Opinion Mining

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Outline

- ☆ Introduction
  - Definition of subjectivity and opinion
  - Opinion mining as a language technology
  - Linguistic phenomena of attitude expressions
  - Applications
- ☆ Research areas of opinion mining
- ☆ Dropping Knowledge Project
- ☆ Summarization

Subjectivity

- ☆ “Subjective expressions are words and phrases being used to express opinions, emotions, evaluations, speculations, etc.” (Wiebe et al., 2005).

- ☆ A general covering term for the above cases is private state:

  “a state that is not open to objective observation or verification” (Quirk et al., 1985)

Three main types of subjective expressions (Wiebe & Mihalcea, 2006)

- ☆ references to private states
  - *He absorbed the information quickly.*
  - *He was boiling with anger.*
- ☆ references to speech (or writing) events expressing private states
  - *UCC/Disciples leaders roundly condemned the Iranian President's verbal assault on Israel.*
  - *The editors of the left-leaning paper attacked the new House Speaker.*
- ☆ expressive subjective elements
  - *That doctor is a quack.*

Opinion (Wikipedia)

- ☆ In general, an opinion is a subjective belief, and is the result of emotion or interpretation of facts.
- ☆ An opinion may be supported by an argument, although people may draw opposing opinions from the same set of facts.
- ☆ In casual use, the term “opinion” may be the result of a person's perspective, understanding, particular feelings, beliefs, and desires. It may refer to unsubstantiated information, in contrast to knowledge and fact-based beliefs.
- ☆ Collective or professional opinions are defined as meeting a higher standard to substantiate the opinion.

☆ Synonym: sentiment analysis

☆ Definition:

- refers to the application of natural language processing, computational linguistics, and text analytics to identify and extract subjective information in source materials. (Wikipedia)

Key Components of Opinions

☆ Opinion holder (source)

– The person or organization that holds a specific opinion on a particular object/target

☆ Opinion target

– A product, person, event, organization, topic or even an opinion

☆ Opinion content

– A view, attitude, or appraisal on an object from an opinion holder.

☆ Polarity

– Orientations of sentiments expressed in an opinion, e.g., positive, negative or neutral

Example

Former Chancellor Helmut Kohl attacked *Angela Merkel* in an interview with ....

Opinion holder

Target

Polarität

- ✓ subjective sentence
- ✓ opinion holder, target, polarity
- ✓ negative

Linguistic Template for Extraction

<Subject, PER/ORG> Verb-Activ <Object, NP>

attack

accuse

condemn

Opinion holder

target

Subtasks

- ☆ Subjectivity classification
  - – Identification of words, phrases, sentences, documents whether they are subjective or objective
- ☆ Polarity classification
  - – Identification of the orientations of the subjectivities, e.g.,
    - positive, neutral, negative
    - scale: 5 scale
- ☆ Opinion extraction
  - – an application of information extraction
  - – Extraction of relations between opinion holder (source), opinion target, opinion, and polarity

Contextual Valence Shifter

Polanyi & Zaenen (2004)

In 2004 AAAI spring Symposium on Attitude

Simple Lexical Valence [Polanyi & Zaenen, 2004]

- Valence: lexical items or multi-word terms (sentiment words) that communicate with a negative or positive attitude

PART OF SPEECH	Positive Valence	Negative Valence
Verbs	Boost, Embrace, Ensure, Encourage, Delight, Manage, Ease	Conspire, Meddle, Discourage, Fiddle, Fail, Haggle
Nouns	Approval, Benefit, Chance, Approval Benefit, Credit, Favor, Freedom, Hope	Backlash, Backlog, Bankruptcy, Beating, Catastrophe
Adjectives	Attractive, Better, Brave, Bright, Creative, Dynamic,	Annoying, Awry, Arbitrary, Bad, Botched,
Adverbs	Attractively, …	Annoyingly, …

Table 1. Examples of words with non-neutral valence.

Contextual Valence Shifter [Polanyi & Zaenen, 2004]

- **Negatives and Intensifiers**
  - *John is successful at tennis* versus *John is never successful at tennis*.
- **Modals**
  - *If Mary were a terrible person, she would be mean to her dogs.*
- **Presuppositional Items**
  - *It is barely sufficient*.
- **Tense**
  - *This was my favorable car*.
- **Collocation**
  - *It looks expensive*. (about appearance)
- **Irony**
  - *The very brilliant organizer failed to solve the problem*.

Discourse based Contextual Valence Shifter (cont.) [Polanyi & Zaenen, 2004]

- Connectors
  - Although Boris is brilliant at math, he is a horrible teacher.

Although Boris is brilliant at math, he is a horrible teacher.

Base valence of terms:		Adjusted computation:	
brilliant	+2	***(Although) brilliant***	0
horrible	−2	***horrible***	−2
total score:	0	total score:	−2

Table 3. Example of valence adjustment based on discourse connective.

Discourse based Contextual Valence Shifter (cont.) [Polanyi & Zaenen, 2004]

- Discourse Structure
  - *John is a **terrific+** athlete. Last week he walked 25 miles on Tuesdays. Wednesdays he walked another 25 miles. Every weekend he hikes at least 50 miles a day.*
- Multi-entity Evaluation
  - *Coffee is expensive, but Tea is cheap.*
- Comparative
  - *In market capital, Intel is way ahead of AMD.*

Motivations of Opinion Mining

- There is a lot of information to discover in online fora and discussions, news eports, client emails or blogs for
  - market research
  - media monitoring and
  - public opinion research

- Opinion mining is a relevant technology to recognize opinions, emotional attitudes about products, services, persons and other topics.

Applications [Liu, 2007]

- Opinion Monitoring
  - Consumer opinion summarization

    E.g. Which groups among our customers are unsatisfied? Why?
  - Public opinion identification and direction

    E.g. What are the opinions of the Americans about the European style cars?
  - Recommendation

    E.g. New Beetles is the favorite car of the young ladies.

- Opinion retrieval / search
  - Opinion-oriented search engine
  - Opinion-based question answering

    E.g. What do Chinese People think about Greek's attitude to work and to EU?

Opinion Mining – Research topics

- Development of linguistic resources for opinion mining
  - Automatically build lexicons of subjective terms
- At the document/sentence level
  - Simple opinion extraction (a holder, an object, an opinion)
  - Subjective / objective classification
  - Sentiment classification: positive, negative and neutral
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  - Identify and extract commented features
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OM – Linguistic Resource of OM [Esuli, 2006]

- Linguistic resource of OM are **opinion words or phrases** which are used as instruments for sentiment analysis. It also called polar words, opinion bearing words, subjective element, etc.

- Research word on this topic deal with three main tasks:
  - Determining term **orientation**, as in deciding if a given Subjective term has a Positive or a Negative slant
  - Determining term **subjectivity**, as in deciding whether a given term has a Subjective or an Objective (i.e. neutral, or factual) nature.
  - Determining the **strength** of term attitude (either orientation or subjectivity), as in attributing to terms (real-valued) degrees of positivity or negativity.

- Example
  - Positive terms: *good, excellent, best*
  - Negative terms: *bad, wrong, worst*
  - Objective terms: *vertical, yellow, liquid*

Orientation of terms [Esuli, 2006]

The problem:

Determining if a subjective term has a Positive or a Negative orientation.

[Hatzivassiloglou and McKeown, 1997]

Hypothesis: *adjectives* in `and` conjunctions usually have similar orientation, though `but` is used with opposite orientation.

Example (conjuction of adjectives)

1. `The tax proposal was` *`simple and well received...`*
2. `The tax proposal was` *`simplistic but well received...`*
3. `* The tax proposal was` *`simplistic and well received...`*

Method: a weighted graph of similarity of orientation is defined by analyzing conjunctions of adjectives in unprocessed text, then a minimum-cut method is applied to the graph.

Orientation of terms [Esuli, 2006]

[Esuli and Sebastiani, 2005]

Hypothesis: terms with similar orientation have similar glosses.

Example (glosses for terms with similar orientation)

good: "*that which is pleasing or valuable or useful*"; "*agreeable or pleasing*".

beautiful: "*aesthetically pleasing*".

pretty: "*pleasing by delicacy or grace; not imposing*".

Each term is represented by its gloss.

A binary classifier is learned, in a semi-supervised process, using the glosses of the Positive and Negative terms in the training set.

Orientation of terms [Esuli, 2006]

[Turney and Littman, 2003]

Hypothesis: terms with similar orientation tend to co-occur in documents.

The *Semantic Orientation* (SO) of a term is estimated by combining a pointwise mutual information (PMI) measure of the term against some *paradigmatic* terms.

Pos = {`good`, `nice`, `excellent`, `positive`, `fortunate`, `correct`, `superior`}
Neg = {`bad`, `nasty`, `poor`, `negative`, `unfortunate`, `wrong`, `inferior`}

PMI is measured using the number of results returned by the AltaVista search engine.

$$PMI(t, t_i) = \log \frac{\#(\text{“}t \;\texttt{NEAR}\; t_i\text{”})}{\#(\text{“}t\text{”})\#(\text{“}t_i\text{”})}$$

$$SO(t) = \Sigma_{t_i \in Pos} PMI(t, t_i) - \Sigma_{t_i \in Neg} PMI(t, t_i)$$

OM – Polarity acquisition of lexicons

- Application:
  - Naive solution to achieve prior polarities
- Problem:
  - Mixture of subjective & objective words
    - E.g. *long & excellent*
  - Conflict
    - E.g. Nice and Nasty (the first hit from Google for "Nice and *")
  - Context dependent
    - E.g. It looks cheap. It is cheap.
    - E.g. It is expensive. It looks expensive.

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OM – Document Level Sentiment Analysis

- Unsupervised review classification
  - Turyney, 2003
- Sentiment classification using machine learning methods
  - Pang et al., 2002, Pang and Lee, 2004, Whitelaw et al., 2005
- Review classification by scoring features
  - Dave, Lawrence and Pennock, 2005

OM – Document-level Sentiment Classification

- Motivation: Determining the overall sentiment properties of a text
- Advantage:
  - Coarse-grained Analysis
  - Detection of a general sentiment trend of a document
- Problem:
  - Different polarities, topics and opinion holders in one document, e.g.

This film should be brilliant. The characters are appealing. Stallone plays a happy, wonderful man. His sweet wife is beautiful and adores him. He has a fascinating gift for living life fully. It sounds like a great story, however, the film is a failure.

Unsupervised review classification

- Hypothesis: the orientation of the whole document is the sum of the orientation of all its parts

- Three steps
  - POS Tagging and Two consecutive word extraction (e.g. JJ NN)
  - Semantic orientation estimation (AltaVisata near operator)
    - Pointwise mutual information

$$PMI(word_1, word_2) = \log_2\left(\frac{P(word_1 \wedge word_2)}{P(word_1)P(word_2)}\right)$$

    - Semantic orientation

      SO(phrase) = PMI(phrase, “excellent”) – PMI(phrase, “poor”)
  - Average SO Computation of all phrases
    - The review is recommended if average SO is positive, not recommended otherwise

- The average accuracy on 410 reviews is 74%, ranging from 84% for automobile reviews to 66% for movie reviews

Others methods

- [Pang et al., 2002]
  - Apply some standard supervised automatic text classification methods to classify orientation of movie reviews
    - Learners: Naive Bayes, MaxEnt, SVM
    - Features: unigrams, bigrams, adjective, POS, position
    - Preprocessing: negation propagation
    - Representation: binary, frequency
  - 82.9% accuracy, on a 10-fold cross validation experiments on 1,400 movie reviews (best from SVM, unigrams, binary)
- [Pang and Lee, 2004]
  - A sentence subjectivity classifier is applied, as preprocessing, to reviews, to filter out Objective sentences.
  - Accuracy on movie reviews classification raises to 86.4%
- [Whitelaw et al. 2005]
  - Appraisal features are added to the Movie Review Corpus, which obtained a 90.2% classification accuracy.

OM – Sentence-level Sentiment Classification

- Advantage:
  - Even though the analysis is still coarse, it is more specific than document-level analysis
  - The results can be reused as input for document-level classification
- Problem:
  - Multiple sentiment expressions with different polarities, e.g.

The very brilliant organizer failed to solve the problem.

OM – Sentence Level Sentiment Analysis (cont.)

- [Rilloff and Wiebe, 2003]: subjective / objective classification
  - Taking advantages of Information Extraction techniques
  - Manually collected opinion words + AutoSlog-TS

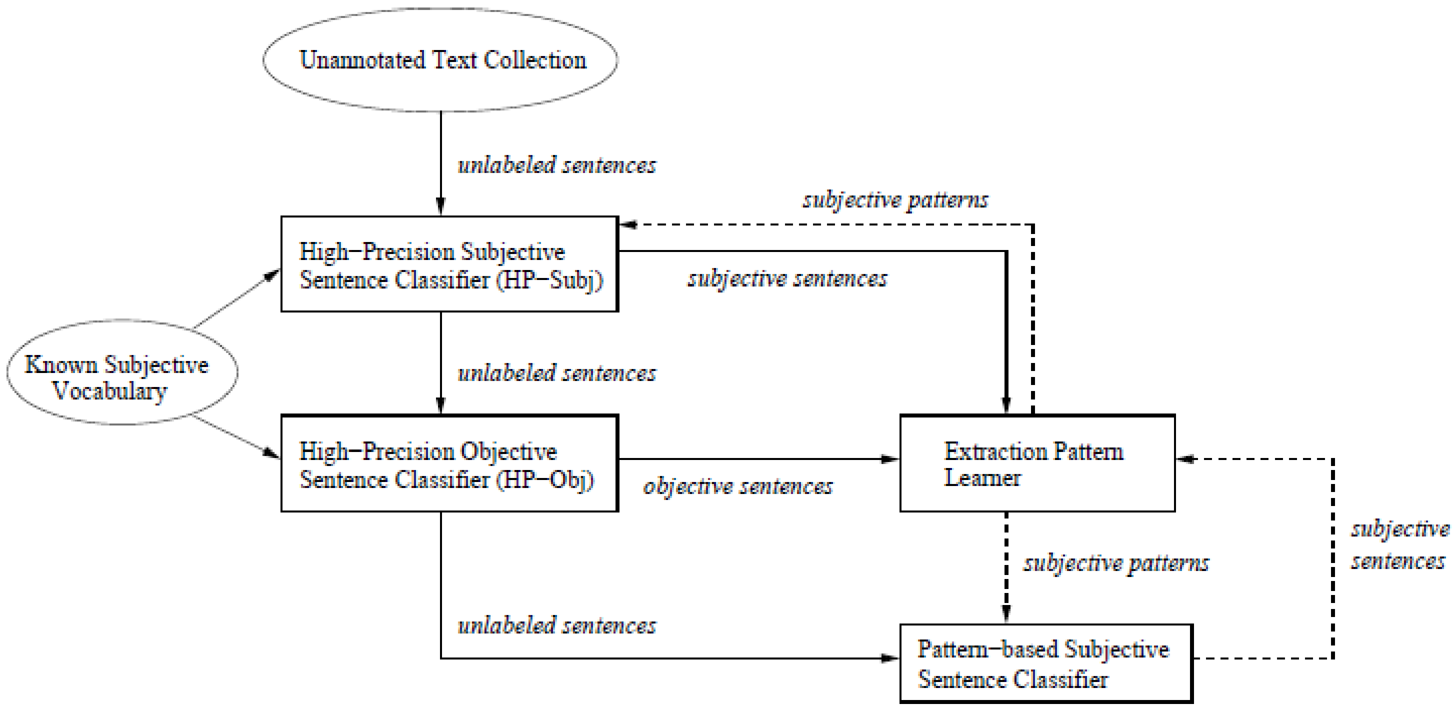

Figure 1: Bootstrapping Process

<subject> passive-vp	*<subj> was satisfied*
<subject> active-vp	*<subj> complained*
<subject> active-vp dobj	*<subj> dealt blow*
<subject> active-vp infinitive	*<subj> appears to be*
<subject> passive-vp infinitive	*<subj> was thought to be*
<subject> auxiliary dobj	*<subj> has position*

active-vp <dobj>	*endorsed <dobj>*
infinitive <dobj>	*to condemn <dobj>*
active-vp infinitive <dobj>	*get to know <dobj>*
passive-vp infinitive <dobj>	*was meant to show <dobj>*
subject auxiliary <dobj>	*fact is <dobj>*

passive-vp prep <np>	*opinion on <np>*
active-vp prep <np>	*agrees with <np>*
infinitive prep <np>	*was worried about <np>*
noun prep <np>	*to resort to <np>*

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OM – Feature-based OM and Summarization [Hu and Liu, 2004]

GREAT Camera., Jun 3, 2004
Reviewer: **jprice174** from Atlanta, Ga.

I did a lot of research last year before I bought this camera... It kinda hurt to leave behind my beloved nikon 35mm SLR, but I was going to Italy, and I needed something smaller, and digital.

The pictures coming out of this camera are amazing. The 'auto' feature takes great pictures most of the time. And with digital, you're not wasting film if the picture doesn't come out. …

Feature1: picture
Positive: 12

- The pictures coming out of this camera are amazing.
- Overall this is a good camera with a really good picture clarity.

…

Negative: 2

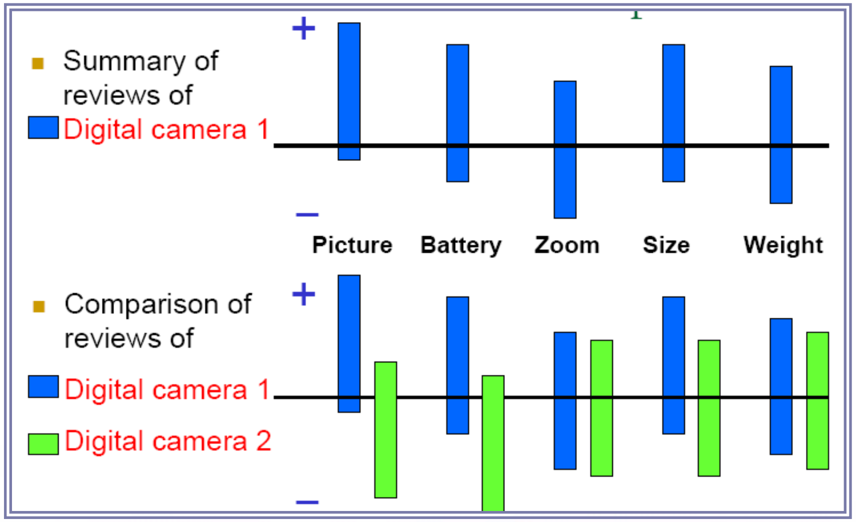
- The pictures come out hazy if your hands shake even for a moment during the entire process of taking a picture.
- Focusing on a display rack about 20 feet away in a brightly lit room during day time, pictures produced by this camera were blurry and in a shade of orange.

Prior & contextual SO

- *E.g. Hotel Review:*
  - *hot water*
  - *hot room*
- *E.g. Car Review*
  - *looks expensive*
  - *Is expensive*

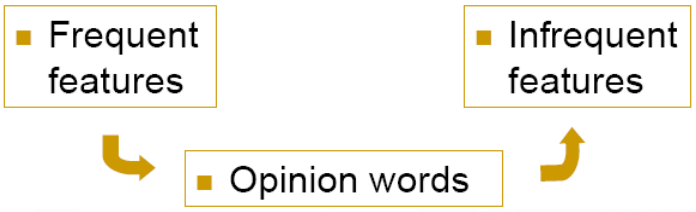
Feature extraction:

- Explicit & Implicit
  - E.g. great photos <photo>
  - E.g. small to keep <size>
- Frequent & Infrequent



Featured-based – Feature Extraction

- Frequent & Infrequent features
  - Frequent feature: Label sequential rules
    - Annotation
      - *"Included memory is stingy"*
      - <{included, VB}{$feature, NN}{is, VB}{stingy, JJ}>
    - Learned LSRs
      - <{easy, JJ}{to}{*, VB}>→ <{easy, JJ}{to}{$feature, VB}>
    - Feature extraction
      - The word that matches $feature is extracted
  - Infrequent feature
    - Observation: the same *opinion word* can be used to describe different features and objects
      - E.g. The pictures (high-freq) are absolutely amazing.
      - E.g. The software (low-freq) that comes with it is amazing.



Featured-based – Group Feature Synonyms

- **Identify part-of relationship [Popescu and Etziono, 2005]**
  - Each noun phrase is given a PMI score with part discriminators (e.g. of scanner, scanner has) associated with the product class, (e.g. a scanner class)

- **Carenini et al., 2005 is based on similarity metrics**
  - The system merges each discovered feature to a feature node in the pre-set taxonomy
  - The similarity metrics are defined based on string similarity, synonyms and other distances measured using WordNet

Camera	Image
Lens	Image Type
Digital Zoom	TIFF
Optical Zoom	JPEG
...	...
Editing/Viewing	Resolution
Viewfi nder	Effective Pixels
...	Aspect Ratio
Flash	...
...	

Feature Extraction and Group

- Advantage:
  - Precise sentiment analysis about explicit features

- Problems:
  - Multiple relations
    - *Gas Mileage of VW Golf is great.*
      - *Entity: VW Golf*
      - *Attribute: Gas Mileage*
  - Domain knowledge intensive:
    - *V12 8000CC is pretty powerful. <automobile engine version>*
    - *V6 4000CC is not a real good engine.*
  - WordNet is too general

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Featured-based Sentiment Orientation [Popescu and Etzioni, 2005]

- **Contextual Semantic Orientation**
  - <word, SO>, <word, feature, SO>, <word, feature, sentence, SO>
    - E.g. S1: ***"I am not happy with this sluggish driver."***

    <sluggish, ?>, <sluggish, driver, ?>, <sluggish, driver, S1, ?>

- **Relaxation labeling: sentiment assignment to words satisfying local constraints.**
  - *Constraints*:
    - conjunctions, disjunctions, syntactic dependency rule, morphological relationships, WordNet-supplied synonymy and antonymy, etc.
  - *Neighborhood*: a set of words connected the word through constraints.
    - E.g. "***hot(?) room and broken(-) fan***" → hot(-)

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OM – Comparative Sentence and Relation Extraction
[Jinal and Liu, SIGIR-2006]

- **Morphological and syntactic properties**
  - Comparative sentences use morphemes like
    - *More/most, -er/-est, less/least, than and as*
  - Other cases
    - Preferring
      - *E.g. I prefer Intel to AMD.*
    - Non-comparatives with comparative words
      - *E.g. In the context of speed, faster means better.*
- **Gradable**
  - Non-Equal Gradable: greater or less
    - *E.g. Optics of camera A is better than that of camera B.*
  - Equality
    - *E.g. Camera A and camera B both come in 7MP.*
  - Superlative
    - *E.g. Camera A is the cheapest camera available in market.*
- **Non-gradable**
  - *E.g. Object A has feature F, but object B does not have.*

OM – Comparative Sentence and Relation Extraction

- Definition: A gradable comparative relation captures the essence of a gradable comparative sentence and is represented with the following:

  (relation word, features, entity S1, entity S2, type)

  - Relation word: The keyword used to expressed a comparative relation in a sentence. *E.g. better, ahead, most, better than*
  - Features: a set of features being compared
  - Entity S1 and Entity S2: sets of entities being compared
  - Type: non-equal gradable, equal or superlative
- Example
  - *Car X has better controls than car Y.*
    - (better, controls, car X, car Y, non-equal-gradable)
  - *Car X and car Y have equal mileage.*
    - (equal, mileage, car X, car Y, equative)
  - *Car X is cheaper than both car Y and car X.*
    - (cheaper, null, car X, car Y car Z, non-equal-gradable)
  - *Company X produces a variety of cars, but still best cars come from company Y.*
    - (best, cars, company Y, null, superlative)

Identify comparative sentences

- Extract sentences which contain at least a keyword
  - 83 keywords
    - Words with POS tags: JJR, JJS, RBR, RBS
    - Exceptions:
      - More, less, most and least
      - Indicative words: Best, exceed, ahead, etc
      - Phrases: in the lead, on par with, etc

- Use a NB classifier : comparative & non-comparative
  - Attribute: class sequential rules (CSRs)
    - 13 manual rules
      - Whereas/IN, but/CC, however/RB, while/IN, though/IN, etc
  - E.g. This camera has significantly more noise at ISO 100 than the Nikon 4500.
    - *<{$entityS1,NN}{has/VBZ}{*}{more/JJB} >→ comparative*

Extract comparative relations [Jindal and Liu, AAAI-2006]

- Classify comparative sentences into: non-equal gradable, equative, and superlative
  - SVM + keywords
  - If the sentence has a particular keyword in the attribute set, the corresponding value is 1, and 0 otherwise
- Extraction of relation items
  - Extraction of features, entities and relation keywords
    - ***(relation word, features, entity S1, entity S2, type)***
  - Assumption:
    - There is only one relation in a sequence
    - Features are nouns
- Not all comparison are evaluations.
  - *E.g. Cellphone X has Bluetooth, but cellphone Y does not have.*

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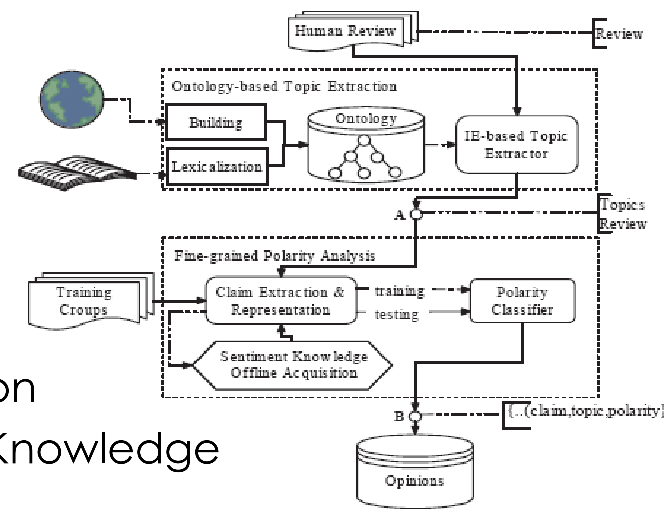
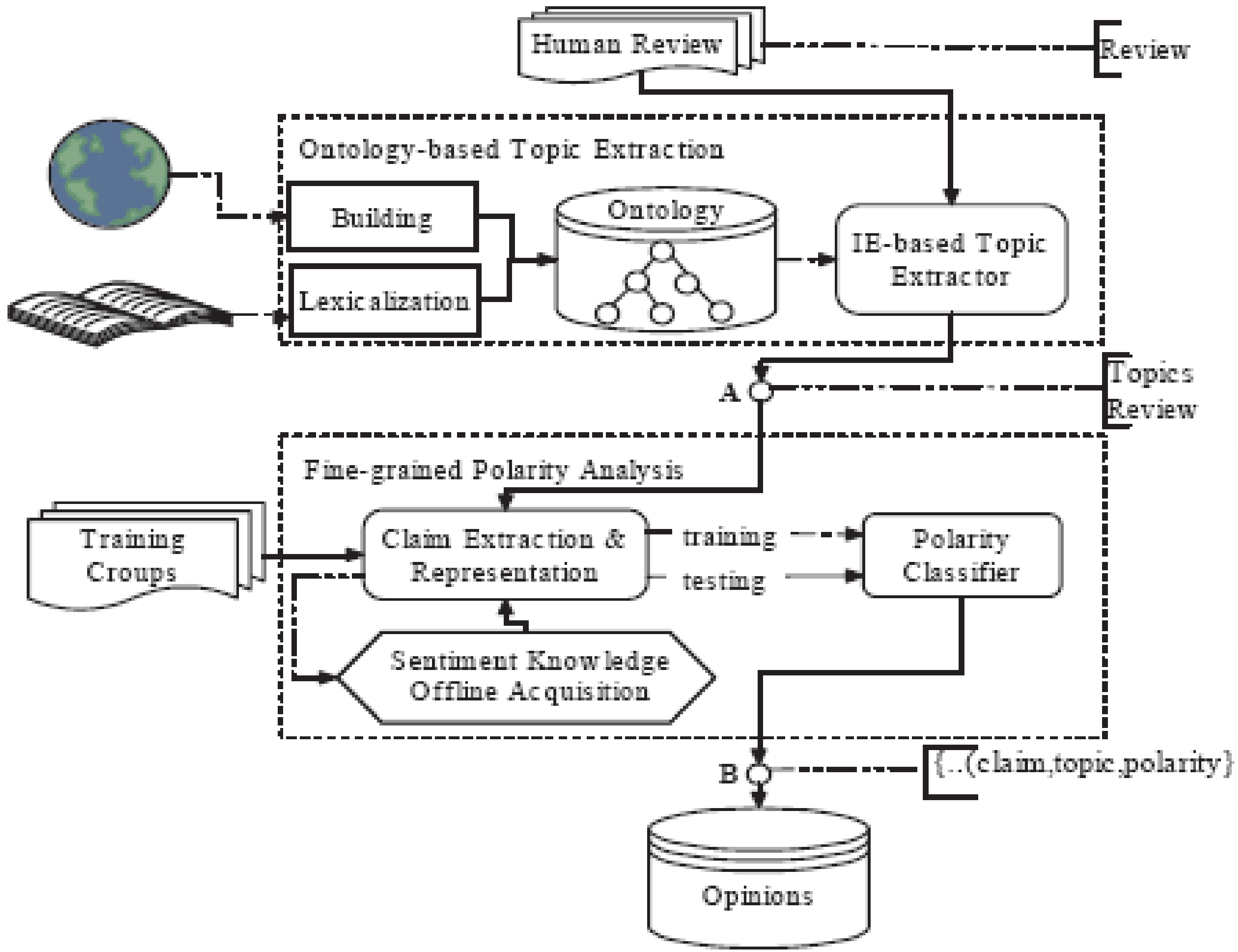
- OMINE – ontology-based opinion mining system

OMINE – Opinion Mining System

- Ontology-based Topic Extraction
  - Offline Ontology Building
  - Ontology Lexicalization
  - IE-based Topic Extraction



- Fine-grained Polarity Analysis
  - Claim Extraction & Representation
  - Offline Acquisition of Sentiment Knowledge
  - Polarity Analysis


Human Review
Review
Ontology-based Topic Extraction
Building
Lexicalization
Ontology
IE-based Topic Extractor
A
Topics Review
Fine-grained Polarity Analysis
Training Groups
Claim Extraction & Representation
training
testing
Polarity Classifier
Sentiment Knowledge Offline Acquisition
B
{..(claim,topic,polarity)}
Opinions

Topic Extraction - Experiment

- Data
  - Taxonomy Resource: eBay http://www.ebay.com and AutoMSN http://autos.msn.com
  - Automobile glossary: http://www.autoglossary.com, around 10,000 terms
  - Data for topic extraction: 1000 sentences from UserReview of AutoMSN
  - Golden standard: 2038 terms identified manually
- CarOnto
  - 363 concepts (e.g. Air Intake & Fuel Delivery)
  - 1233 instances (e.g. 5- speed automatic overdrive)
  - 145 values (e.g. wagon for Style, 250@5800 RPM for Horsepower)
  - 803 makes and models (e.g. BMW, Z4)
  - Ontology lexicalization is applied to 363 concepts and retrieves 9033 lexicons.
  - 11214 domain-specific lexicon instances as total
- Topic Extraction
  - TermExtractor (Sclano and Velardi, 2007)
  - OPINE (Popescu and Etzioni, 2005)

OntoTpcEx	Recall	Precision
Before Enrichment	20.97%	88.12%
After Enrichment	**89.35%**	**94.44%**
TermExtractor	15.72%	97.46%
OPINE	79.44%	93.12%

Polarity Analysis- Experiment

- Data
  - Resource: UserReview From AutoMSN
  - The polarities of these reviews have already been annotated by reviewers in two classes: pro and con.
  - Around 20 thousand sentences, and 50% of them are positive and the other 50% are negative.
  - 19600 sentences are used to train the classifier, and 200 positive and 147 negative sentences are applied as a test corpus
- Acquisition of Sentiment Knowledge

Type	Precision	Num
Sentiment word	95.0%	623
Negation word	73.8%	22

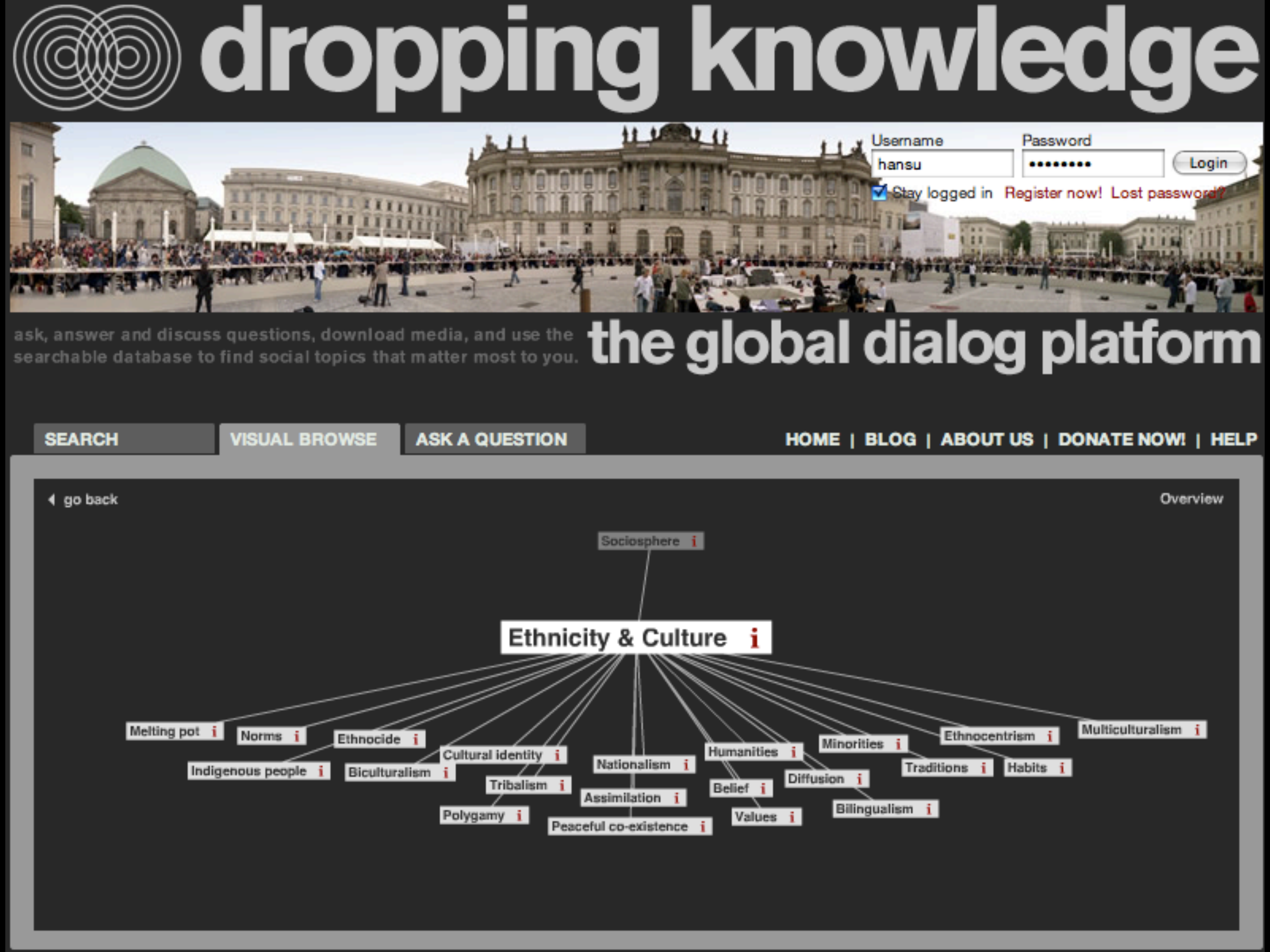
POSITIVE	NEGATIVE
awesome, cute, speedy excellent, well, standard great, strong, comfortable sporty, super, adorable	unimpressive, awful, terrible useless, tremendous, costly expensive, troublesome, tight cumbersome, ugly, squeaky

POS	Negation words
aux	*doesn't, didn't, wouldn't, shouldn't couldn't, don't, can't, won't*
det	*no, little, least*
mod	*never, barely, not, less*

Challenges

- Interaction between Pattern and Slot
  - <holder> **would like better** <object>
    - I would like better fuel mileage.
  - <object -1> drives like <**object-2**>
    - This car drives like a Porsche/a Nissan.
- Anaphoric resolution for summarization
  - E.g. "The turbo engine is a must-have, which provide a very decent acceleration."
- Others (context or semantic implication)
  - He is not the sharpest knife in the drawer.
  - She is a few fries short of a Happy Meal.
  - Stephanie McMahon is the next Stalin.
  - No one would say that John is smart.
  - My little brother could have told you that.
  - You are no Jack Kennedy.
  - They have not succeeded, and will never succeed, in breaking the will of this valiant people.
- More …

"Who is the fairest one of all, and state your sources!"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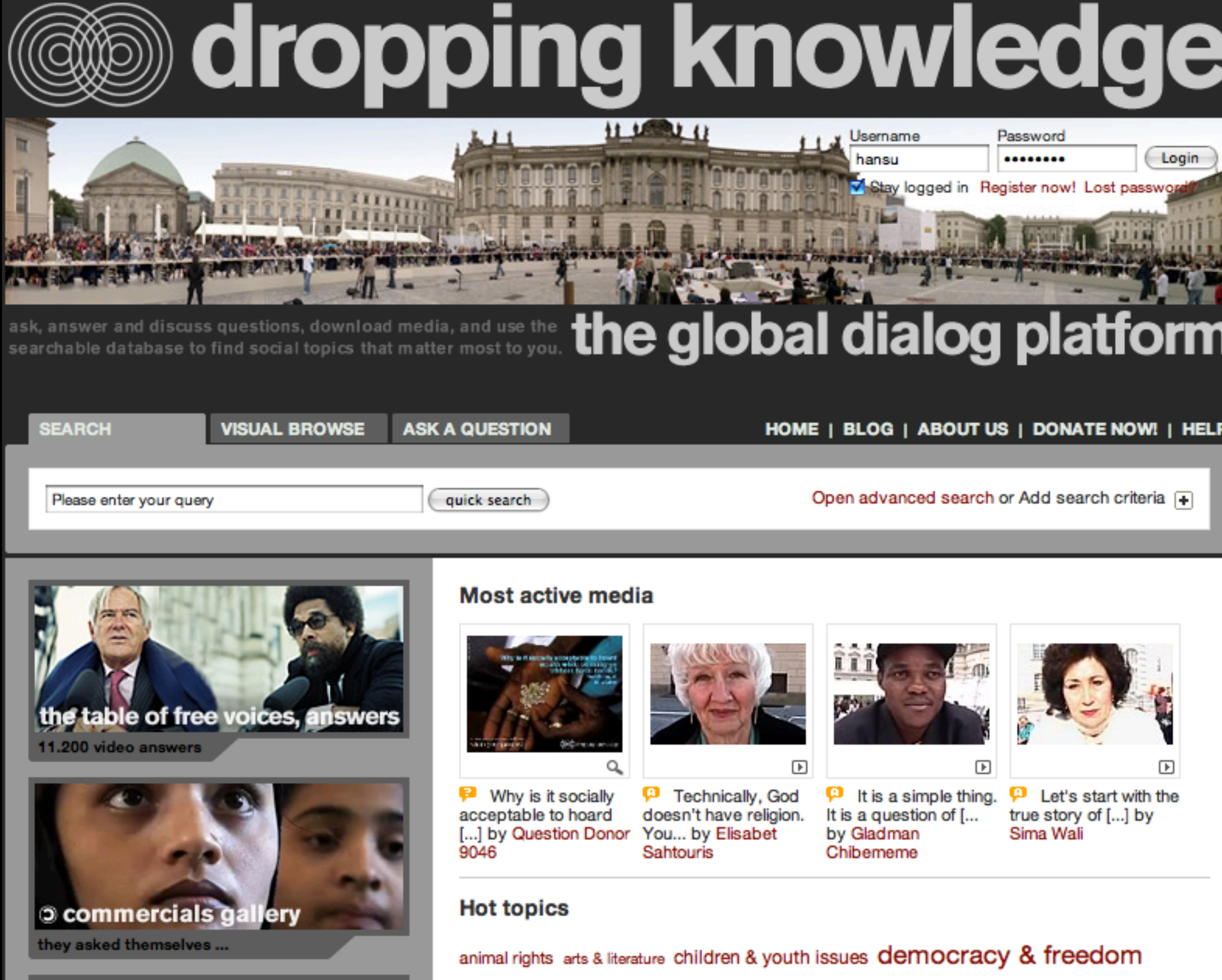
go back
Overview
Sociosphere
Ethnicity & Culture
Melting pot
Norms
Ethnocide
Cultural identity
Nationalism
Humanities
Minorities
Ethnocentrism
Multiculturalism
Indigenous people
Biculturalism
Tribalism
Assimilation
Belief
Diffusion
Traditions
Habits
Polygamy
Peaceful co-existence
Values
Bilingualism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the table of free voices, answers
11.200 video answers
commercials gallery
they asked themselves ...
Most active media
Why is it socially acceptable to hoard [...] by Question Donor 9046
Technically, God doesn't have religion. You... by Elisabet Sahtouris
It is a simple thing. It is a question of [... by Gladman Chibememe
Let's start with the true story of [...] by Sima Wali
Hot topics
animal rights
arts & literature
children & youth issues
democracy & freedom

Q

Silke Gesierich, Berlin: Do we have the right to consider human beings as more valuable than other life forms?

A

Catherine David

Tavis Smiley

Roland Berger

Antoschka - Ekaterina Moshaeva

Anthony Arnove

Cornel West

Anuradha Mittal

Leung Ping-Kwan

Wim Wenders: Yes

Dritëro Kasapi

China Keitetsi

Hans-Peter Dürr

Bill Joy

Thenmozhi Soundararajan:
No, no, no. ...

Udi Aloni:

Yes, yes, yes, yes,
yes

E. Mahleb

Simon Retallack

hendrik@druknet.bt

Foossa

Anuradha Koirala

Sharaf - Abdul Bakri

Bora Cosic

Homero Aridjis

Miki 99

Govindaswamy Hariramamurthi:

Yassin Adnan

Galsan Tschinag

stantin

Barloewen

Angaangaq Lyberth

Geert Lovink

Summarization

- Opinion Mining provides input for consumers, analysts and decision makers: a quick overview of the distributions of opinions and their polarities to specific individuals, organizations, products, technologies, issues and events.
- But opinion mining can not replace human experts, because computers still cannot model complex contexts and world knowledge.

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köszönöm
תודה!
děkuji
mahalo
고맙습니다
thank you
merci
谢谢
danke
Ευχαριστώ
شكرا
どうもありがとう
gracias