Business Intelligence Trends
商業智慧趨勢

意見探勘與情感分析
(Opinion Mining and Sentiment Analysis)

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2013-05-20

課程大綱 (Syllabus)

週次	日期	內容（Subject/Topics）
1	102/02/18	商業智慧趨勢課程介紹 (Course Orientation for Business Intelligence Trends)
2	102/02/25	管理決策支援系統與商業智慧 (Management Decision Support System and Business Intelligence)
3	102/03/04	企業績效管理 (Business Performance Management)
4	102/03/11	資料倉儲 (Data Warehousing)
5	102/03/18	商業智慧的資料探勘 (Data Mining for Business Intelligence)
6	102/03/25	商業智慧的資料探勘 (Data Mining for Business Intelligence)
7	102/04/01	教學行政觀摩日 (Off-campus study)
8	102/04/08	個案分析一 (SAS EM 分群分析)： Banking Segmentation (Cluster Analysis – KMeans using SAS EM)
9	102/04/15	個案分析二 (SAS EM 關連分析)： Web Site Usage Associations (Association Analysis using SAS EM)

課程大綱 (Syllabus)

週次	日期	內容（Subject/Topics）
10	102/04/22	期中報告 (Midterm Presentation)
11	102/04/29	個案分析三 (SAS EM 決策樹、模型評估)： Enrollment Management Case Study (Decision Tree, Model Evaluation using SAS EM)
12	102/05/06	個案分析四 (SAS EM 迴歸分析、類神經網路)： Credit Risk Case Study (Regression Analysis, Artificial Neural Network using SAS EM)
13	102/05/13	文字探勘與網路探勘 (Text and Web Mining)
14	102/05/20	意見探勘與情感分析 (Opinion Mining and Sentiment Analysis)
15	102/05/27	商業智慧導入與趨勢 (Business Intelligence Implementation and Trends)
16	102/06/03	商業智慧導入與趨勢 (Business Intelligence Implementation and Trends)
17	102/06/10	期末報告1 (Term Project Presentation 1)
18	102/06/17	期末報告2 (Term Project Presentation 2)

Outline

- Social Word-of-Mouth
- Opinion Mining and Sentiment Analysis
- Social Media Monitoring/Analysis
- Resources of Opinion Mining
- Opinion Spam Detection

Word-of-mouth on the Social media

- Personal experiences and opinions about anything in reviews, forums, blogs, micro-blog, Twitter.
- Posting at social networking sites, e.g., Facebook
- Comments about articles, issues, topics, reviews.

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Social media + beyond

- Global scale
  - No longer – one's circle of friends.
- Organization internal data
  - Customer feedback from emails, call center
- News and reports
  - Opinions in news articles and commentaries

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Social Media and the Voice of the Customer

- Listen to the Voice of the Customer (VoC)
  - Social media can give companies a torrent of highly valuable customer feedback.
  - Such input is largely free
  - Customer feedback issued through social media is qualitative data, just like the data that market researchers derive from focus group and in-depth interviews
  - Such qualitative data is in digital form – in text or digital video on a web site.

Source: Robert Wollan, Nick Smith, Catherine Zhou, The Social Media Management Handbook, John Wiley, 2011.

Listen and Learn
Text Mining for VoC

- Categorization
  - Understanding what topics people are talking or writing about in the unstructured portion of their feedback.
- Sentiment Analysis
  - Determining whether people have positive, negative, or neutral views on those topics.

Source: Robert Wollan, Nick Smith, Catherine Zhou, The Social Media Management Handbook, John Wiley, 2011.

Opinion Mining and Sentiment Analysis

- Mining opinions which indicate positive or negative sentiments
- Analyzes people's opinions, appraisals, attitudes, and emotions toward entities, individuals, issues, events, topics, and their attributes.

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Opinion Mining and Sentiment Analysis

- Computational study of
  opinions,
  sentiments,
  subjectivity,
  evaluations,
  attitudes,
  appraisal,
  affects,
  views,
  emotions,
  ets., expressed in text.
  - Reviews, blogs, discussions, news, comments, feedback, or any other documents

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Terminology

- Sentiment Analysis
  is more widely used in industry
- Opinion mining / Sentiment Analysis
  are widely used in academia
- Opinion mining / Sentiment Analysis
  can be used interchangeably

Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Example of Opinion: review segment on iPhone

"I bought an iPhone a few days ago.

It was such a nice phone.

The touch screen was really cool.

The voice quality was clear too.

However, my mother was mad with me as I did not tell her before I bought it.

She also thought the phone was too expensive, and wanted me to return it to the shop. … "

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Example of Opinion: review segment on iPhone

"(1) I bought an iPhone a few days ago.

(2) It was such a **nice** phone.

(3) The touch screen was really **cool**.

(4) The voice quality was **clear** too.

(5) However, my mother was mad with me as I did not tell her before I bought it.

(6) She also thought the phone was too **expensive**, and wanted me to return it to the shop. … "

+Positive Opinion

-Negative Opinion

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Why are opinions important?

- "Opinions" are key influencers of our behaviors.
- Our beliefs and perceptions of reality are conditioned on how others see the world.
- Whenever we need to make a decision, we often seek out the opinion of others.
  In the past,
  - Individuals
    - Seek opinions from friends and family
  - Organizations
    - Use surveys, focus groups, opinion pools, consultants

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Applications of Opinion Mining

- Businesses and organizations
  - Benchmark products and services
  - Market intelligence
    - Business spend a huge amount of money to find consumer opinions using consultants, surveys, and focus groups, etc.
- Individual
  - Make decision to buy products or to use services
  - Find public opinions about political candidates and issues
- Ads placements: Place ads in the social media content
  - Place an ad if one praises a product
  - Place an ad from a competitor if one criticizes a product
- Opinion retrieval: provide general search for opinions.

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Research Area of Opinion Mining

- Many names and tasks with difference objective and models
  - Sentiment analysis
  - Opinion mining
  - Sentiment mining
  - Subjectivity analysis
  - Affect analysis
  - Emotion detection
  - Opinion spam detection

Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Existing Tools
(“Social Media Monitoring/Analysis")

- Radian 6
- Social Mention
- Overtone OpenMic
- Microsoft Dynamics Social Networking Accelerator
- SAS Social Media Analytics
- Lithium Social Media Monitoring
- RightNow Cloud Monitor

Source: Wiltrud Kessler (2012), Introduction to Sentiment Analysis

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Source: Wiltrud Kessler (2012), Introduction to Sentiment Analysis

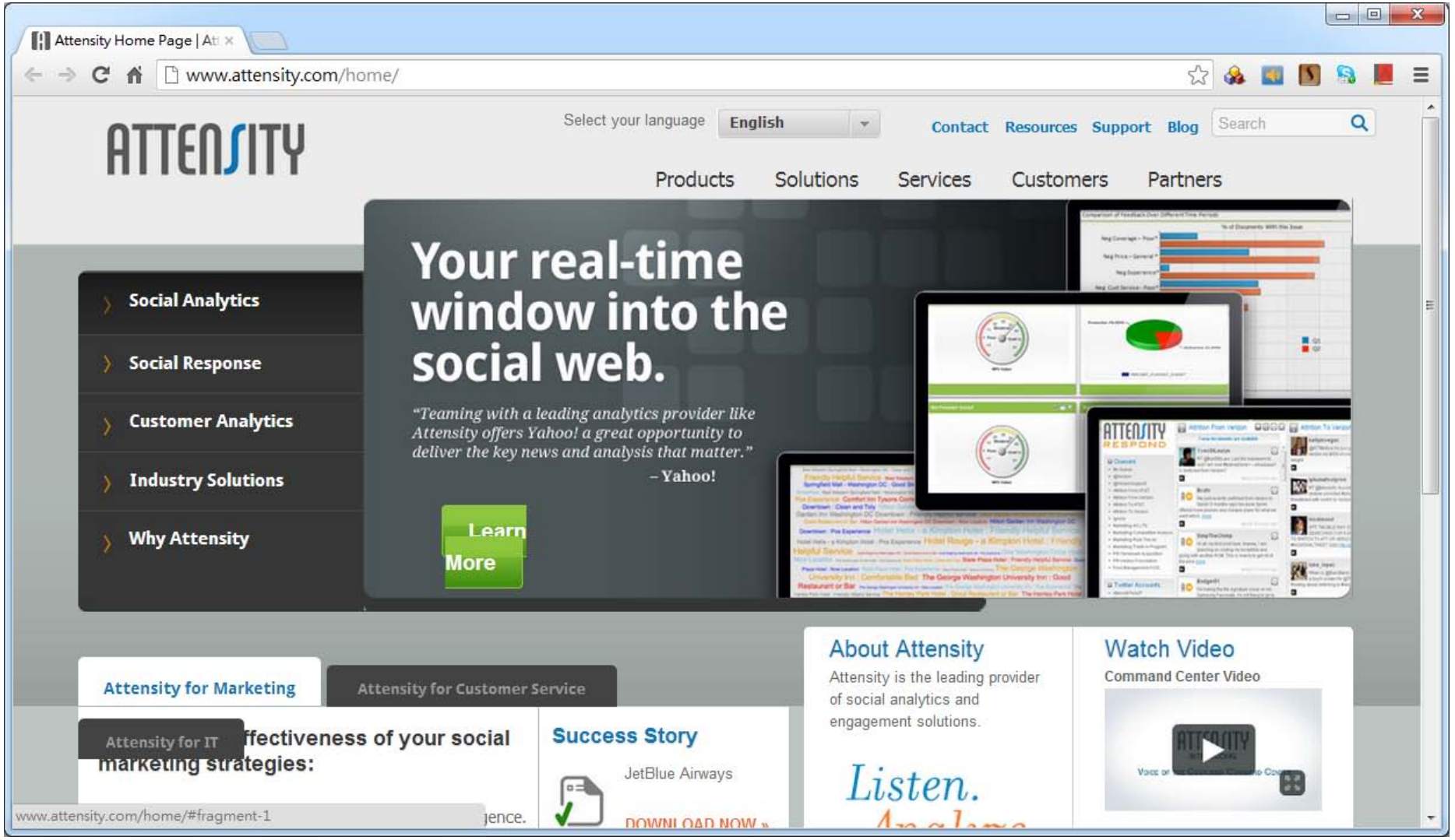
Word-of-mouth

Voice of the Customer

- 1. Attensity
  - Track social sentiment across brands and competitors
  - http://www.attensity.com/home/
- 2. Clarabridge
  - Sentiment and Text Analytics Software
  - http://www.clarabridge.com/

Attensity: Track social sentiment across brands and competitors

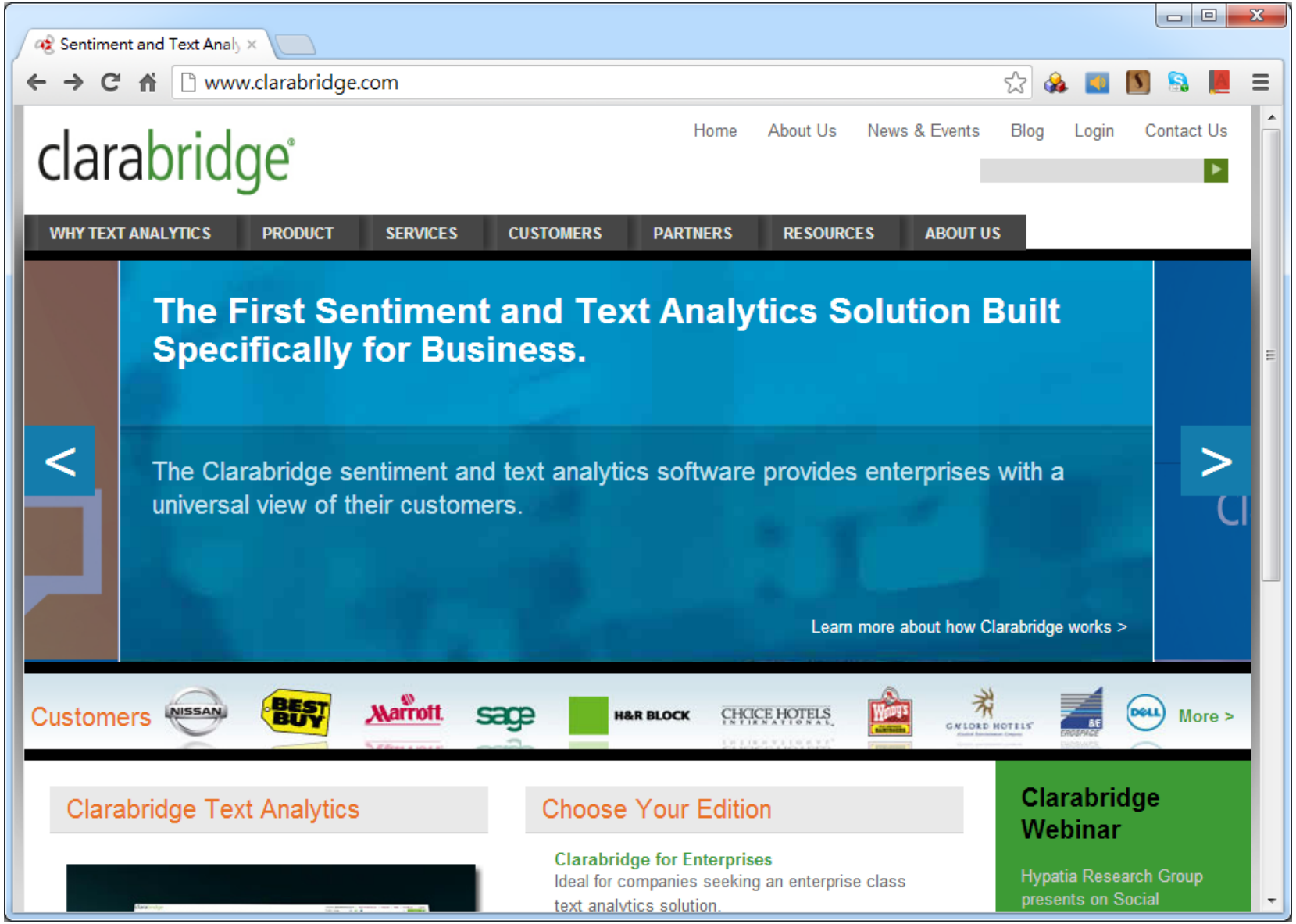
http://www.attensity.com/



http://www.youtube.com/watch?v=4goxmBEg2Iw#!

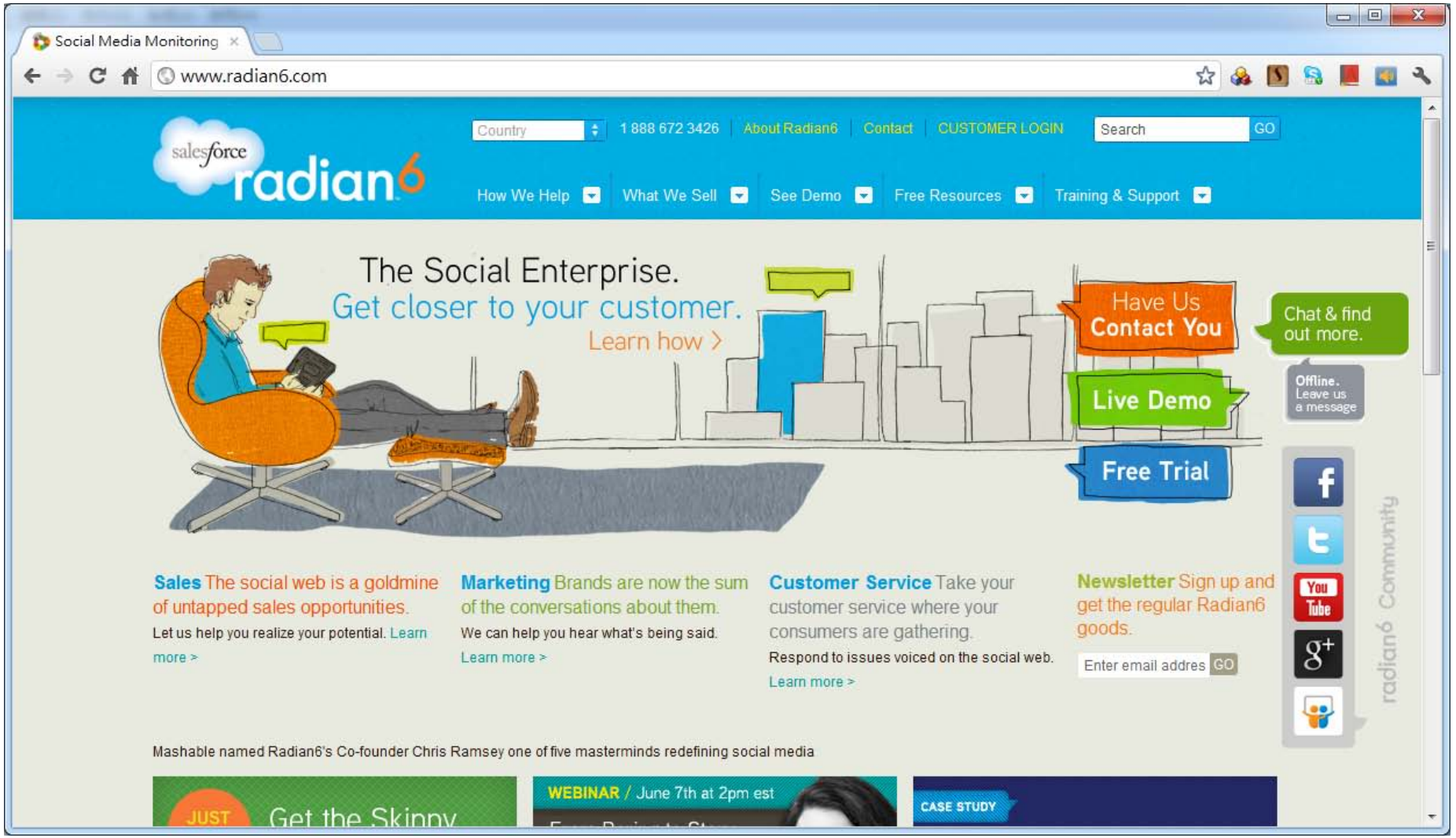
Clarabridge: Sentiment and Text Analytics Software

http://www.clarabridge.com/



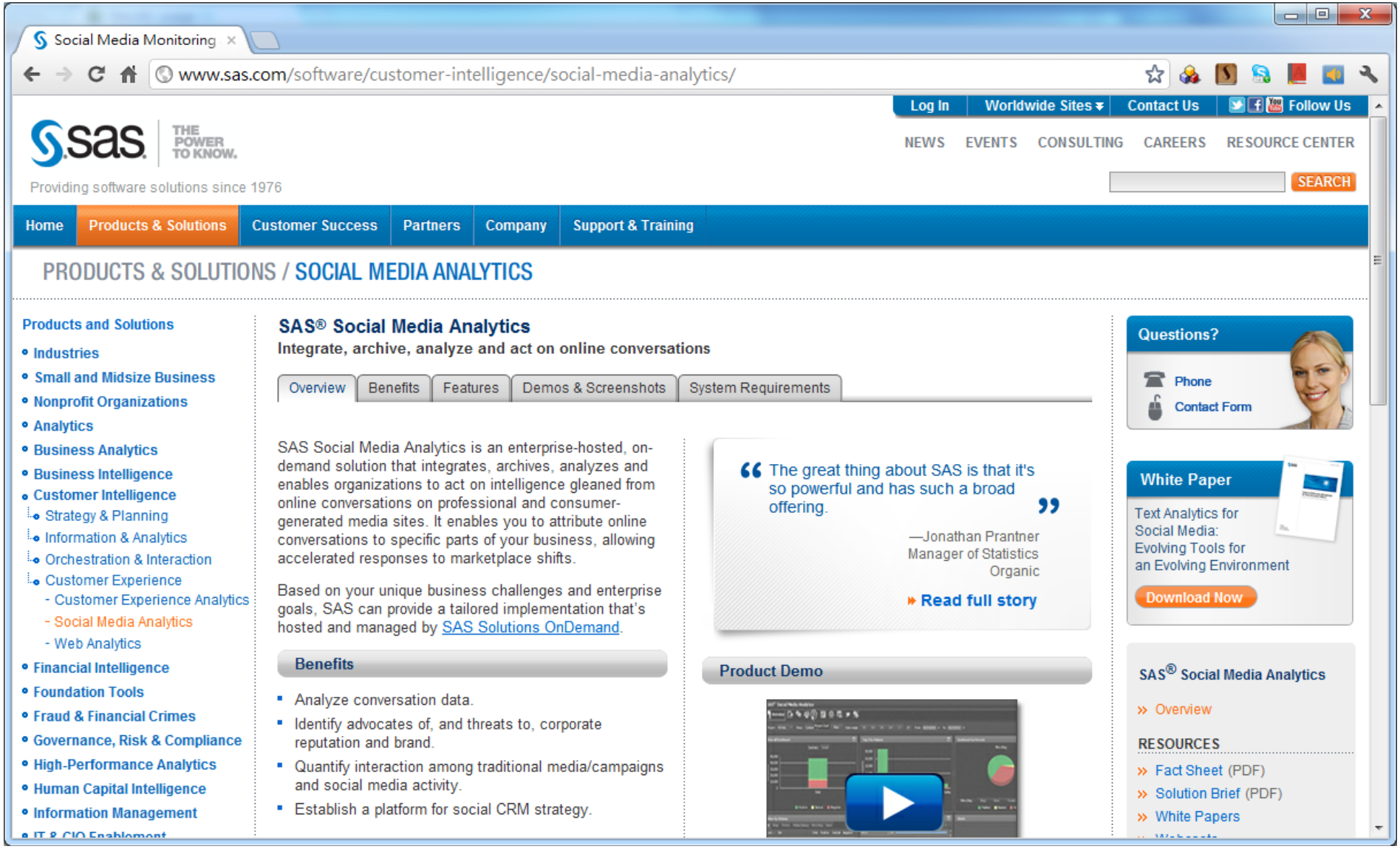
http://www.youtube.com/watch?v=IDHudt8M9P0

http://www.radian6.com/



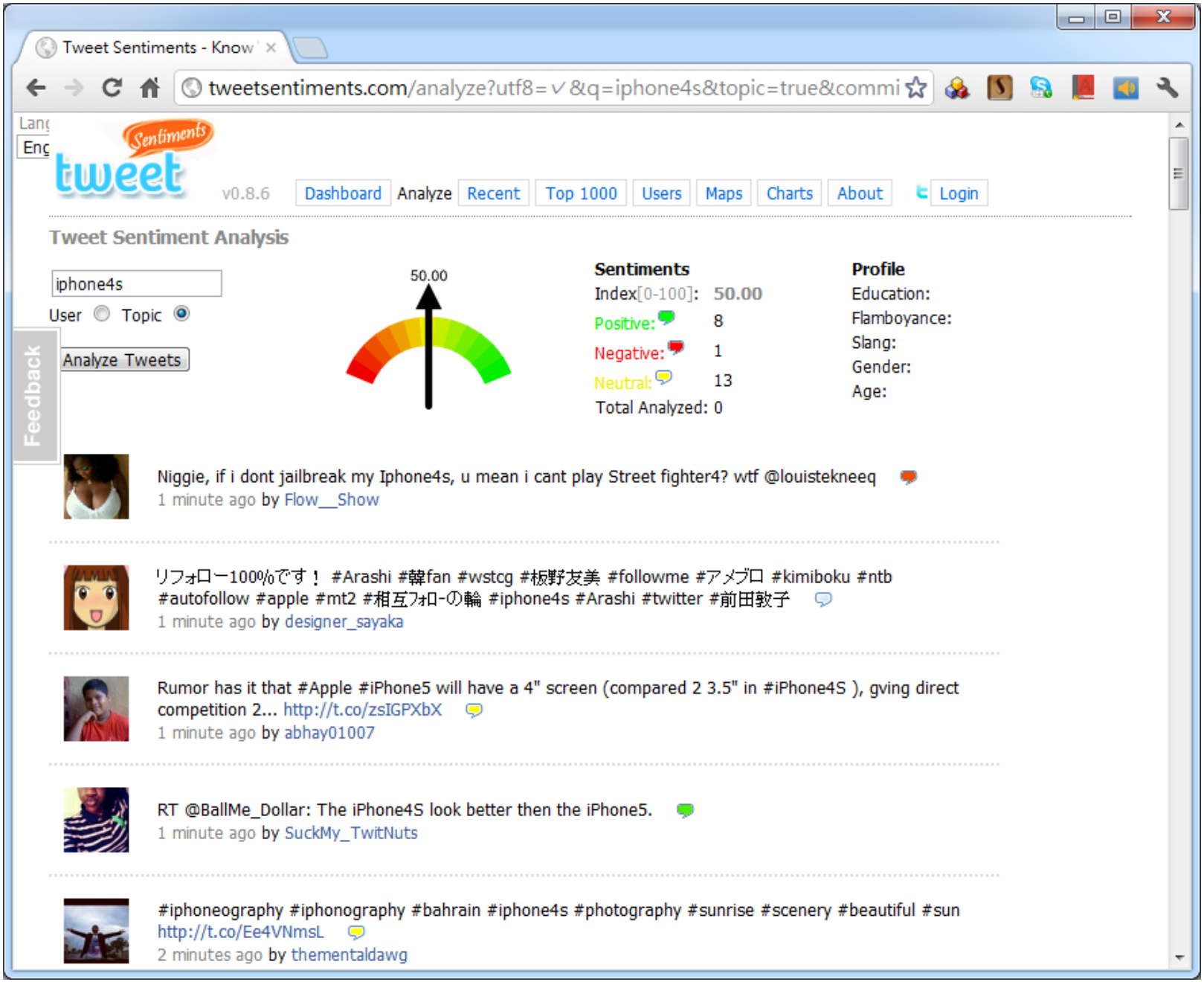
http://www.youtube.com/watch?feature=player_embedded&v=8i6Exg3Urg0

http://www.sas.com/software/customer-intelligence/social-media-analytics/



http://www.tweetfeel.com

http://tweetsentiments.com/



http://www.i-buzz.com.tw/

http://www.eland.com.tw/solutions

http://opview-eland.blogspot.tw/2012/05/blog-post.html

Sentiment Analysis

- Sentiment
  - A thought, view, or attitude, especially one based mainly on emotion instead of reason
- Sentiment Analysis
  - opinion mining
  - use of natural language processing (NLP) and computational techniques to automate the extraction or classification of sentiment from typically unstructured text

Applications of Sentiment Analysis

- Consumer information
  - Product reviews
- Marketing
  - Consumer attitudes
  - Trends
- Politics
  - Politicians want to know voters' views
  - Voters want to know policitians' stances and who else supports them
- Social
  - Find like-minded individuals or communities

Sentiment detection

- How to interpret features for sentiment detection?
  - Bag of words (IR)
  - Annotated lexicons (WordNet, SentiWordNet)
  - Syntactic patterns
- Which features to use?
  - Words (unigrams)
  - Phrases/n-grams
  - Sentences

Problem statement of Opinion Mining

- Two aspects of abstraction
  - Opinion definition
    - What is an opinion?
    - What is the structured definition of opinion?
  - Opinion summarization
    - Opinion are subjective
      - An opinion from a single person (unless a VIP) is often not sufficient for action
    - We need opinions from many people, and thus opinion summarization.

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Abstraction (1): what is an opinion?

- Id: **Abc123** on **5-1-2008** "*I bought an iPhone a few days ago. It is such a nice phone. The touch screen is really cool. The voice quality is clear too. It is much better than my old Blackberry, which was a terrible phone and so difficult to type with its tiny keys. However, my mother was mad with me as I did not tell her before I bought the phone. She also thought the phone was too expensive, …*"
- One can look at this review/blog at the
  - Document level
    - Is this review + or -?
  - Sentence level
    - Is each sentence + or -?
  - Entity and feature/aspect level

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Entity and aspect/feature level

- Id: **Abc123** on **5-1-2008** "*I bought an iPhone a few days ago. It is such a nice phone. The touch screen is really cool. The voice quality is clear too. It is much better than my old Blackberry, which was a terrible phone and so difficult to type with its tiny keys. However, my mother was mad with me as I did not tell her before I bought the phone. She also thought the phone was too expensive, …*"
- What do we see?
  - Opinion targets: entities and their features/aspects
  - Sentiments: positive and negative
  - Opinion holders: persons who hold the opinions
  - Time: when opinion are expressed

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Two main types of opinions

- Regular opinions: Sentiment/Opinion expressions on some target entities
  - Direct opinions: sentiment expressions on one object:
    - "The touch screen is really cool."
    - "The picture quality of this camera is great"
  - Indirect opinions: comparisons, relations expressing similarities or differences (objective or subjective) of more than one object
    - "phone X is cheaper than phone Y." (objective)
    - "phone X is better than phone Y." (subjective)
- Comparative opinions: comparisons of more than one entity.
  - "iPhone is better than Blackberry."

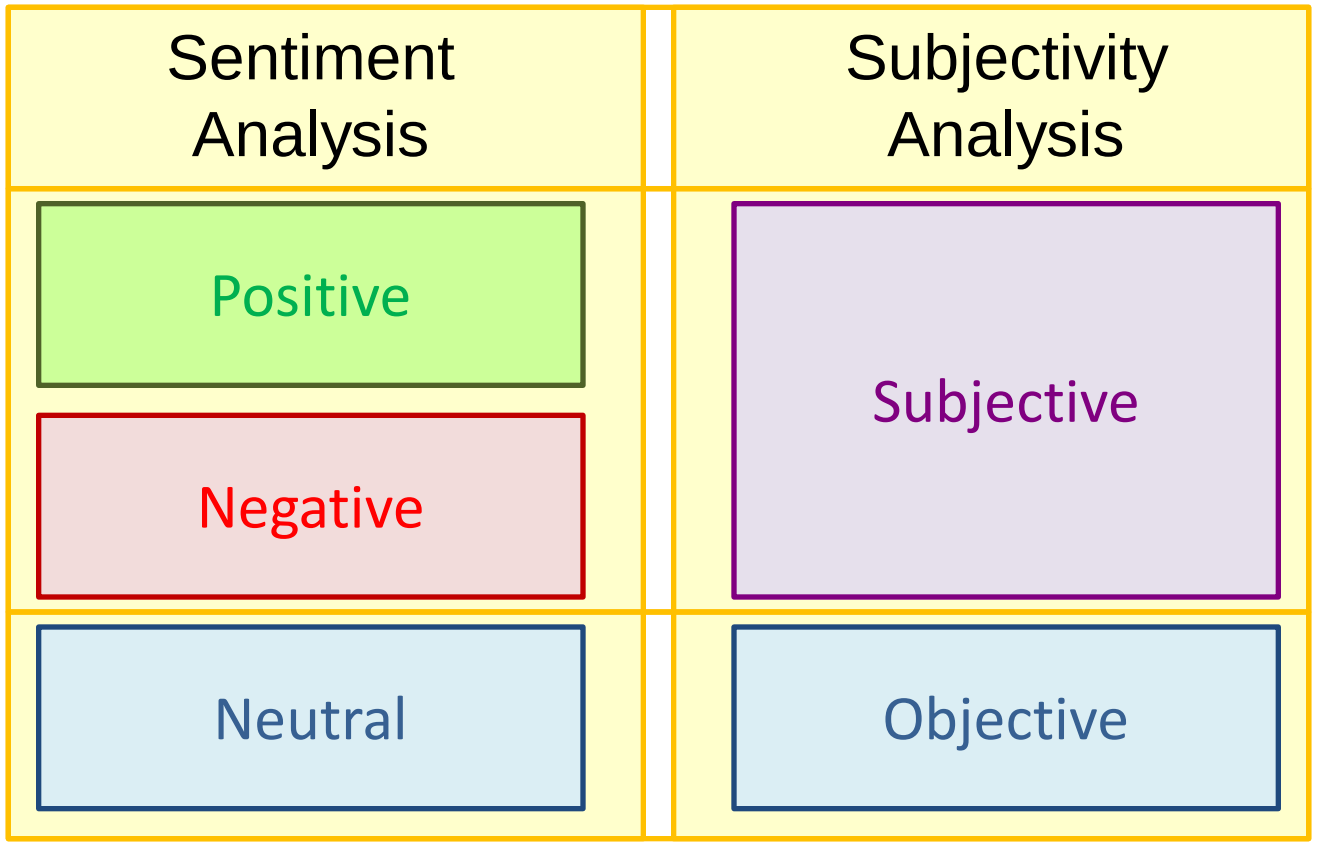
Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Subjective and Objective

- Objective
  - An objective sentence expresses some factual information about the world.
  - "I returned the phone yesterday."
  - Objective sentences can implicitly indicate opinions
    - "The earphone broke in two days."
- Subjective
  - A subjective sentence expresses some personal feelings or beliefs.
  - "The voice on my phone was not so clear"
  - Not every subjective sentence contains an opinion
    - "I wanted a phone with good voice quality"
- ➔ Subjective analysis

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Sentiment Analysis vs. Subjectivity Analysis



A (regular) opinion

- Opinion (a restricted definition)
  - An opinion (regular opinion) is simply a positive or negative sentiment, view, attitude, emotion, or appraisal about an entity or an aspect of the entity from an opinion holder.
- Sentiment orientation of an opinion
  - Positive, negative, or neutral (no opinion)
  - Also called:
    - Opinion orientation
    - Semantic orientation
    - Sentiment polarity

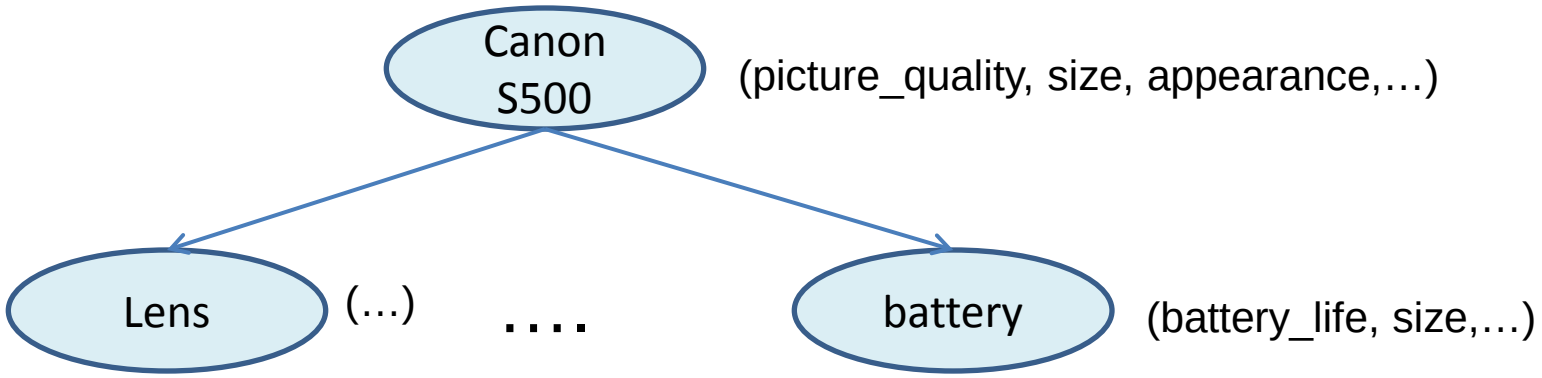
Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Entity and aspect

- Definition of Entity:
  - An *entity e* is a product, person, event, organization, or topic.
  - e is represented as
    - A hierarchy of components, sub-components.
    - Each node represents a components and is associated with a set of attributes of the components
- An opinion can be expressed on any node or attribute of the node
- Aspects(features)
  - represent both components and attribute

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Entity and aspect



Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Opinion definition

- An opinion is a quintuple
  $(e_j, a_{jk}, so_{ijkl}, h_i, t_l)$
  where
  - e_j is a target entity.
  - a_{jk} is an aspect/feature of the entity e_j .
  - so_{ijkl} is the sentiment value of the opinion from the opinion holder on feature of entity at time.
    so_{ijkl} is +ve, -ve, or neu, or more granular ratings
  - h_i is an opinion holder.
  - t_l is the time when the opinion is expressed.

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  - h_i is an opinion holder.
  - t_l is the time when the opinion is expressed.
- (e_j, a_{jk}) is also called opinion target

Terminologies

- Entity: object
- Aspect: feature, attribute, facet
- Opinion holder: opinion source

- Topic: entity, aspect

- Product features, political issues

Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Subjectivity and Emotion

- Sentence subjectivity
  - An objective sentence presents some factual information, while a subjective sentence expresses some personal feelings, views, emotions, or beliefs.
- Emotion
  - Emotions are people's subjective feelings and thoughts.

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Emotion

- Six main emotions
  - Love
  - Joy
  - Surprise
  - Anger
  - Sadness
  - Fear

Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Abstraction (2): opinion summary

- With a lot of opinions, a summary is necessary.
  - A multi-document summarization task
- For factual texts, summarization is to select the most important facts and present them in a sensible order while avoiding repetition
  - 1 fact = any number of the same fact
- But for opinion documents, it is different because opinions have a quantitative side & have targets
  - 1 opinion <> a number of opinions
  - Aspect-based summary is more suitable
  - Quintuples form the basis for opinion summarization

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

An aspect-based opinion summary

Cellular phone 1:

Aspect: **GENERAL**

Positive:	125	<individual review sentences>
Negative:	7	<individual review sentences>

Aspect: **Voice quality**

Positive:	120	<individual review sentences>
Negative:	8	<individual review sentences>

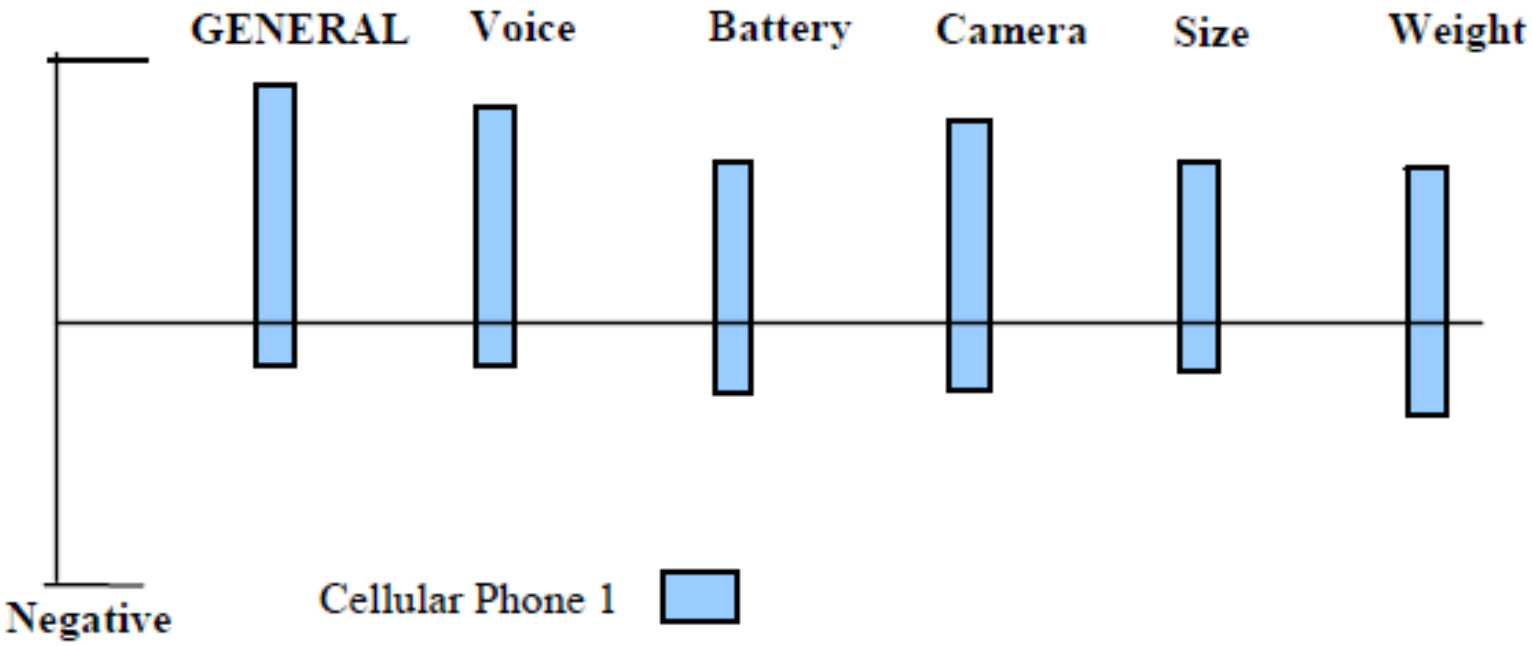
Aspect: **Battery**

Positive:	80	<individual review sentences>
Negative:	12	<individual review sentences>

…

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Visualization of aspect-based summaries of opinions



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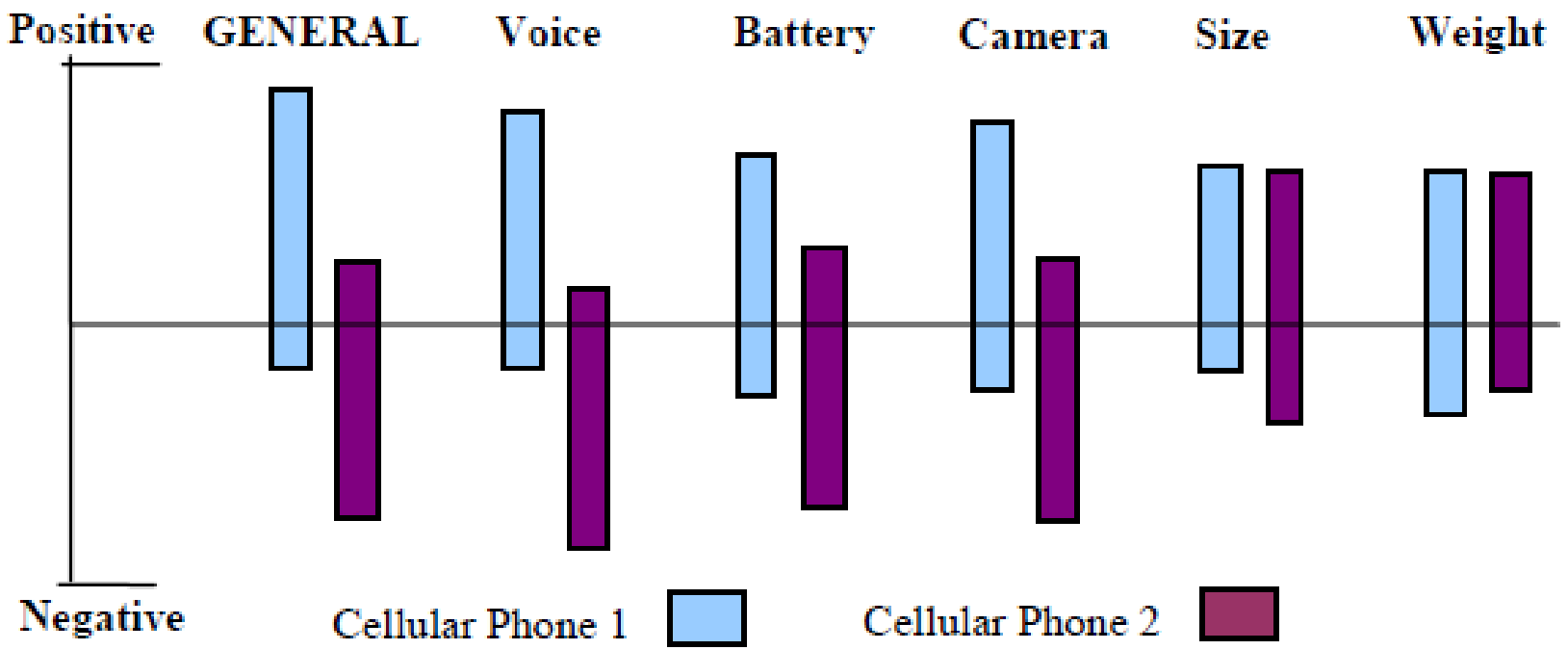
Visualization of aspect-based summaries of opinions



Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Classification Based on Supervised Learning

- Sentiment classification
  - Supervised learning Problem
  - Three classes
    - *Positive*
    - *Negative*
    - *Neutral*

Source: Bing Liu (2011) , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data,” Springer, 2nd Edition,

Opinion words in Sentiment classification

- topic-based classification
  - topic-related words are important
    - e.g., *politics, sciences, sports*
- Sentiment classification
  - topic-related words are unimportant
  - **opinion words** (also called **sentiment words)**
    - **that indicate positive or negative opinions** are important,
      e.g., *great, excellent, amazing, horrible, bad, worst*

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Features in Opinion Mining

- *Terms and their frequency*
  - *TF-IDF*
- *Part of speech (POS)*
  - Adjectives
- *Opinion words and phrases*
  - *beautiful, wonderful, good, and amazing are positive opinion words*
  - *bad, poor, and terrible are negative opinion words.*
  - opinion phrases and idioms,
    e.g., *cost someone an arm and a leg*
- *Rules of opinions*
- *Negations*
- *Syntactic dependency*

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

Rules of opinions

Syntactic template	**Example pattern**
<subj> passive-verb	<subj> was satisfied
<subj> active-verb	<subj> complained
active-verb <dobj>	endorsed <dobj>
noun aux <dobj>	fact is <dobj>
passive-verb prep <np>	was worried about <np>

Source: Bing Liu (2011) , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data," Springer, 2nd Edition,

A Brief Summary of Sentiment Analysis Methods

Study	Analysis Task	Sentiment Identification		Sentiment Aggregation		Nature of Measure
		Method	Level	Method	Level	
Hu and Li, 2011	Polarity	ML (Probabilistic model)	Snippet			Valence
Li and Wu, 2010	Polarity	Lexicon/Rule	Phrase	Sum	Snippet	Valence
Thelwall et al., 2010	Polarity	Lexicon/Rule	Sentence	Max & Min	Snippet	Range
Boiy and Moens, 2009	Both	ML (Cascade ensemble)	Sentence			Valence
Chung 2009	Polarity	Lexicon	Phrase	Average	Sentence	Valence
Wilson, Wiebe, and Hoffmann, 2009	Both	ML (SVM, AdaBoost, Rule, etc.)	Phrase			Valence
Zhang et al., 2009	Polarity	Lexicon/Rule	Sentence	Weighted average	Snippet	Valence
Abbasi, Chen, and Salem, 2008	Polarity	ML (GA + feature selection)	Snippet			Valence
Subrahmanian and Reforgiato, 2008	Polarity	Lexicon/Rule	Phrase	Rule	Snippet	Valence
Tan and Zhang 2008	Polarity	ML (SVM, Winnow, NB, etc.)	Snippet			Valence
Airoldi, Bai, and Padman, 2007	Polarity	ML (Markov Blanket)	Snippet			Valence
Das and Chen, 2007	Polarity	ML (Bayesian, Discriminate, etc.)	Snippet	Average	Daily	Valence
Liu et al., 2007	Polarity	ML (PLSA)	Snippet			Valence
Kennedy and Inkpen, 2006	Polarity	Lexicon/Rule, ML (SVM)	Phrase	Count	Snippet	Valence
Mishne 2006	Polarity	Lexicon	Phrase	Average	Snippet	Valence
Liu et al., 2005	Polarity	Lexicon/Rule	Phrase	Distribution	Object	Range
Mishne 2005	Polarity	ML (SVM)	Snippet			Valence
Popescu and Etzioni 2005	Polarity	Lexicon/Rule	Phrase			Valence
Efron 2004	Polarity	ML (SVN, NB)	Snippet			Valence
Wilson, Wiebe, and Hwa, 2004	Both	ML (SVM, AdaBoost, Rule, etc.)	Sentence			Valence
Nigam and Hurst 2004	Polarity	Lexicon/Rule	Chunk	Rule	Sentence	Valence
Dave, Lawrence, and Pennock, 2003	Polarity	ML (SVM, Rainbow, etc.)	Snippet			Valence
Nasukawa and Yi 2003	Polarity	Lexicon/Rule	Phrase	Rule	Sentence	Valence
Yi et al., 2003	Polarity	Lexicon/Rule	Phrase	Rule	Sentence	Valence
Yu and Hatzivassiloglou 2003	Both	ML (NB) + Lexicon/Rule	Phrase	Average	Sentence	Valence
Pang, Lee, and Vaithyanathan 2002	Polarity	ML (SVM, MaxEnt, NB)	Snippet			Valence
Subasic and Huettner 2001	Polarity	Lexicon/Fuzzy logic	Phrase	Average	Snippet	Valence
Turney 2001	Polarity	Lexicon/Rule	Phrase	Average	Snippet	Valence

(Both = Subjectivity and Polarity; ML= Machine Learning; Lexicon/Rule= Lexicon enhanced by linguistic rules)

Source: Zhang, Z., Li, X., and Chen, Y. (2012), "Deciphering word-of-mouth in social media: Text-based metrics of consumer reviews," ACM Trans. Manage. Inf. Syst. (3:1) 2012, pp 1-23.,

Word-of-Mouth (WOM)

- "This book is the best written documentary thus far, yet sadly, there is no soft cover edition."

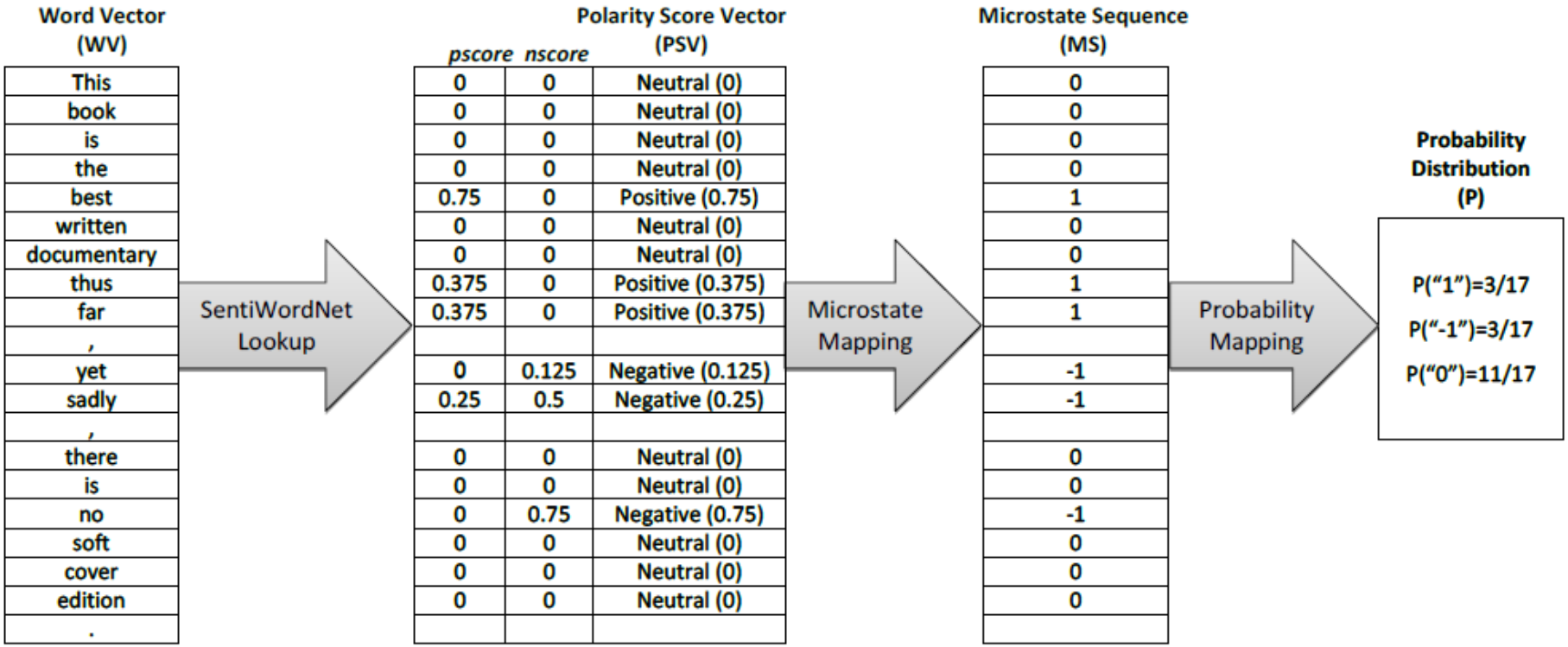
- "This book is the best written documentary thus far, yet sadly, there is no soft cover edition."

Source: Zhang, Z., Li, X., and Chen, Y. (2012), "Deciphering word-of-mouth in social media: Text-based metrics of consumer reviews," ACM Trans. Manage. Inf. Syst. (3:1) 2012, pp 1-23.,

	Word	POS
This	This	DT
book	book	NN
is	is	VBZ
the	the	DT
best	best	JJS
written	written	VBN
documentary	documentary	NN
thus	thus	RB
far	far	RB
,	,	,
yet	yet	RB
sadly	sadly	RB
,	,	,
there	there	EX
is	is	VBZ
no	no	DT
soft	soft	JJ
cover	cover	NN
edition	edition	NN
.	.	.

Source: Zhang, Z., Li, X., and Chen, Y. (2012), "Deciphering word-of-mouth in social media: Text-based metrics of consumer reviews," ACM Trans. Manage. Inf. Syst. (3:1) 2012, pp 1-23.,

Conversion of text representation



Source: Zhang, Z., Li, X., and Chen, Y. (2012), "Deciphering word-of-mouth in social media: Text-based metrics of consumer reviews," ACM Trans. Manage. Inf. Syst. (3:1) 2012, pp 1-23.,

Datasets of Opinion Mining

- Blog06
  - 25GB TREC test collection
  - http://ir.dcs.gla.ac.uk/test collections/access to data.html
- Cornell movie-review datasets
  - http://www.cs.cornell.edu/people/pabo/movie-review-data/
- Customer review datasets
  - http://www.cs.uic.edu/~liub/FBS/CustomerReviewData.zip
- Multiple-aspect restaurant reviews
  - http://people.csail.mit.edu/bsnyder/naacl07
- NTCIR multilingual corpus
  - NTCIR Multilingual Opinion-Analysis Task (MOAT)

Source: Bo Pang and Lillian Lee (2008), "Opinion mining and sentiment analysis," Foundations and Trends in Information Retrieval

Lexical Resources of Opinion Mining

- SentiWordnet
  - http://sentiwordnet.isti.cnr.it/
- General Inquirer
  - http://www.wjh.harvard.edu/~inquirer/
- OpinionFinder's Subjectivity Lexicon
  - http://www.cs.pitt.edu/mpqa/
- NTU Sentiment Dictionary (NTUSD)
  - http://nlg18.csie.ntu.edu.tw:8080/opinion/
- Hownet Sentiment
  - http://www.keenage.com/html/c_bulletin_2007.htm

Example of SentiWordNet

POS	ID	PosScore	NegScore	SynsetTerms	Gloss
a	00217728	0.75	0	beautiful#1	delighting the senses or exciting intellectual or emotional admiration; "a beautiful child"; "beautiful country"; "a beautiful painting"; "a beautiful theory"; "a beautiful party“
a	00227507	0.75	0	best#1	(superlative of `good') having the most positive qualities; "the best film of the year"; "the best solution"; "the best time for planting"; "wore his best suit“
r	00042614	0	0.625	unhappily#2 sadly#1	in an unfortunate way; "sadly he died before he could see his grandchild“
r	00093270	0	0.875	woefully#1 sadly#3 lamentably#1 deplorably#1	in an unfortunate or deplorable manner; "he was sadly neglected"; "it was woefully inadequate“
r	00404501	0	0.25	sadly#2	with sadness; in a sad manner; "`She died last night,' he said sadly"

《知網》情感分析用詞語集（beta版）

- “中英文情感分析用詞語集”
  - 包含詞語約 17887
- “中文情感分析用詞語集”
  - 包含詞語約 9193
- “英文情感分析用詞語集”
  - 包含詞語 8945

Source: http://www.keenage.com/html/c_bulletin_2007.htm

中文情感分析用詞語集

中文正面情感詞語	836
中文負面情感詞語	1254
中文正面評價詞語	3730
中文負面評價詞語	3116
中文程度級別詞語	219
中文主張詞語	38
Total	9193

Source: http://www.keenage.com/html/c_bulletin_2007.htm

中文情感分析用詞語集

- “正面情感”詞語
  - 如：

    愛，讚賞，快樂，感同身受，好奇，
    喝彩，魂牽夢縈，嘉許...
- “負面情感”詞語
  - 如：

    哀傷，半信半疑，鄙視，不滿意，不是滋味兒
    ，後悔，大失所望...

Source: http://www.keenage.com/html/c_bulletin_2007.htm

中文情感分析用詞語集

- “正面評價”詞語
  - 如：
    不可或缺，部優，才高八斗，沉魚落雁，
    催人奮進，動聽，對勁兒 ...
- “負面評價”詞語
  - 如：
    醜，苦，超標，華而不實，荒涼，混濁，
    畸輕畸重，價高，空洞無物 ...

Source: http://www.keenage.com/html/c_bulletin_2007.htm

中文情感分析用詞語集

- “程度級別”詞語
  - 1. “極其|extreme / 最|most”
    - 非常，極，極度，無以倫比，最為
  - 2. “很|very”
    - 多麼，分外，格外，著實
  - …
- “主張”詞語
  - 1. {perception|感知}
    - 感覺，覺得，預感
  - 2. {regard|認為}
    - 認為，以為，主張

Source: http://www.keenage.com/html/c_bulletin_2007.htm

Opinion Spam Detection

- Opinion Spam Detection: Detecting Fake Reviews and Reviewers
  - Spam Review
  - Fake Review
  - Bogus Review
  - Deceptive review
  - Opinion Spammer
  - Review Spammer
  - Fake Reviewer
  - Shill (Stooge or Plant)

Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

Opinion Spamming

- Opinion Spamming
  - "illegal" activities
    - e.g., writing fake reviews, also called shilling
  - try to mislead readers or automated opinion mining and sentiment analysis systems by giving undeserving positive opinions to some target entities in order to promote the entities and/or by giving false negative opinions to some other entities in order to damage their reputations.

Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

Forms of Opinion spam

- fake reviews (also called bogus reviews)
- fake comments
- fake blogs
- fake social network postings
- deceptions
- deceptive messages

Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

Fake Review Detection

- Methods
  - supervised learning
  - pattern discovery
  - graph-based methods
  - relational modeling
- Signals
  - Review content
  - Reviewer abnormal behaviors
  - Product related features
  - Relationships

Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

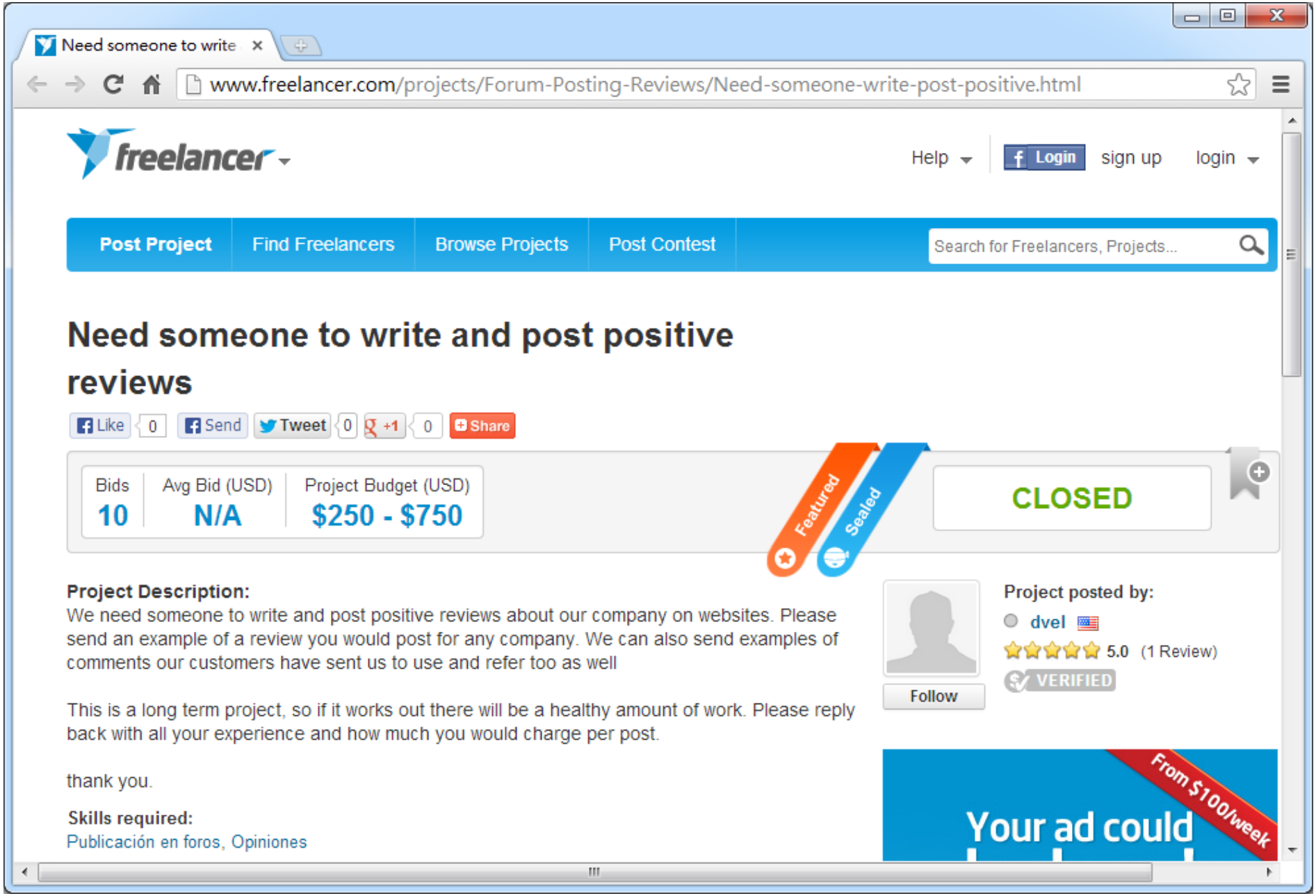
Professional Fake Review Writing Services (some Reputation Management companies)

- Post positive reviews
- Sponsored reviews
- Pay per post
- Need someone to write positive reviews about our company (budget: $250-$750 USD)
- Fake review writer
- Product review writer for hire
- Hire a content writer
- Fake Amazon book reviews (hiring book reviewers)
- People are just having fun (not serious)

Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

Source:http://www.sponsoredreviews.com/

Source: https://payperpost.com/



Source:http://www.freelancer.com/projects/Forum-Posting-Reviews/Need-someone-write-post-positive.html

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2. Guan Wang, Sihong Xie, Bing Liu, Philip S. Yu. Identify Online Store Review Spammers via Social Review Graph. ACM Transactions on Intelligent Systems and Technology, accepted for publication, 2011.
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Source: http://www.cs.uic.edu/~liub/FBS/fake-reviews.html

Summary

- Social Word-of-Mouth
- Opinion Mining and Sentiment Analysis
- Social Media Monitoring/Analysis
- Resources of Opinion Mining
- Opinion Spam Detection

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