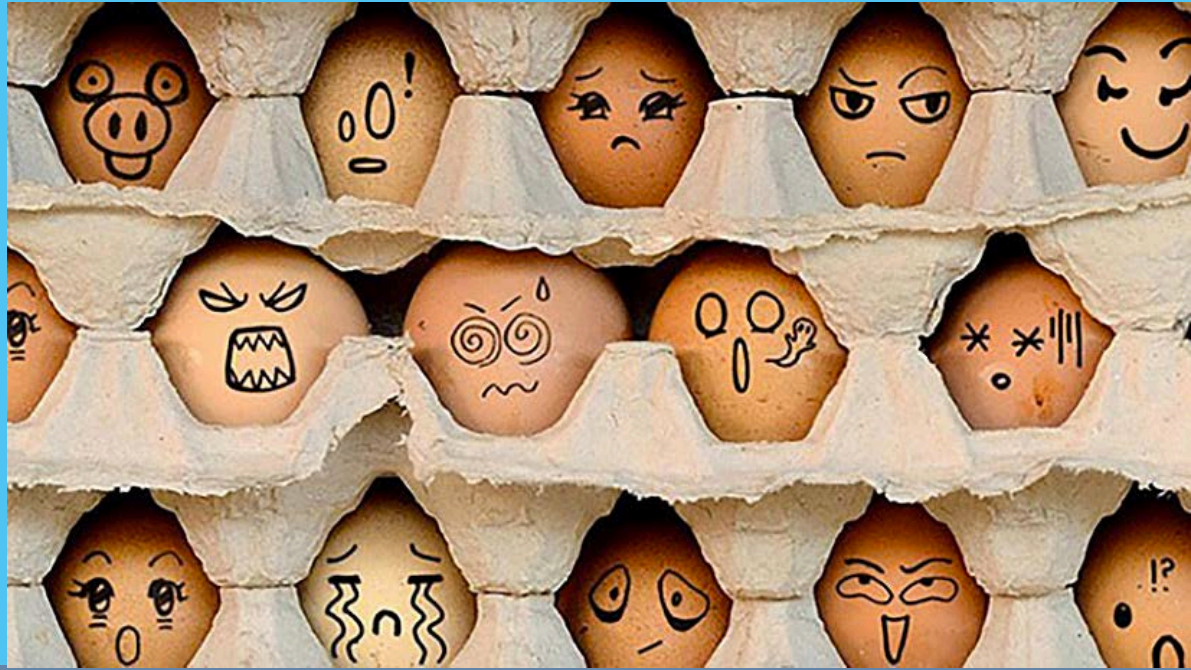
- Hybrid of linguistic analysis and machine learning
- Want to arrive at basic psychological reasoning
  - At the level of a 7 year old
  - About daily life experiences



- Compositional pragmatics for sentiment
- Sarcasm via bootstrapping

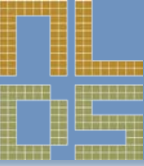


# Sentiment Analysis



NATURAL LANGUAGE  
AND DIALOGUE  
SYSTEMS  
UC SANTA CRUZ

# A common approach to sentiment



Look at sentiment words to figure out emotion




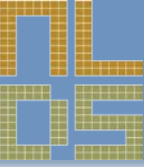
Extremely **poor** made. On the top of the hammer, it has a hollow I hole and the manufacturer just filled it with brown **messy** glue?.

**negative opinion**

I got this little hammer for jewelry stamping and it's **wonderful**! It's just the right size and has **enough** weight to it that I don't have to **slam** it down to get a **good** impression. The handle is also a **great** size and fits **well** in my hand.

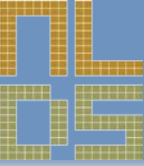
**positive opinion**

# A common approach to sentiment



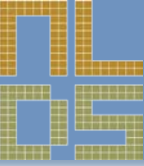
Give me a dictionary long enough  
and a counter big enough and I shall  
know what the world thinks.

# An Example



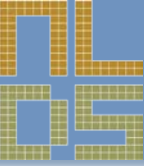
Trump beat Cruz yesterday.

# An Example



Trump smoked Cruz yesterday.

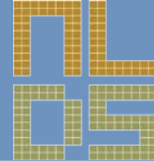
# An Example



My guy Trump beat Cruz yesterday.



# Semantics of Benefit and Loss



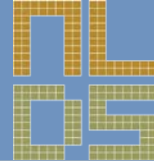
Trump beat Cruz

Trump won benefit

Cruz lost loss



# Psychology of Benefit and Loss



Trump beat Cruz

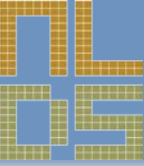
Trump won      benefit

Cruz lost      loss



- Author's opinion of event: contingent on feelings towards **beneficiary** and **loser**

# Psychology of Benefit and Loss



Trump beat Cruz

Trump



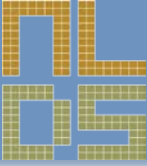
Cruz



Trump beat Cruz



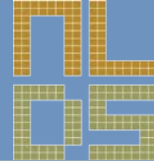
# Psychology of Benefit and Loss



X beat Y

X	Y	X beat Y
+	-	+
-	+	-
-	-	?????

# Psychology of Benefit and Loss



$x$	$E_{existing}$	$E_{non-existent}$	$E_{+property}$	$E_{-property}$
+	+	-	+	-
-	-	+	-	+

EXISTENCE: A participant has/lacks existence.

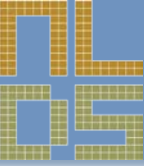
POSSESSION: One participant has/lacks possession of another.

AFFECTEDNESS: A participant has a positive/negative property.

$x$	$y$	$E_{have}$	$E_{lack}$	$E_{withhold}$	$E_{deprive}$	$E_{spare}$
+	+	+	-	-	-	#
+	-	-	+	+	#	+
-	+	-	+	+	+	#
-	-	+	-	-	-	-
VERB CLASS		RESULT STATE		FUNCTOR		
creation		existence		$E_{existing}$		
destruction		existence		$E_{non-existent}$		
gain		possession		$E_{have}$		
loss		possession		$E_{lack}$		
benefit		affectedness		$E_{positive}$		
injury		affectedness		$E_{negative}$		

Anand & Reschke (2009)

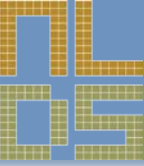
# Political Ads from 2008 Race



Reschke & Anand (2011)



# Tweets from the NH primary



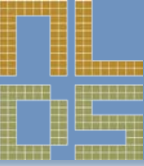
Even though I'm upset that Trump won, I'm pretty happy that Christie got walloped.

I certainly am happy that Clinton has some competition

I am worried that cruz will eviscerate trump

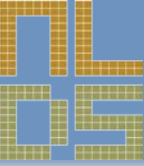
I want Trump to win the Republican nomination.

# Tweets from the NH primary



I am happy that Clinton has competition

# Tweets from the NH primary



+ event

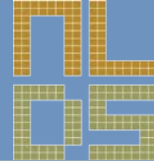
I am happy that [ Clinton has competition ]

+ event

I am happy that [ Clinton has competition ]

x	competition
+	-
-	+

# Tweets from the NH primary

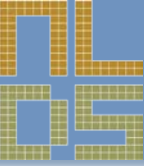


+ event

I am happy that [ Clinton has competition ]

x	competition
+	-
-	+

# Tweets from the NH primary



Even though I'm upset that **Trump** won, I'm pretty happy that **Christie** got walloped.

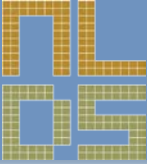
I certainly am happy that **Clinton** has some competition

I am worried that **cruz** will eviscerate **trump**

I want **Trump** to win the Republican nomination.



# First person shortcut



- “I” in a comment always marks a +
- Lots of examples in **first person blog** posts
- Lets us learn types of events easier
  - Don’t have to worry if a + event has to do with a – participant
  - Can learn “self-helping” and “self-hurting” events

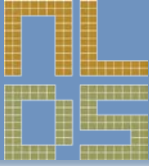
I got a promotion!

I was fired

I had drinks with some friends

I was stood up

# First person shortcut to events (blogs)



Positive	Negative
HEADED HOME	LOST JOB
PLAYS	KILLING ME
GRILLED	DIAGNOSED WITH
SHARE	HATE MYSELF
TAKE PICTURES	NOT LOVE ME
THRILLED	LOVED YOU
PARTICIPATED IN	SCREAMING
DANCED	NOT HELP IT
SURPRISED BY	WANT CRY
RECOMMEND	CHEATER

- Positive matches contain more action-rich verbs
- Negative matches are more related to personal feelings

Sarcasm

TODAY'S MOOD  
FORECAST...

**BITCHY WITH A CHANCE  
OF SARCASM.**

STIRR OF ECHOES



NATURAL LANGUAGE  
AND DIALOGUE  
SYSTEMS  
UC SANTA CRUZ

# Sarcasm, new and old

**OH YOU HATE  
FACEBOOK?**

**PLEASE, POST ANOTHER STATUS ALL**

**FIRST LINE**

**SECOND LINE**

**"LIKE THIS IF YOU HATE  
CANCER"**

A MODEST  
**PROPOSAL**  
For preventing the  
**CHILDREN**  
OF  
**POOR PEOPLE**

From being a  
Burthen to their Parents,  
OR THE  
**COUNTRY,**  
AND  
For making them Benefical to the  
PUBLICK.

DUBLIN:  
Printed by S. Harding, opposite the Horse and  
Van near Fiddle-Street, on the Blind Key.  
MDCCLXXIX.

RENCE IN

**YOU THINK PLAYING VIDEO GAMES AT 26  
IS IMMATURE?**

**I SHOULD BE MORE MATURE LIKE  
YOU AND WATCH JERSEY SHORE**

**YOU'RE NEW HERE**

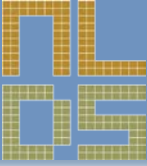
510 x 507 - diylol.com

**I HEARD YOU LIKE CANDY**

Forgive me if I doubt your sincerity, but you seem like a troll to me. I suspect that you aren't interested in learning about evolution at all. Your questions, while they do support your claim to know almost nothing, are pretty typical of creationist "prove it to me" questions.

Wrong again! You obviously can't recognize refutation when it's printed before you. I haven't made the tag "you liberals" derogatory. You liberals have done that to yourselves! I suppose you'd rather be called a social reformist! Actually, socialist is closer to a true description.

# Sarcasm is creative, but principled



- Classic case: contrast between a **negative situation** and a **positive sentiment**

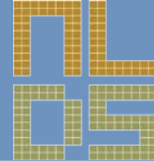
I just love **getting pulled over** its so amazing

Yay for **not having weekends**

I just love **being unfollowed**. It's my favorite thing!



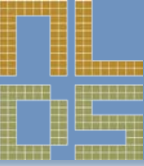
# Sarcasm is creative, but principled



- Classic case: contrast between a **negative situation** and a **positive sentiment**
- But argumentative data tends to be more complex:

**I love** how you're able to determine, not having been there, precisely what was said and precisely where it fell in relation to the law.

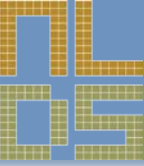
# A more complicated example



You already knew that.

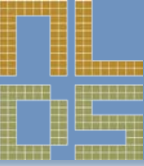


# A more complicated example



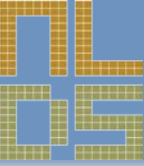
You already knew that, didn't you?

# A more complicated example



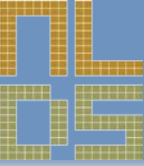
But you already knew that, didn't you?

# A more complicated example



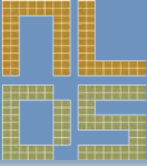
But you already knew that, didn't you, dearie?

# A more complicated example



But you (of course) already knew that, didn't you, dearie?

# Lesson: Markers of sarcasm compound



**Doubt**

**Negative Eval/Insult**

**First Person Thought**

**Downtoners**

**Quotation**

Forgive me if I **doubt** your sincerity, but you seem like a **troll** to me. I **suspect** that you aren't interested in learning about evolution at all. Your questions, while they do support your claim to **know almost nothing**, are **pretty** typical of creationist **“prove it to me”** questions.

**Exclamation**

**Adverbs of Emphasis**

**Quotation**

**Hypothetical Marker**

**Wrong again!** You **obviously** can't recognize refutation when its printed before you. I haven't made the tag **“you liberals”** derogatory. You liberals have done that to yourselves! I **suppose** you'd rather be called a social reformist! Actually, socialist is closer to a true description.

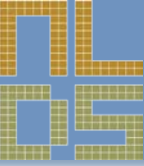
# Theoretical Models of Sarcasm

- Ironical interpretation relies on a contrast effect
- Event or Situation evokes a scale
- Event can be **placed** on that scale
- **Statement** about event contrasts with actual scale placement



Colston & O'Brian (2000)

# A general pattern of conflict



- On scale X, author simultaneously commits to
  - Sentence **high** on X
  - Sentence **low** on X

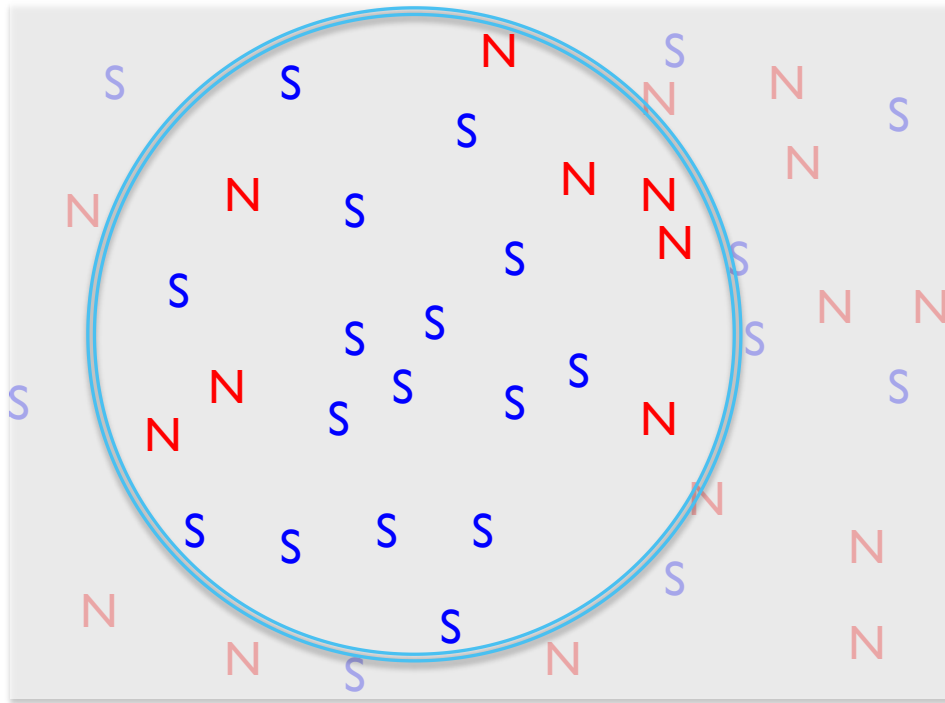
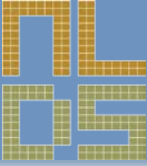
But you (**of course**) already **knew** that, **didn't you**, dearie?

I **love** how you're **able to determine**, **not having been there**, **precisely** what was said and **precisely** where it fell in relation to the law.

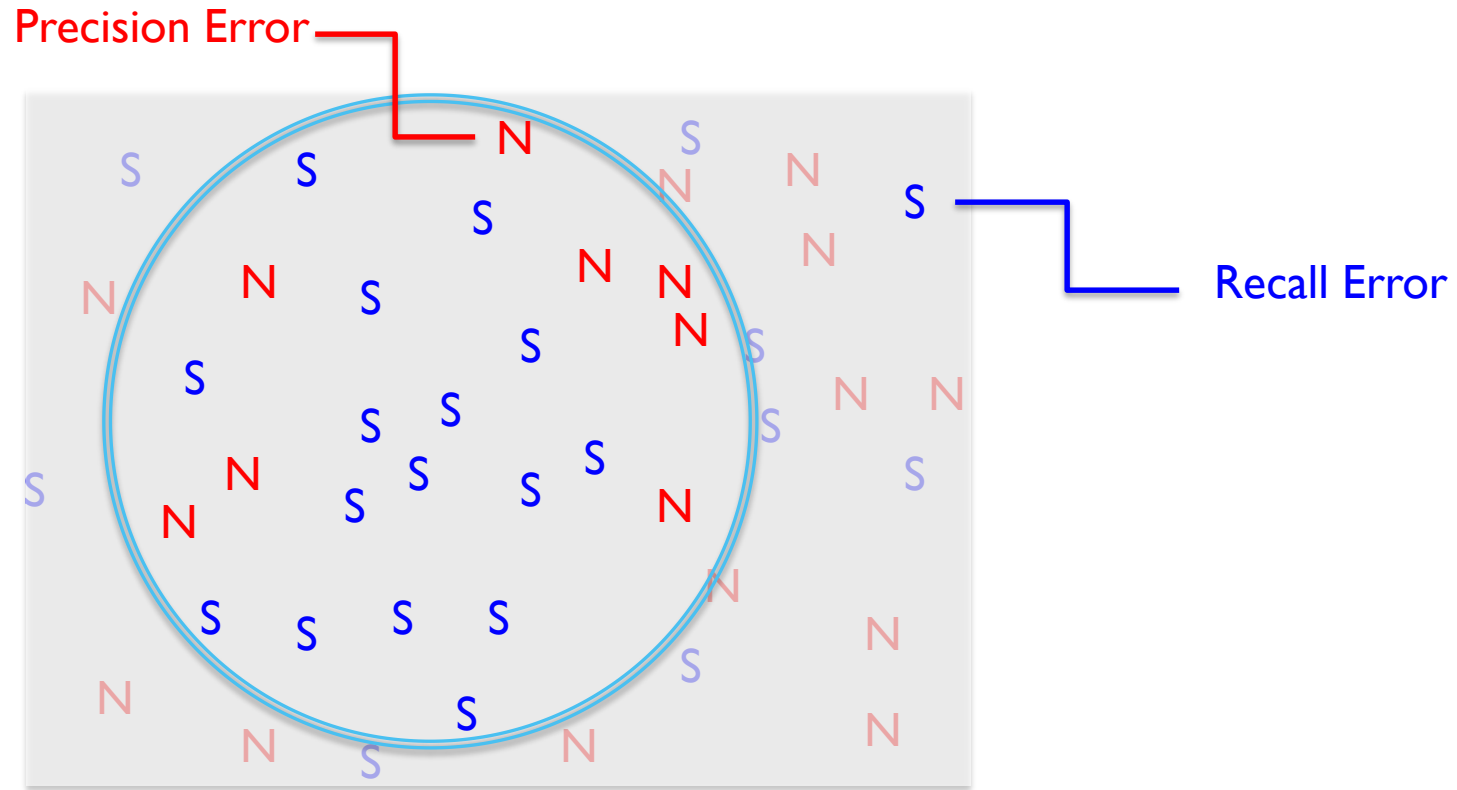
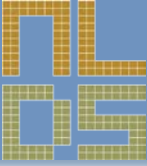




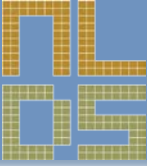
# Bootstrapping



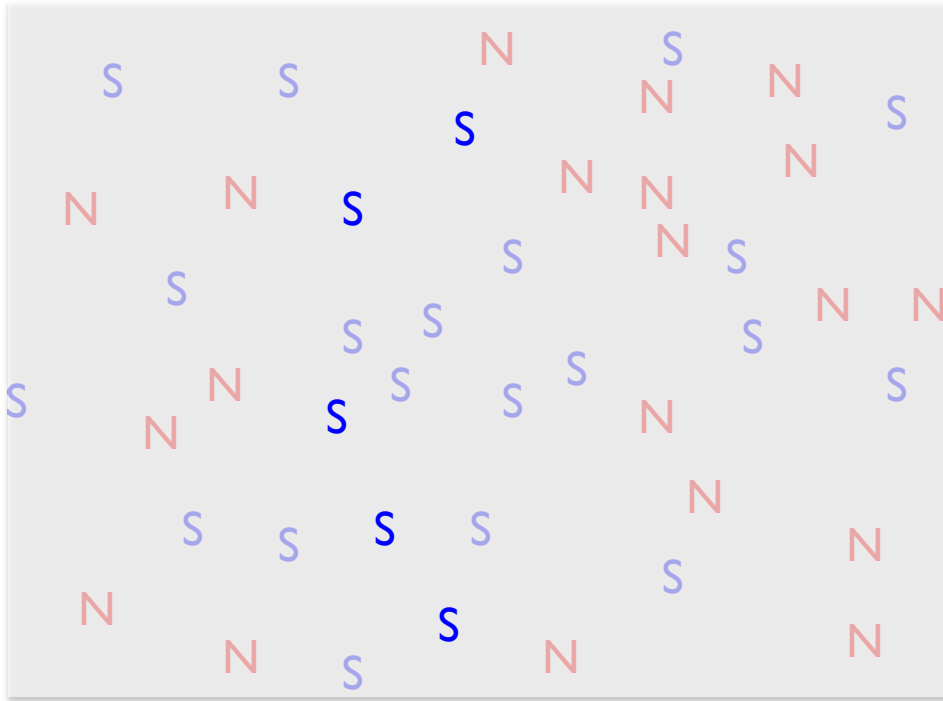
# Bootstrapping



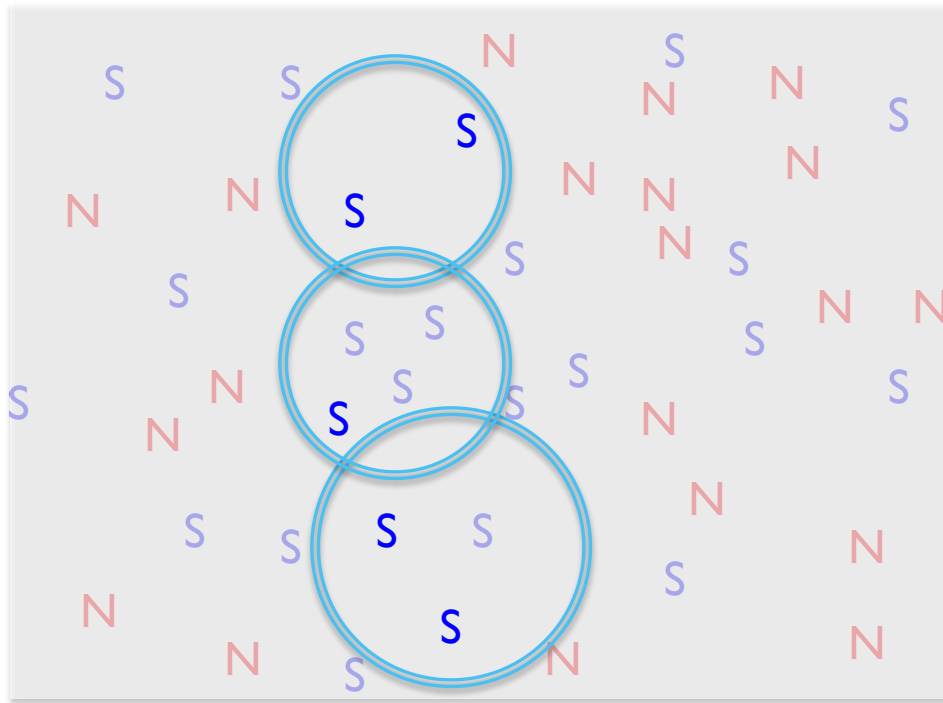
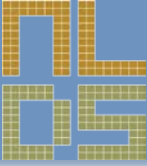
# Bootstrapping



- Start with seed terms

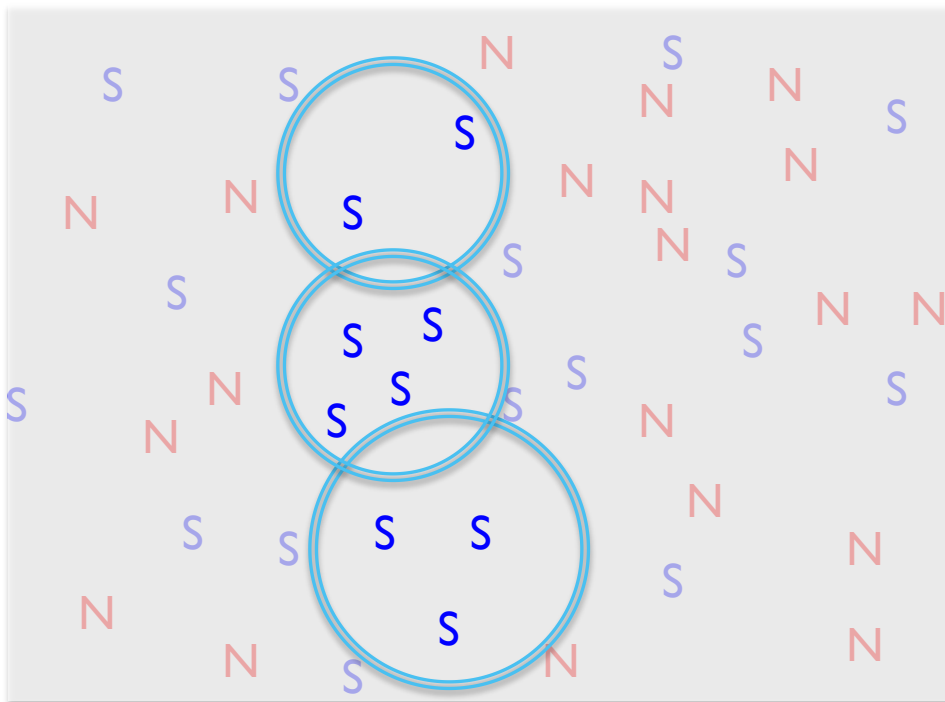
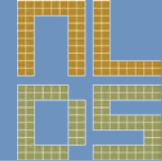


# Bootstrapping



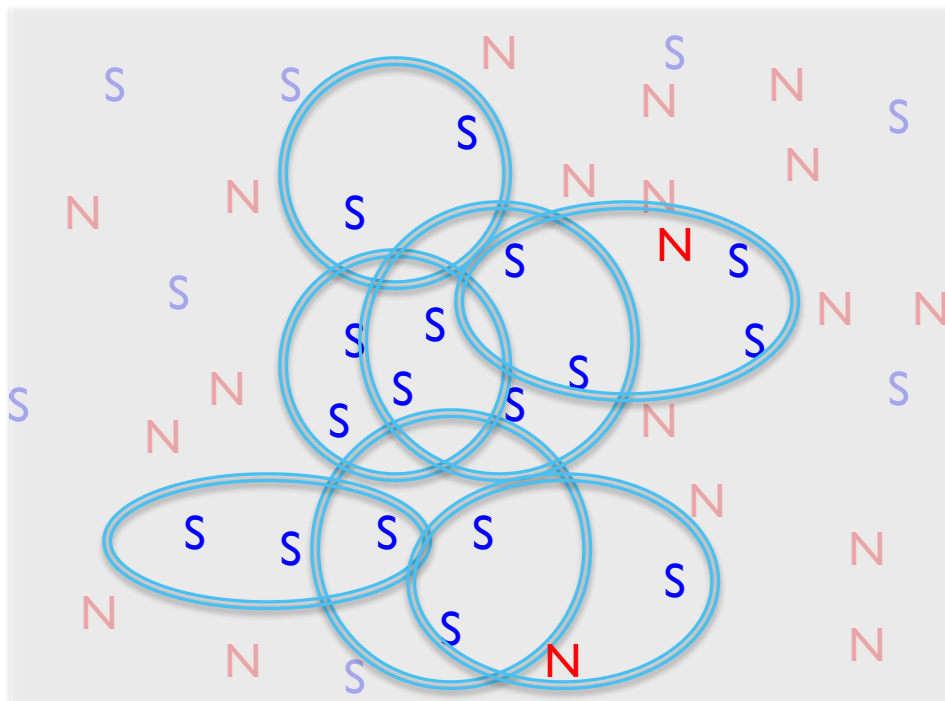
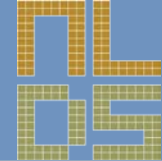
- Start with seed terms
- Learn H precision patterns for seeds

# Bootstrapping

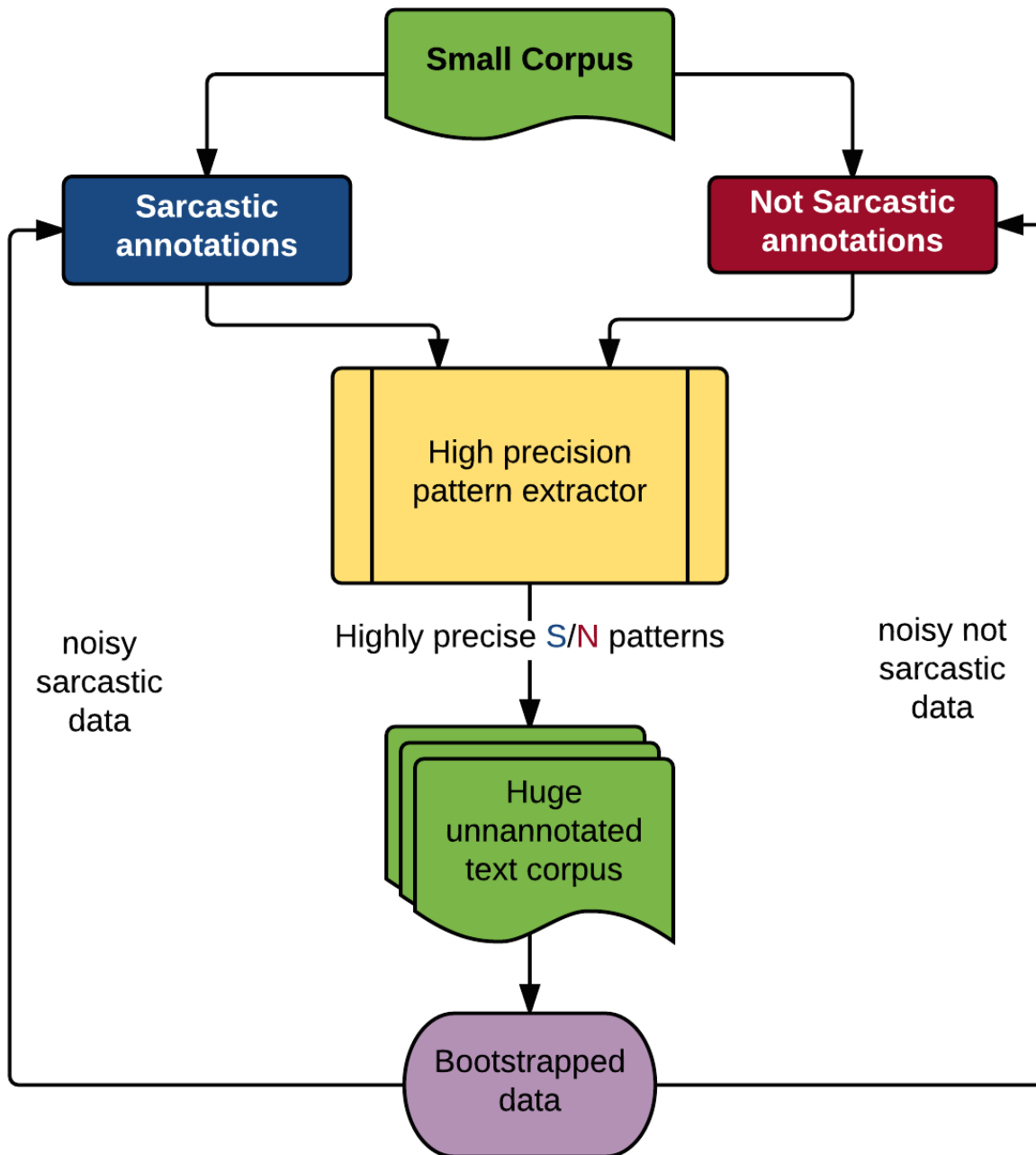


- Start with seed terms
- Learn H precision patterns for seeds
- Extract new seeds from patterns

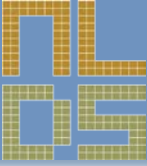
# Bootstrapping



- Start with seed terms
- Learn H precision patterns for seeds
- Extract new seeds from patterns
- Repeat!



# Linguistic Pattern Learner: AutoSlog-TS



- SUNDANCE: A shallow parser (Riloff, Phillips 2004)
- AutoSlog-TS: a weakly supervised pattern learner (Riloff, 96)
- Uses 24 syntactic templates representing **types of** linguistics pattern that get **instantiated**

Pattern Template	Example Pattern
<subj> PassVP	<subj> was observed
<subj> ActVP	<subj> observed
<subj> ActVP Dobj	<subj> want explanation
<subj> ActInfVP	<subj> expected to find
<subj> PassInfVP	<subj> was used to measure
<subj> AuxVP Dobj	<subj> was success
<subj> AuxVP Adj	<subj> is religious
ActVP <dobj>	create <dobj>
InfVP <dobj>	to limit <dobj>
ActInfVP <dobj>	like to see <dobj>
PassInfVP <dobj>	was interested to see <dobj>
Subj AuxVP <dobj>	question is <dobj>
NP Prep <np>	origins of <np>
ActVP Prep <np>	evolved from <np>
PassVP Prep <np>	was replaced by <np>
InfVP Prep <np>	to use as <np>
<possessive> NP	<possessive> son



# Sarcastic Patterns for Tweets

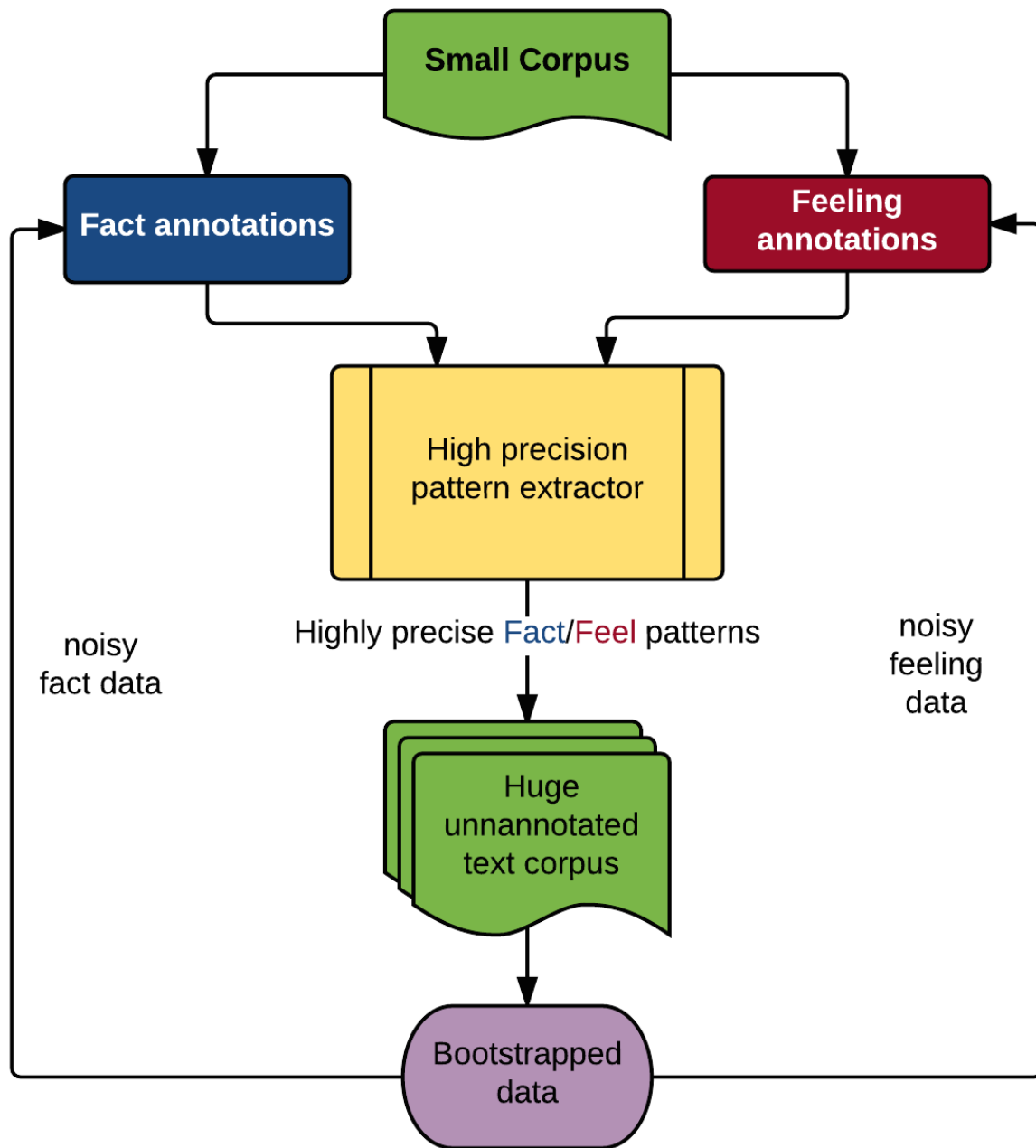
SARCASTIC				
F	P	Syntactic Template	Sample Pattern	Instantiation
34	I	2gram Adj Noun	JUST LOVE	I just love getting pulled over its so amazing
30	I	2gram Adj Noun	GREAT WAY	And now I don't feel good. Fantastic. Great way to end my great day.
15	I	Np Prep <NP>	YAY FOR	Yay for not having weekends
13	0.93	2gram Adv Adv	FAVORITE THING	I just love being unfollowed. It's my favorite thing!
9	0.89	Subj AuxVP <dobj>	LOVE GETTING	I love getting up at 5am...hands down, best time to start the day

# Sarcastic Patterns for Forums

<b>F</b>	<b>P</b>	<b>Syntactic Template</b>	<b>Sample Pattern</b>	<b>Instantiation</b>
8	I	ActVp Prep <NP>	SAY ABOUT	You sure you weren't on a sub? You know what they say about submariners, right?
8	I	2gram Adj Noun	YOUR HEAD	Oh man Easy now I KNOW you were dropped on your head as a child....
7	I	ActVp Prep <NP>	GET OVER	Yea they get over it in a year or two. Haaa Haaa
7	I	2gram Adv Adv	AH YES	Ah yes, your diversionary tactics. I am sure if I provided it, you would move the goal posts, or demand evidence that you know is not yet available..

# Not Sarcastic Patterns for Forums

F	P	Syntactic Template	Sample Pattern	Instantiation
31	1	2gram Adj Noun	NATURAL SELECTION	As was pointed out in some of your own quotations, survival is not an 'end' of natural selection.
11	1	2gramAdjNoun	BIG BANG	There are certainly other theories, but the big bang is the only one supported by the evidence.
9	1	Np Prep <NP>	PURPOSE OF	Since the original purpose of the Second Amendment doesn't appear to be needed, there is a new use that is protected.
9	1	Np Prep <NP>	EVOLUTION OF	We can see the evolution of organisms in the world today.
4	1	Np Prep <NP>	SPECIES OF	There is no evidence of any interim species of apes and humans.
24	0.92	Np Prep <NP>	THEORY OF	Eleven years is quite swift, but it actually supports the theory of evolution through natural selection.
16	0.81	infinitiveverb <doobj>	EXPLAIN	Demographics plays a role, but it does not explain away the whole shift in the numbers.



# Learned Patterns for Factual vs. Feeling

	Pattern	Text Match	Sentence Match
FACT	NP Prep <np>	SPECIES OF	Because specific <b>species of</b> horses only exist at certain periods in the geological record.
	<subj> PassVP	EXPLANATION OF	So basically you are saying that evolution is the one and only true <b>explanation of</b> how we came to be, and that it is okay for the schools to force students to accept this fact.
	<subj> AuxVPDobj	BE EVIDENCE	Contradiction in science <b>is not evidence</b> of doubt.
FEEL	Adj Noun	MY ARGUMENT	<b>My arguments</b> are completely solid, and you haven't even gotten close to refuting them.
	<subj> AuxVP Adj	BE ABSURD	Funny enough there wasn't a single scientific fact presented to support creationism, they merely tried to use science to disprove evolution. Which <b>is absurd</b> , given that all their facts were wrong.
	Adv Adj	MORALLY WRONG	Since the fetus was already dead, then besides inappropriate use of a dead human body I cannot think of anything <b>morally wrong</b> with it

# Fine-grained Grammatical Patterns

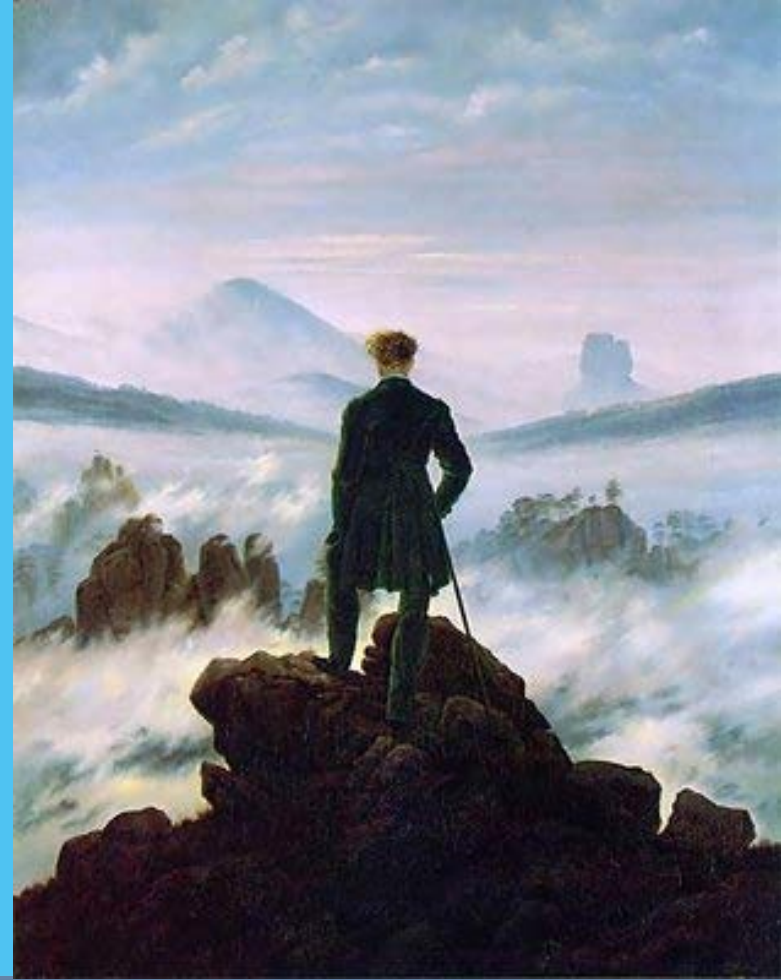
- **“OF”** as a preposition:
  - Observed to attach to objective terminology in **factual** arguments
- **“FOR”** as a preposition:
  - Observed to express advocacy or refer to population groups in **feeling**-based arguments

FACT “OF” Phrases	FEEL “FOR” Phrases
RESULT OF	MARRIAGE FOR
ORIGIN OF	STANDING FOR
THEORY OF	SAME FOR
EVIDENCE OF	TREATMENT FOR
PARTS OF	DEMAND FOR
EVOLUTION OF	ATTENTION FOR
PERCENT OF	ADVOCATE FOR
THOUSANDS OF	NO EVIDENCE FOR
EXAMPLE OF	JUSTIFICATION FOR
LAW OF	EXCUSE FOR

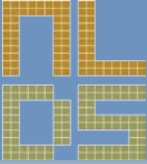
High-Probability FACT Phrases with “OF”  
and FEEL Phrases with “FOR”

Oraby et al. (2015)

Upshot



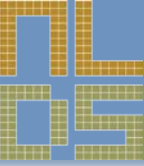
# What tools do we need?



- Tracking arguments
  - commonsense-event outcomes
  - abstract logic of argument frames and types
  - techniques to recognize and extract arguments
- Sarcasm
  - commonsense-event outcomes
  - knowing how people talk about events
  - models robust to creative productivity
- Tracking mood in narratives
  - commonsense-event outcomes
  - knowing how people think of complex mental states
  - knowing how people construct stories

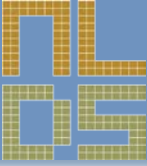


# What tools do we need?



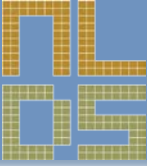
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# Some potential applications



- Higher quality and more meaningful interactions with machines
  - Eliminate and/or interpret sarcastic information
  - Mood-guided responses
  - Provide digests of online discussions
- Discover new ideas that matter
- Enable design of “proactive positive planning” systems, which curate events that help w/ mood

# Common theme



- What we are looking for:
  - the affect people have to common life events
  - the “obvious” of human psychology
- Different from other cases of “world knowledge” in artificial intelligence
  - not about the physical world, but the emotional/ethical
  - varies from person to person
    - Is life sacred?
    - How does being alone make you feel?

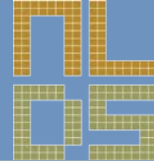


UC SANTA CRUZ

What kind of  
educational training  
should we be giving to students?

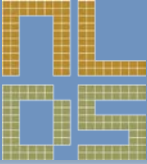


# Open questions



- Assuming Machine Learning/Data Science/Corpus Linguistics, what else is desirable?
- We feel interdisciplinary training is useful, do you?
- How important is knowledge of linguistic syntax and semantics?
  - Know the difference between a syntactic and semantic head?
  - Know different verb types, lexical relations, etc.
- How important is knowledge of pragmatic and discourse categories?
  - Know what a tag question is? What discourse markers do?

# Programs completed and in progress



- Designated Emphasis in CL and NLP
  - can be added to any program in CS or Ling
- M.S. in Data Science
  - NLP Track: Core NLP, Information extraction, Information Retrieval, Data Mining (no linguistics)
- NLP M.S./M.A. ?
  - Some classes from M.S. in Data Science + some Linguistics