

Moving from Sentiment Detection to
Sentiment Explanation:
On Subjectivity, Sentiment, and Emotion

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Though they both hated the cruise, he enjoyed the food and she liked the casino.

She didn't mind the cruise, but was only really happy at the casino.



lan

Should i stop smoking even though i like it?

im 37 and smoked since i was 8.i know i should stop if i want a better life but i like the feeling it gives and to be honest ive never known any differance,should i stop

2 weeks ago (Tiebreaker)

[Report Abuse](#)

i have been working as a stylist at great clips for about 7 months now. i like it and i hate it at the same time. i like it cuz most of the time i only have to work a 6 hour shift and i get tips from customers but i hate it cuz i dont really like being close to strangers and i hate getting hair all over my clothes, shoes, face and hands. So i was curious, what kind of jobs does everyone have and what they like and dislike about their jobs.

The movement.... er... sometimes I like it and sometimes I hate it. It would've been soooooo much better if they used head tracking rather than rotating the shoulders. But I do think it's neat to actually do things like doing a door gesture to open a door.

Why i won't buy this game even though i like it.

Atari and the cryptic studios fiasco - no one is sure if the game will end up like APB leaving lifetime subscribers and loyal customers

Monthly fees - i would rather pay outright for a game, not the time spent on it active.

Credit card purchase only - I know you can cancel your CC but it's a waste of money wasted running through hoops.

Reviews - nearly every review i have read or seen online view the game is even for an MMO.

What facets are here? "Hair on my shoes" — hard to represent!

Opinions change depending on circumstances

It's not enough just to say "Positive" — nothing here is simply 'positive'

Star ratings...but what do the stars mean?

278. Pizza Rustica

Category: [Pizza](#)

Neighborhood: [West Hollywood](#)

 52 reviews
8908 Santa Monica Blvd
West Hollywood, CA 90069
(310) 360-0313

only 3 stars,
bad location



Only downside is the neighborhood, But the Pizza is Xcelent!! I have loved this chain ever since trying it down in South Beach, Some of the best pizza around..... They serve beer and...

279. North End Pizzeria

Category: [Pizza](#)

Neighborhood: [Burbank](#)

 61 reviews
212 E Orange Grove Ave
Burbank, CA 91502
(818) 557-8325

3 stars, so
what's wrong?



Well, this is one great pizza joint. Nice parlor feel, with a little outdoor area. In fact, as of this moment, this is one of my top 3 pizza spots in all of LA. The "North End"...

280. Johnnie's New York Pizza

Categories: [Pizza](#), [Italian](#)

 9 reviews
10401 Venice Blvd
Los Angeles, CA 90024
(310) 845-9470

3 stars, not
gourmet



You have to go into Johnnie's knowing it is NOT gourmet pizza. It's 'pizza place' pizza, as in the little pizza place that every little town has. And yes, I know it's a franchise. They...

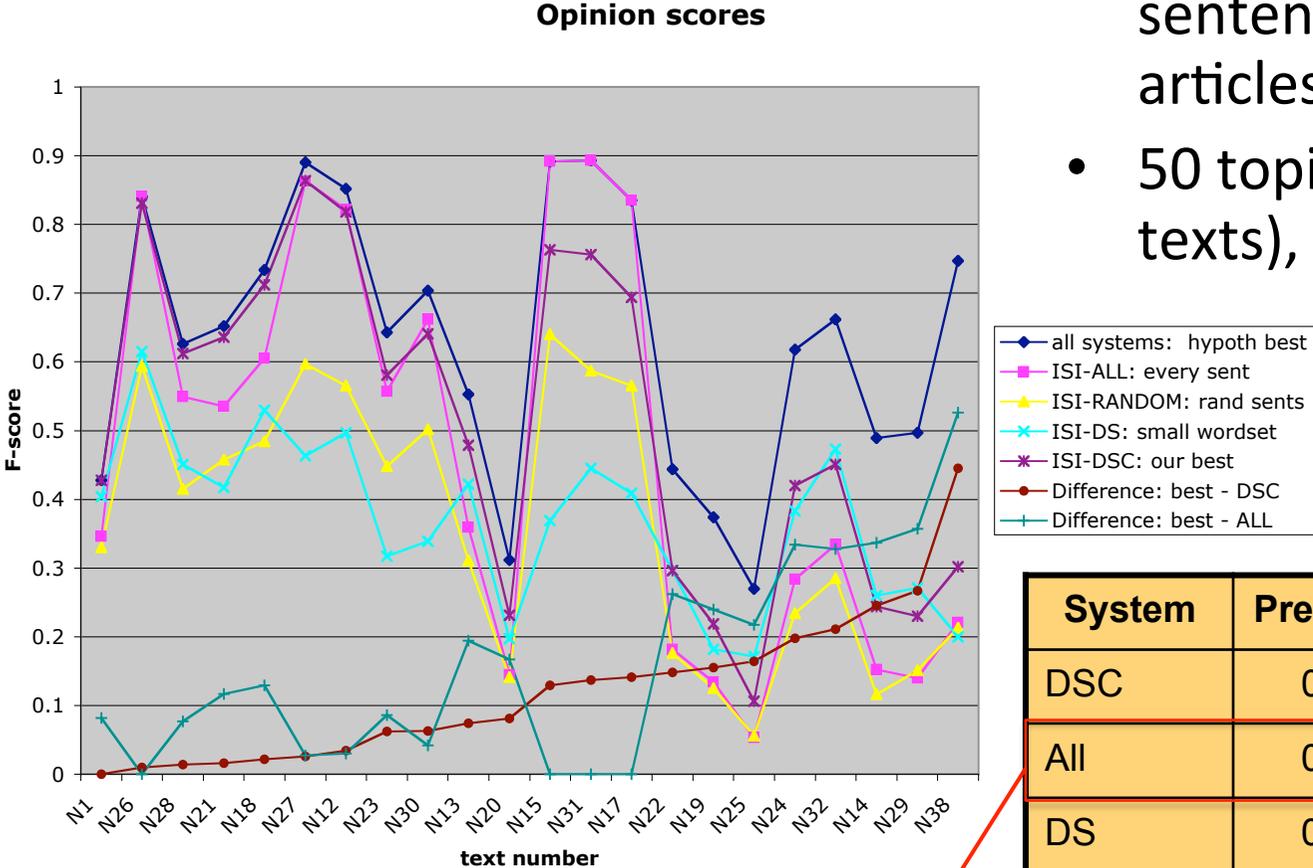
There's a lot of confusion around...

- Subjectivity: Wiebe ca. 2000
- Sentiment:
 - Valences: Pang et al. 2002
 - Holders and topics: various people; see Kim & Hovy 2004
 - Facets: various people
- Emotion: somewhere this slipped in

...so let's just talk about *opinions*

How frequent are opinions? NIST test, 2003

- Task: find opinion sentences in news articles
- 50 topics (each with ~20 texts), 55 systems



ISI results:

System	Precision	Recall	Avg F
DSC	0.53	0.83	0.597
All	0.41	1.00	0.540
DS	0.54	0.67	0.533
Random	0.41	0.50	0.409
None	0.00	0.00	0.000

Just say **everything** is an opinion!

Open questions we must answer,
if we want to know what we are talking about

Definitions:

- What are *Sentiment? Opinion? Emotion?*

Theory:

- What is the structure of these concepts?

Practice:

- Is sentiment recognition all just a matter of word-combination learning and scoring?

Evaluation:

- How do people assign values? Do they agree?

If we don't create some clarity but just proceed with intuitive definitions, we can probably never achieve consistency — therefore no scientific value

My opinion about opinion research

I think most work done today in automated
Sentiment Analysis is poor

Today I will explain why I think so
and what I think we can do about it

Types of Sentiment

- There seem to be various kinds of Sentiment:
 - **Opinions**
 - E.g., *like/dislike/mixed/don't-know... believe/disbelieve/unsure... want/don't-want/sometimes-want...*
 - What the person decides
 - **Feelings/emotions**
 - E.g., *happy/sad/angry... calm/energetic/patient/relaxed...*
 - What the person feels
- This is not a simple matter
 - Very difficult to make complete and adequate lists
 - These things are connected: cause / reinforce one another
 - Researchers in Emotion/Affect (in Psychology) have written dozens of books on this

What is an opinion?

- Merriam-Webster dictionary:
 - “A view, judgment, or appraisal formed in the mind about a particular matter”
 - “A belief stronger than an impression and less strong than positive knowledge”
- At least two kinds of opinion:
 - **Judgment**: *good, bad, desirable, disgusting...*: “The food is horrible”
 - **Belief**: *true, false, possible, likely...*: “The world is flat”

Structure of opinions

- Both Judgment and Belief opinions defined as a quadruple: [**Topic, Holder, Claim, Valence**]
 - **Topic** = theme/topic of consideration
 - **Holder** = person or organization making opinion
 - **Claim** = statement about the topic
 - **Valence** (judgment opinions):
 - *Positive* or *Negative* or *Mixed* or
 - *Neutral*: “I don’t care one way or the other about him”
 - *Unstated*: “they had strong political feelings”
 - **Valence** (belief opinions):
 - *Believed* or *Disbelieved* or *Unsure* or
 - *Neutral*: “I don’t care one way or the other about him”
 - *Unstated*: “perhaps he believed it, I don’t know”

Formal definition of opinion

An *opinion* is a **decision** made by someone (the Holder) about a topic (the Topic). This decision assigns the Topic to one of a small number of classes (the Valences) that affect the role that the topic will play in the Holder's future goals and planning decisions.

Judgment opinions express whether or not the Holder will follow **goals** to try to own/control/obtain the Topic. *Belief opinions* express whether or not the Holder will assume the Topic is **true** in later communication and reasoning.

Opinion: What about other aspects?

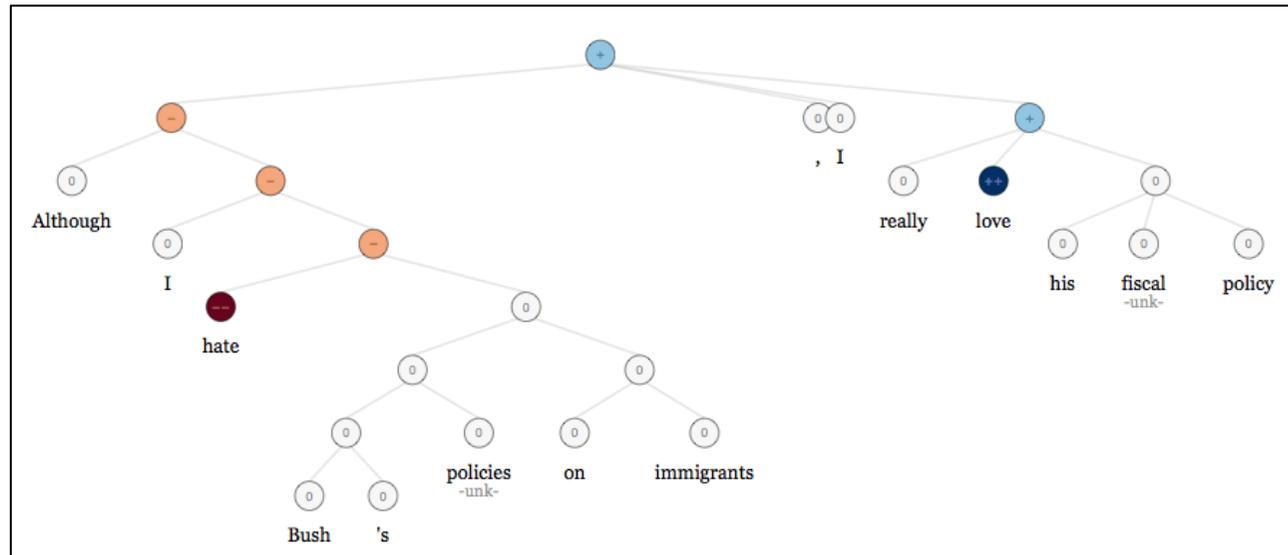
- **Strength** of opinion
 - Very hard to normalize
- **Facet(s) of topic**
 - Not “the camera” but “the weight of the camera”
 - Just a narrower topic
- **Conditions** on opinion
 - “I like it only when X” / “If X then I like it”
 - Can do, but even more complexity
- **Reasoning/warrant** for opinion
 - “The reason I like it is X”
 - Can do, and must do...

The unit of opinion expression

- **Word level:** words are clues
 - Yes: “hate”, “disgusting”, “anger”
 - No: “run”, “announce”, “tall”
- **Sentence level:** composing the words
 - Yes: “The US attack on Iraq is wrong.”
 - No: “To receive a copy of our catalogue, send mail.”
- **Text level (implicature):** composing meanings through rhetorical relations
 - “Not only did he eat the meat, he spoiled all the rest of the food as well”
 - “Sure he ate the meat. But he still didn’t clean the kitchen!”

Calculating opinions 1

- **Valence:** mostly keyword lookup, lately also neural embeddings
 - Many keyword lists; easy to build them
 - SentiWordNet and other free resources
- **Composing valences:**
 - Simple approaches just sum or multiple, or do a weighted sum
 - This does take into account the relative strengths/positions
 - Socher 2013 trains a Recursive Autoencoder

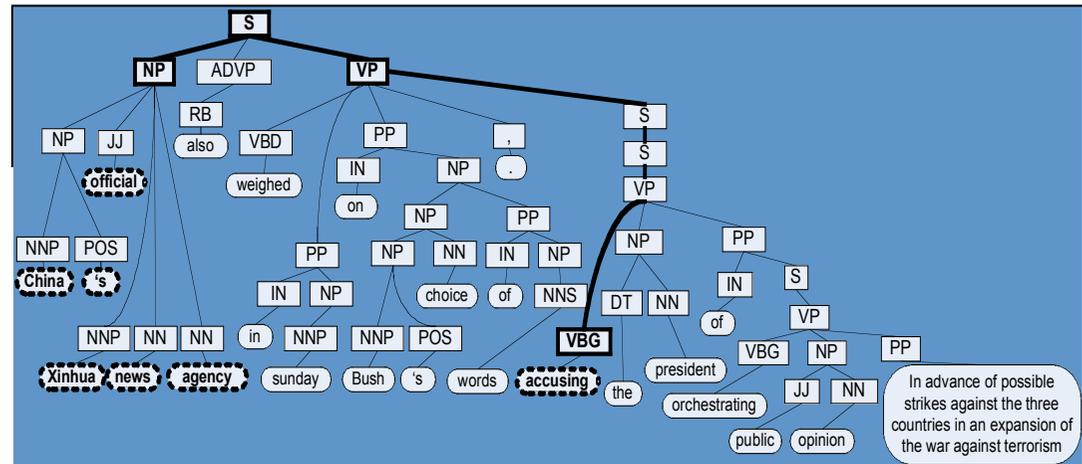


Socher: "Although I hate Bush's policies on immigration, I really love his fiscal policy"

Calculating opinions 2

- **Holder:** parse tree paths from the valence, learned
- **Topic:** parse tree path, learned

“China’s official Xinhua news agency also weighed in Sunday on Bush’s choice of words, *accusing* the president of orchestrating public opinion...” from (Kim & Hovy 2010)



- **Facet:** automatic detection using LSA or other similar ‘semantic clustering’ methods
- **Strength:** no consistency at present
- **Condition** and reason: no literature I am aware of

Going beyond simple Opinion/Sentiment

- Sentiment reflects the deeper psychological state of the author
- People give reasons why they like or dislike something, and these reasons pertain to:
 - Goals and Plans regarding future actions
 - Emotional attachments and Attitudes toward objects and people
- And **this** is what we (and companies) really want!

People differ...

I like the ABC party.
I especially hate the
foreigners



It upsets me when
people don't respect
our customs

When I get angry,
I write a letter to the
paper!

I don't care about any party
and I don't mind people
coming to help us, but I
don't like the government



It upsets me when
I see people
destroying things

When I get angry,
I join a protest
march!

I like the XYZ party
and I hate the
foreigners



It really gets me moving
when I see foreigners
controlling our stuff

And when I get
angry,
I shoot someone!

Example: Army challenge project

- Project at ISI, 2002–05
- Context: Help experts build psychological models of people in focus areas — help Army avoid mistakes
- Input: newspaper articles
- Automatically identify and extract people's *Attitudes*, *Stimuli*, and *Actions*

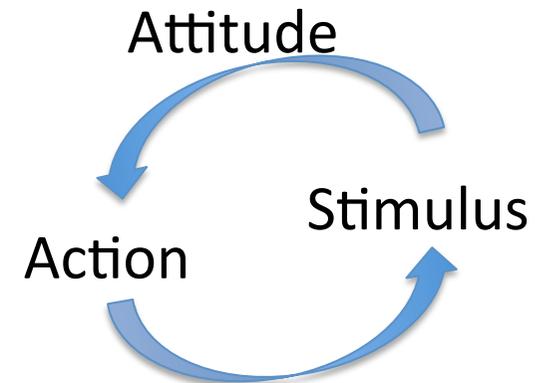


Historian

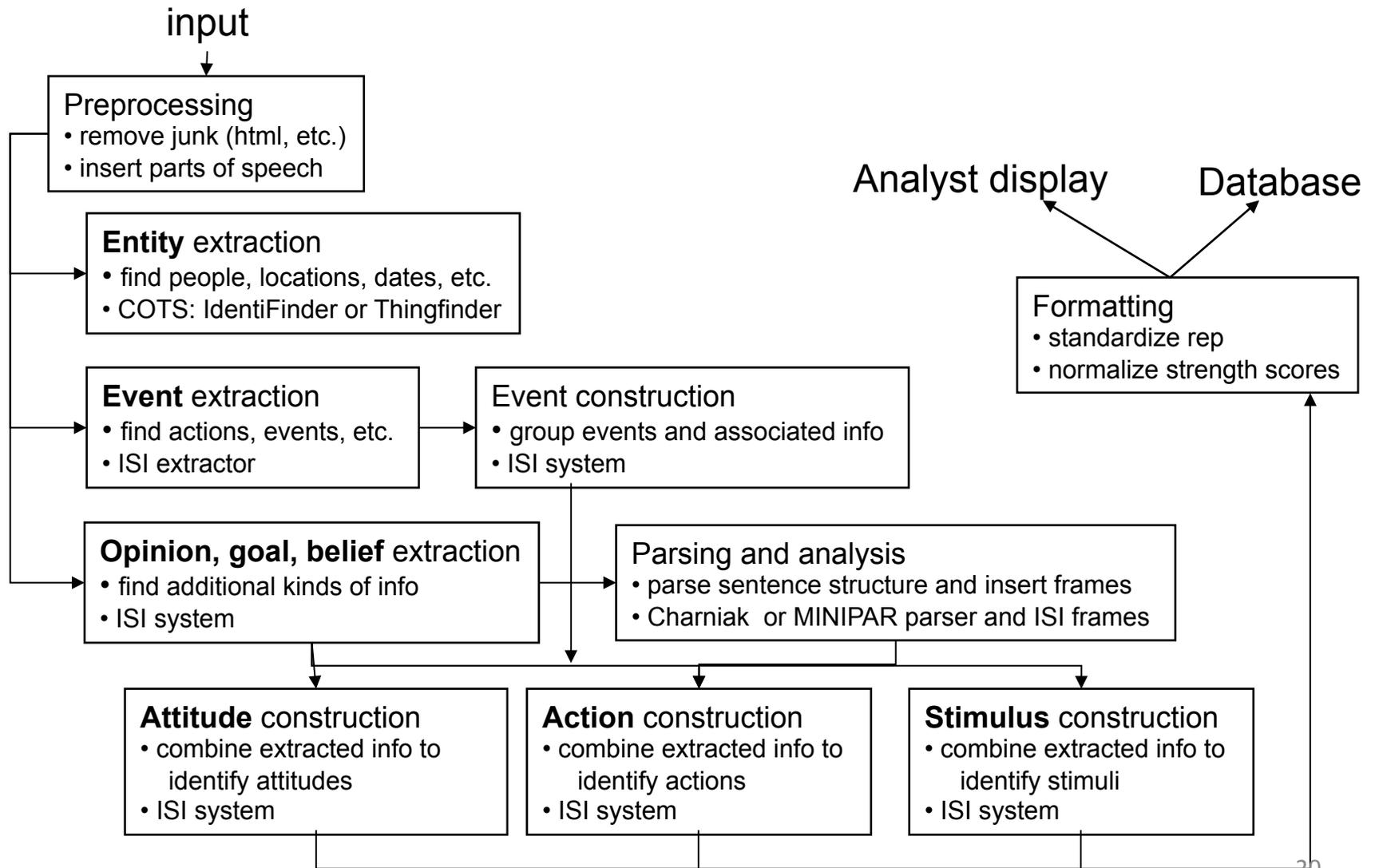
Sociologist

Anthropologist

Don't do that!



ISI's Info Extraction for psychological models: InfoStill data flow and system modules

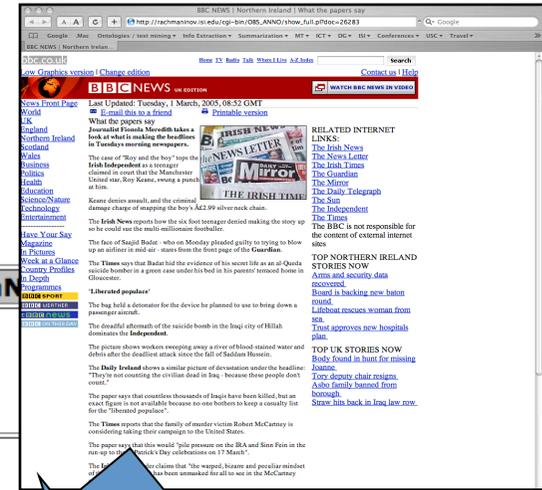


Principal challenge

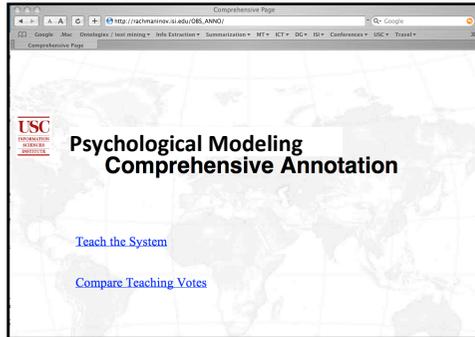
- Problem: What are *Attitude*, *Stimulus*, and *Action*?
 - Domain experts disagree
 - For Attitude, Opinions are somehow important, but are not everything — also relevant are Goals and Beliefs
- Approach:
 - First extract all simpler pieces (entities, events, goals, beliefs, opinions, etc.)
 - Analyze internal structure of each piece
 - Then try to combine them somehow, to identify useful sentences

Example database content

DocumentID	DocumentTitle	ReportDate	ExtractionDate	OrganizationName	PersonName	LocationName	Category	SubCategory	Policy
36758	Clarke to 'eliminate disrespect'	2005/09/27	2005/09/28 00:30:33 PDT	'Fair	Charles Clarke	London			
36758	Clarke to 'eliminate disrespect'	2005/09/27	2005/09/28 00:30:33 PDT	'Fair	Clarke	London			
36758	Clarke to 'eliminate disrespect'	2005/09/27	2005/09/28 00:30:33 PDT	'Fair	Hazel Blears	London	bombings denied		policy
36758	Clarke to 'eliminate disrespect'	2005/09/27	2005/09/28 00:30:33 PDT	'Fair	Labour	London	bombings denied		policy
36758	Clarke to 'eliminate disrespect'	2005/09/27	2005/09/28 00:30:33 PDT	'Fair	Ruth Kelly	London	bombings denied		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Angela Merkel	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Communism	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	George Bush	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Gerhard Schroeder	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Merkel	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Oskar Lafontaine	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Christian Union	Schroeder	Europe	attack		policy
36522	Merkel poised to win as Germans vote	2005/09/18	2005/09/19 00:00:28 PDT	Frankfurter Allgemeine Zeitung	Angela Merkel	Europe	attack		policy



S-A-A Annotation interface (1)



Annotation interface:

- Provides link to original document
- Defines each factor



Combined Annotation Page

http://rachmaninov.isi.edu/cgi-bin/OBS_ANNO/combine_train.pl

Google .Mac Ontologies / text mining Info Extraction Summarization MT ICT DG ISI Conferences USC Travel

Please choose sentences which you think represent Attitude, Action, or Stimulus

(Document Id [26283](#))
(You have worked on this document before -- Your previous annotation is loaded)

- **Stimulus** -- An event, issue, or characteristic. For example, three bombings have occurred in public buildings over the last week.
- **Attitude** -- The way the Target Audience feels or thinks about a given stimulus. Continuing with the above example, the TA is afraid to enter any public buildings.
- **Action** -- The outward, observable action or inaction after being exposed to a stimulus and filtering it through one's own orientation. Continuing with the above example, the TA remains at home.

Which sentences express Stimulus/Orientations/Behaviors?

If you think any word(s) help identify an **attitude**, please press 'alt' and Click on each one to record them.
 If you think any word(s) help identify a **action**, please press 'shift' and Click on each one to record them.
 If you think any word(s) help identify a **stimulus**, please press 'ctrl' and Click on each one to record them.
 (If you feel that any words should be grouped together as a unit, please surround them using "" in the Indicator Words boxes.)

If you have any additional comments for the sentence please type them into the Comments boxes.

No	Sentence Content	Please make your choice			
		TYPE	Yes	No	Indicator Words

S-A-A Annotation interface (2)

S-A-A annotation interface:

- Provides multiple choices, plus indicator word field, per sentence
- Provides comment field per sentence
- Mouse or keyboard-only mode for speed
- Records each annotator session separately
- Allows revisiting for completion or changes

Interface development:

- Required multiple iterations
- Provided feedback to domain theorists

Combined Annotation Page

http://rachmaninov.isi.edu/cgi-bin/OBS_ANNO/combine_train.pl

Google .Mac Ontologies / text mining Info Extraction Summarization MT ICT DG ISI Conferences USC Travel

Combined Annotation Page

No	Sentence Content	Please make your choice				
		TYPE	Yes	No	Indicator Words	
0	Filed at 5:24 a.m.	ATT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		ACT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		STIM	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		Comments	<input type="text"/>			
1	ET ISTANBUL, Turkey (AP) -- Turkey, home to the largest Kurdish minority in the world, is watching nervously as Kurds gain unprecedented political power in neighboring Iraq following major gains in that country's elections.	ATT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	nervously <input type="text"/>
		ACT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	watching <input type="text"/>
		STIM	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		Comments	<input type="text"/>			
2	Opposition to Kurdish nationalism has been a cornerstone of Turkish policy for decades, out of fear that Turkish Kurds could be encouraged to press for independence.	ATT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	opposition <input type="text"/>
		ACT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		STIM	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		Comments	<input type="text"/>			
3	Some 12 million Kurds live in Turkey.	ATT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		ACT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		STIM	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		Comments	<input type="text"/>			
4	Advertisement	ATT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		ACT	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		STIM	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
		Comments	<input type="text"/>			
5	The Turkish military has battled Kurdish insurgents in southeastern Turkey since 1984, a fight that has left 37,000 dead, and Turkish officials have stressed that the country will not accept Kurdish independence in northern Iraq, which borders Turkey.	ATT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	not accept independence <input type="text"/>
		ACT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	battled, stressed <input type="text"/>
		STIM	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	insurgent <input type="text"/>
		Comments	<input type="text"/>			

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Results of S-A-A annotation exercise

- 12 people (all experts, but different backgrounds)
- Too few people for real conclusion, but surprising agreement level
- Need to compute kappa score for real agreement relative to chance

Texts	Attitude			Stimulus			Action			# people		
	M	C	Total	M	C	Total	M	C	Total	M	C	Total
	O	O	O	S	S	S	B	B	B	# h	# h	# h
	%	%	%	%	%	%	%	%	%			
1	0.57	1.00	0.75	1.00	1.00	1.00	0.57	0.80	0.67	7	5	12
2	0.86	1.00	0.92	0.57	0.60	0.58	0.71	0.80	0.75	7	5	12
3	0.86	1.00	0.92	0.57	1.00	0.75	1.00	1.00	1.00	7	5	12
4	0.57	1.00	0.67	1.00	0.60	0.75	0.57	1.00	0.75	7	5	12
5	0.71	0.60	0.67	1.00	0.80	0.92	0.71	0.60	0.67	7	5	12
6	0.57	0.80	0.67	0.57	0.80	0.67	0.71	0.60	0.67	7	5	12
7	0.71	1.00	0.83	1.00	1.00	1.00	0.71	0.60	0.67	7	5	12
8	0.71	0.60	0.58	1.00	0.80	0.92	0.71	0.60	0.67	7	5	12
9	0.71	1.00	0.58	0.86	1.00	0.92	0.57	0.80	0.67	7	5	12
10	0.57	1.00	0.75	0.57	0.60	0.58	0.86	0.60	0.75	7	5	12
11	0.71	0.80	0.75	0.86	0.80	0.83	0.86	1.00	0.50	7	5	12
12	1.00	1.00	1.00	1.00	0.60	0.83	0.71	0.80	0.75	7	5	12
13	0.57	0.80	0.58	0.71	0.80	0.50	0.57	0.60	0.58	7	5	12
14	0.86	0.80	0.83	0.71	0.80	0.75	0.57	0.60	0.58	7	5	12
15	0.50	0.80	0.64	1.00	0.80	0.91	1.00	0.60	0.73	6	5	11
16	0.67	1.00	0.64	0.83	1.00	0.55	1.00	1.00	0.55	6	5	11
17	0.80	1.00	0.90	1.00	1.00	0.50	1.00	0.80	0.60	5	5	10
18	0.80	1.00	0.90	0.80	0.60	0.70	0.80	0.60	0.60	5	5	10
19	0.50	0.80	0.67	0.75	0.60	0.56	0.50	0.60	0.56	4	5	9
20	0.75	1.00	0.67	0.75	0.80	0.56	1.00	0.60	0.78	4	5	9
21	0.50	0.80	0.67	1.00	1.00	1.00	0.75	0.80	0.78	4	5	9
22	0.75	1.00	0.89	0.75	0.80	0.78	0.75	0.80	0.78	4	5	9
23	0.50	1.00	0.78	1.00	0.80	0.56	0.75	0.60	0.67	4	5	9
Ave	0.69	0.90	0.75	0.84	0.81	0.74	0.76	0.73	0.68			

Analysis of Attitude features

- Attitudes are a combination of basic factors

- Attitude includes 12 classes:

- MOTIVATION
- SUPERLATIVE
- BELIEF
- GOAL
- OPINION
- RELIGION
- EXTREMUM
- REPORT
- GPE
- DATE
- TIME
- LOCATION

- Each feature has a recognizer engine
- Each engine returns a fragment of text (plus usually a score)
- To find the 'attitude strength' of a sentence, we combine the various scores using their *relative strengths*
- This we do by correlating human (SME) judgments



- Combination function: $X = \sum_i \alpha_i f_i$ learn optimal coefficients α_i
- Annotation tests show much higher agreement among domain specialists than for basic factors alone

Where next? Generalizing this

- **Why** do you hold the opinion?
- Sometimes, you just like something (I like blue; I like jazz); but sometimes, there's a **reason**
- My camera can be great for one purpose (like mountain climbing: sturdy) and terrible for another (like taking to the beach: too heavy)

Buying a Digital Camera for Kids

How to Choose Just the Right Camera

From [Christy Matte](#), former About.com Guide

See More About: [digital cameras](#) [fisher-price](#) [vtech](#) [hardware for kids](#)

Most kids are fascinated by digital cameras. Capturing a friend or family member in a still shot is a lot of fun and, as photographers know, taking pictures can help you view your world in different ways. This guide is designed to help you choose the best type of digital camera for your child. It is broken down into three sections, or stages, that describe what type of photography experience a child is looking for. The age guidelines are simply there as a starting point. Kids progress in their own timeframes, and some will be more interested in "serious photography" than others.



Learning to Use a Camera

Medioimages/Photodisc/Getty Images

Stage 1 – Toddler through Early Elementary

Climber's camera choice

Well, there are entire magazines devoted to helping you choose a camera. I will only point out a few things: the **ideal** climbing camera should be light, sturdy, weather-resistant, with very sharp optical quality for landscapes, a flash for those early morning starts, long exposure capability for those easygoing camping pictures on a tripod, over/underexposure capabilities for snow or dark rock, easy to manipulate with gloves, very resistant to the cold, last a long time on its set of batteries, and so much more...

How can you find this information?

- Goal and plan harvesting phrases
 - “a * camera because *”
- A small ontology of physical features relating to actions
 - movement
 - cognition
 - social acts

want a sturdy camera because

About 8,320,000 results (0.16 seconds)

[How to select a durable and sturdy camera - CNET Digital cameras ...](#)

[forums.cnet.com/7723-7593_102-336378.html](#) - Cached

4 posts - 2 authors - Last post: 26 Mar 2009

Digital cameras: How to select a durable and **sturdy camera** - Read digital camera ... I would **like** to purchase a digital camera in below \$160 **Because** it is impossible to get a perfect seal against dust and water with a ...

[Need a sturdy camera!!](#)

[www.dcresource.com/.../showthread.php?...Need-a-sturdy-ca...](#) - Cached

4 posts - 4 authors - Last post: 29 May 2005

However, i'm looking for a **sturdy camera** that will not **need** repairs for ... taken cameras backpacking and climbing with no damage **because** I ...

[Choosing a Digital Camera for Kids](#)

[familyinternet.about.com/od/.../a/buykidscamera.htm](#) - Cached

Turning the camera on and off on their own; The **cause** and effect of pushing a ... Since Stage 1 usually applies to younger kids, you'll **want a sturdy camera** ...

[Olympus Stylus Tough: A Sturdy And Reliable Camera | Advice ...](#)

[adviceabouteverything.com/olympus-stylus-tough-a-sturdy-a...](#) - Cached

7 Sep 2011 – Different facts about Olympus Stylus Tough digital cameras, why you ... The pictures also come out clear **because** face detection technology ensures ... who **want** to take excellent quality pictures and **need a sturdy camera** that ...

What you can do with this

- You can answer “why” questions
“why does he like a sturdy camera?” — “he climbs mountains”
- You can check if your valence classifier is correct: the profile and plans **predict** what the claim value should be
A mountaineer’s camera should be strong yet light
- You can tell the people who want opinions what to do to their product
For mountaineers, emphasize the robustness!

Conclusion: Understanding opinions

- Need automated interpretation / understanding of *all* relevant parts:
 - **Topic** (type): input
 - **Claim**: topic decomposition problem
 - **Holder**: parsing and identification problem
 - **Facet**: clustering around keywords
 - **Valence**: word-based classification problem
 - **Topic/argument structure**: parsing / graph construction problem
 - **Reason**: author profiling and plan recognition problem

Thank you!