

Natural Language Processing: Sentiment Analysis

16 February 2022

Sentiment Analysis

Background

“What people think?”

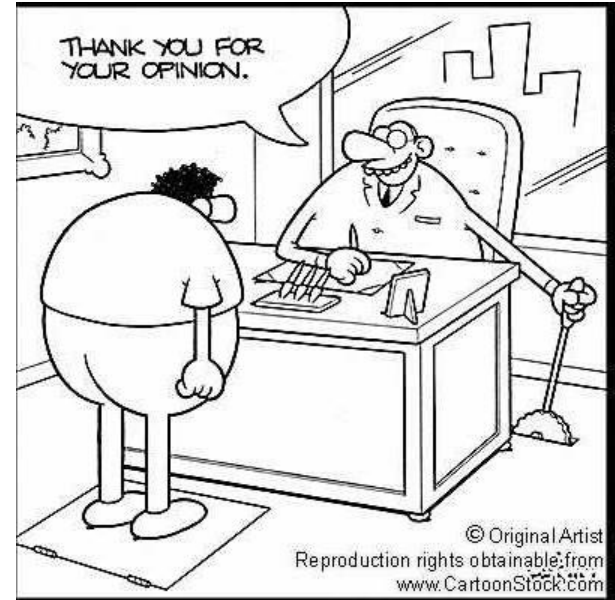
What others think has always been an important piece of information

“Which car should I buy?”

“Which schools should I apply to?”

“Which Professor to work for?”

“Whom should I vote for?”



“So whom shall I ask?”

Pre Web

- Friends and relatives
- Acquaintances
- Consumer Reports



Post Web

“...I don't know who..but apparently it's a good phone. It has good battery life and...”

- Blogs (google blogs, livejournal)
- E-commerce sites (amazon, ebay)
- Review sites (CNET, PC Magazine)
- Discussion forums (*forums.craigslist.org, forums.macrumors.com*)
- Friends and Relatives (occasionally)



Too Much Data

- Searching for reviews may be however difficult
 - Can we [search](#) for opinions as conveniently as in general Web search?
 - Eg.: is it easy to search for *“iPhone vs Google Phone”*?

“Look at reviews on one site only...?”

Problems?

- Biased views
 - all reviewers on one site may have the same opinion
- Fake reviews/Spam
 - people post good reviews about their own product or services
 - some posts are plain spams



Coincidence or Fake..?

Reviews for a moving company from YellowPages

- # of merchants reviewed by each of these reviewers more than 1?
- Review dates close to one another
- All rated 5 stars
- Reviewers seem to know exact names of people working in the company and too many positive mentions

THE BEST!!!!

11/30/2007 Posted by **karen**

NorthStar did an outstanding job of packing and moving my things. Quite frankly I was expecting some things to be broken. However, to my surprise not one thing was broken and everything went as smooth as could be expected. I had approximately 15,000 lbs. of items to move. I am very impressed with NorthStar and I would not hesitate to utilize them again for my next move. All of the young men who assisted in packing and loading were very hard working and polite.

Pros: everything was great

GOOD MOVING

10/11/2007 Posted by **loanee777**

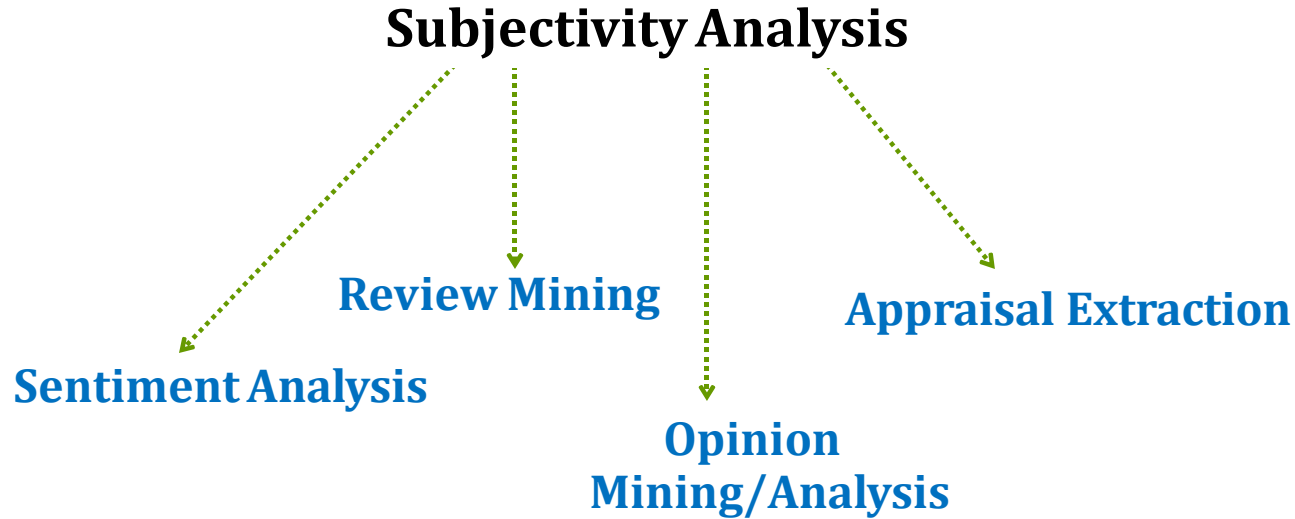
About a month ago, on Sep 12, we hired NorthStar Moving to move our belongings from our house in Van Nuys to the Highway Storage place in Santa Clara. We would like to express our sincere thanks and appreciation for the professional work that was carried out by NorthStar team of workers. In particular, we would like to mention the four NorthStar workers: Roy Ashual, Moshiko Haziza, Guillermo Molise and Roberto Mendoza for their very dedicated service. Besides being good natured and helpful they worked very well and took good care of our personal effects. We would definitely refer them and NorthStar Moving to any of our friends who are looking for a good moving company.

Great movers

10/08/2007 Posted by **shelly_morgan**

I wanted to thank the Northstar Moving group for a fabulous job. We hired Northstar Moving on August 4th to move us out of two storage units and where we were staying to our new home in Los Angeles. I had gone through surgery on the 2nd and was in no condition to move around a lot. The Northstar Moving team was great. I slept in while my husband met them at the first pick-up point. Then they came to the 2nd and that is where I met them. When we arrived at the new house they found something for me to sit on and I set in one place in the garage telling them which room the items went. They were great. They had wonderful personalities. I have never had so much fun moving (even if I was in some pain). Northstar thank you again for the great team and customer service.

Research Task's Names



They are synonyms and are interchangeably used

Sentiment Analysis

- Sentiment analysis is the detection of **attitudes**

“enduring, affectively colored beliefs, dispositions towards objects or persons”

1. **Holder (source)** of attitude

2. **Target (aspect)** of attitude

3. **Type** of attitude

- From a set of types
 - *like, love, hate, value, desire, etc.*
- Or (more commonly/simply) simple weighted **polarity**:
 - *positive, negative, neutral, together with their strengths*

4. **Text** containing the attitude

- Sentence or entire document
 - blogs
 - editorials
 - reviews (of products, movies, books, etc.)
 - newspaper articles
 - etc.

Sentiment Analysis

- Simplest task:
 - Is the attitude of this text positive or negative?
- More complex:
 - Rank the attitude of the text from 1 to 5
- Advanced:
 - Detect the target, source, or complex attitude types

Why sentiment analysis?

- *Politics*: what do people think about particular candidate or issue?
- *Movie*: is this review positive or negative?
- *Products*: what do people think about the new iPhone?
- *Public sentiment*: how is consumer confidence?
- *Prediction*: predict election outcomes or market trends from sentiment
- Etc.

Political opinion mining

**emilia** @PoliticalEmilia · 43m

As somebody whose immediate family are **immigrants** from Iran, I want to remind that this isn't the fault of Iranian Americans. Most of us want no more war in the Middle East.

Take your anger out at your government leaders, not at us. We have nothing to do with it. [#IranAttacks](#)

81 239 1.9K

**Nithya Raman** @nithyavraman · Jan 6

LA is one of the most **immigrant**-rich cities in the US.

Almost 50% of residents are foreign-born. 10% are undocumented.

As Trump works to implement his racist agenda, what are our elected officials doing to defend **immigrant** Angelinos?

The answer: infuriatingly little. (thread)

55 138 606

**Brigitte Gabriel** @ACTBrigitte · 3m

Thank Goodness there were ZERO U.S. casualties from the attacks Iran made tonight.

President **Trump** is monitoring the situation with his top leaders right now.

I've never felt more comfortable with a leader at the helm, than I do tonight with President **Trump** in office.

21 145 413

**Palmer Report** @PalmerReport · 1m

So a foreign nation fired missiles at U.S. troops tonight, and the President of the United States ISN'T addressing the nation? How far gone is Donald **Trump**? His handlers don't even trust him to read a speech off a teleprompter anymore.

15 74 225

**Andrea Chalupa** @AndreaChalupa · 7m

Trump is betting on Iran doing something so horrific to Americans that we rally around the flag, and the 2020 election becomes a mindless debate of who's "patriotic" vs. who's anti-war ("weak" on Iran).

47 147 425

Entity

Also called (target) objects, which can be a product, a service, an organization, an event, etc.

Time

Time when opinions has been expressed

Read all 2 Reviews | [Write a Review](#)

Finally a Camera Worthy to capture your Special moments


★★★★★ Written: Feb 10 '13

User Rating:	Excellent	Pros:	Build design, quality photos and video, quality components, everything about this camera!
Ease of Use:	██████████	Cons:	a bit bulky (if you had to nit-pick)
Durability:	██████████	The Bottom Line:	I would find it hard to believe finding a better built, better designed camera in the same price range of this Panasonic DMC-ZS20.
Battery Life:	██████████		
Photo Quality:	██████████		
Shutter Lag:	██████████		

Panasonic DMC-ZS20 finally a Camera worthy of capturing my family moments! I will give a full breakdown of this camera and enjoy the moment!

What's new in this version?
Panasonic DMC-ZS20
USB c

About the Author



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Member: Charles Junglas
Location: Misawa AB, Japan
Reviews written: 34
Trusted by: 13 members

Attributes/Aspects

Characteristics or components of an entity (e.g. the size of a camera, the price of a product, etc.)

Opinion Holder

The person who expresses opinions on an entity in the form of a review, a rating, a twitter message, etc.

Google Product Search



HP Officejet 6500A Plus e-All-in-One Color Ink-jet - Fax / copier / printer / scanner

\$89 online, \$100 nearby ★★★★★ 377 reviews

September 2010 - Printer - HP - Inkjet - Office - Copier - Color - Scanner - Fax - 250 sh

Reviews

Summary - Based on 377 reviews



What people are saying

ease of use	<div><div></div><div></div></div>	"This was very easy to setup to four computers."
value	<div><div></div><div></div></div>	"Appreciate good quality at a fair price."
setup	<div><div></div><div></div></div>	"Overall pretty easy setup."
customer service	<div><div></div><div></div></div>	"I DO like honest tech support people."
size	<div><div></div><div></div></div>	"Pretty Paper weight."
mode	<div><div></div><div></div></div>	"Photos were fair on the high quality mode."
colors	<div><div></div><div></div></div>	"Full color prints came out with great quality."

Bing Shopping

HP Officejet 6500A E710N Multifunction Printer

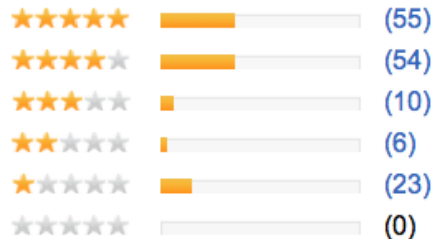
[Product summary](#) [Find best price](#) **Customer reviews** [Specifications](#) [Related items](#)



\$121.53 - \$242.39 (14 stores)

☐ Compare

Average rating ★★★★★ (144)



Most mentioned



Show reviews by source

Best Buy (140)
CNET (5)
Amazon.com (3)

Subjectivity Analysis on iPhone Reviews

Business' Perspective (e.g.):

- **Apple:** What do consumers think about iPhone?
 - Do they like it?
 - What do they dislike?
 - What are the major complaints?
 - What features should we add?
- **Apple's competitor:**
 - What are iPhone's weaknesses?
 - How can we compete with them?
 - Do people like everything about it?

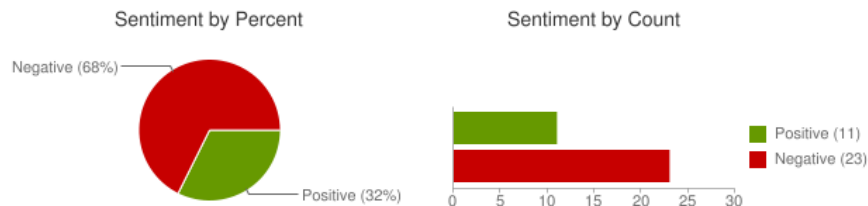
Business intelligence

Target Sentiment on Twitter

Type in a word and we'll highlight the good and the bad

[Save this search](#)

Sentiment analysis for "united airlines"



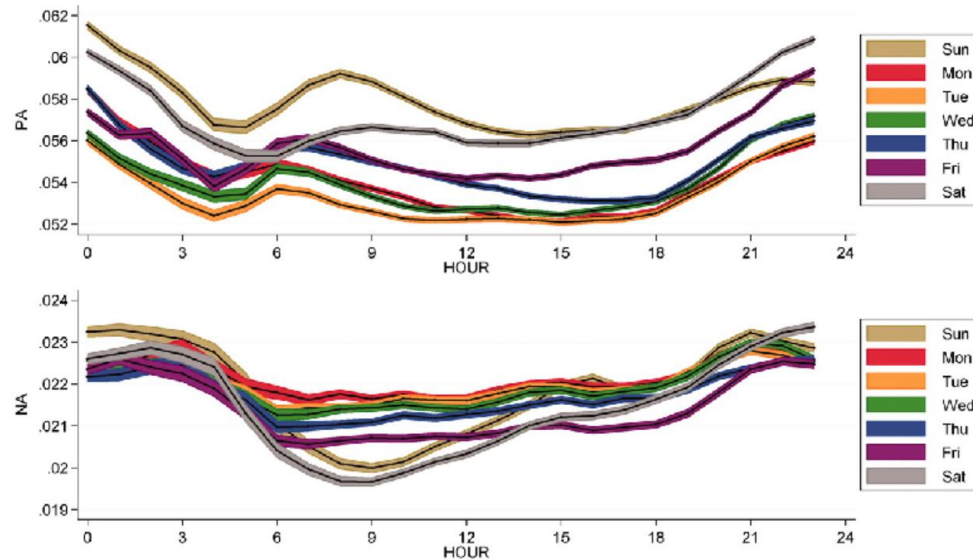
[jljacobson](#): OMG... Could **@United airlines** have worse customer service? W8g now 15 minutes on hold 4 questions about a flight 2DAY that need a human.
[Posted 2 hours ago](#)

[12345clumsy6789](#): I hate **United Airlines** Ceiling!!! Fukn impossible to get my conduit in this damn mess! ?
[Posted 2 hours ago](#)

[EMLandPRGbelgiu](#): EML/PRG fly with Q8 **united airlines** and 24seven to an exotic destination. <http://t.co/Z9QloAjE>
[Posted 2 hours ago](#)

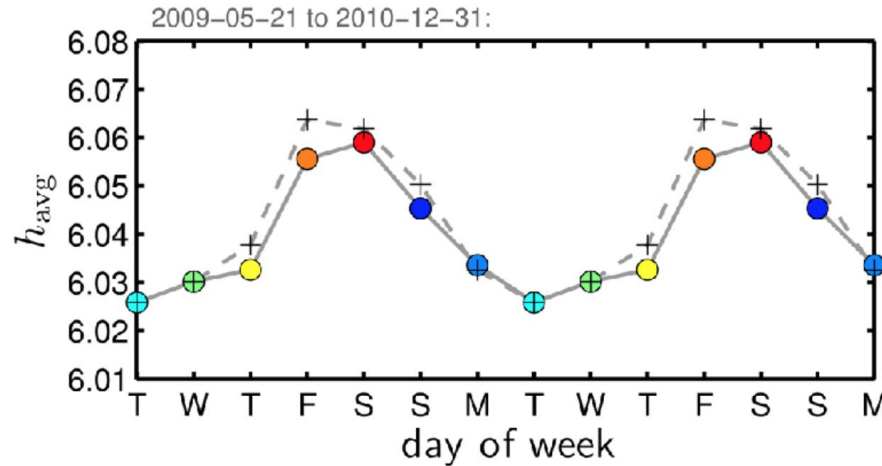
[CountAdam](#): FANTASTIC customer service from **United Airlines** at XNA today. Is tweet more, but cell phones off now!
[Posted 4 hours ago](#)

Positive/negative tone during a day (Twitter study across globe)



Positive affect (PA)
and negative affect
(NA) measured with
LIWC

Patterns of Happiness vs. Days of Week



Analysis of 46 billion words contained in nearly 4.6 billion expressions posted over a 33 month span by over 63 million unique users

Sentiment Analysis

Difficulties & Challenges




Problems: What makes reviews hard to classify?




- Subtlety:
 - Perfume review in *“Perfumes: the Guide”*:
 - *“If you are reading this because it is your darling fragrance, please wear it at home exclusively, and tape the windows shut.”*

Thwarted Expectations and Ordering Effects

- “This film should be brilliant. It sounds like a great plot, the actors are first grade, and the supporting cast is good as well, and Stallone is attempting to deliver a good performance. However, it **can't hold up**.”
- Well as usual Keanu Reeves is nothing special, but surprisingly, the very talented Laurence Fishbourne is **not so good** either, I was surprised.

Alternating Sentiments

 I suggest that instead of fillings songs in tunes you should fill tunes (not made of songs) only. The phone has good popularity in old age people. Third i had tried much for its data cable but i find it nowhere. It should be supplied with set with some extra cost. 


 Good features of this phone are its cheapest price and durability . It should have some features more than nokia 1200. it is easily available in market and repair is also available 


Sentiment Classification: Dealing with Negations

I really like this movie

I really **don't** like this movie

Negation changes the meaning of "like" to negative

Negation can also change negative to positive

- **Don't** dismiss this film
- **Doesn't** let us get bored

Sentiment Classification: Dealing with Negation

Simple baseline method: Add NOT_ to every word between negation and following punctuation:

didn't like this movie , but I



didn't NOT_like NOT_this NOT_movie , but I

Similar Ways of Accounting for Negation

- Let us consider the following **positive** sentence:
 - Example: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
- Rest of Sentence (RoS):
 - Following: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
 - Around: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
- First Sentiment-Carrying Word (FSW):
 - Following: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
 - Around: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*

Similar Ways of Accounting for Negation

The best performing method is considering two words following a negation keyword to be negated by that keyword. Overall accuracy of sentiment classification significantly increases with 5.5% and macro-level F1 significantly increases with 6.2%, compared to not accounting for negation (2k English movie review sentences).

- Let us consider the following positive sentence:
 - Example: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
- Next Non-Adverb (NNA):
 - Following: *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
- Fixed Window Length (FWL):
 - Following (3): *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*
 - Around (3): *Luckily, the smelly poo did not leave awfully nasty stains on my favorite shoes!*

Grammar, spellings...

Hi,

I have Haier phone.. It was good when i was buing this phone.. But I
invented A lot of bad features by this phone those are It's cost is low
but Software is not good and Battery is very bad.... Ther are no signals
at out side of the city...,, People can't understand thys type of
software...,, There aren't features in this phone, Design is better not
good...,, Sound also bad..So I'm not intrest this side.They are giving
heare phones it is good. They are
these are also good.They are givi
also good because other phonesa
low wait.

Lack of punctuation marks,
grammatical errors

it is

Direct vs. Comparative Opinions

Direct opinion

Sentiment is directly expressed, for example, on one or more attributes of an object, such as a product, a service or an event:

- *“The television has a clear screen with very high contrast.”*

Comparative opinion

Relations expressing similarities or differences between two or more objects based on some of the shared attributes of the objects, e.g.

- *“The picture quality of camera x is **better than** that of y ”*

Two types of comparatives and superlatives: by adding -er, -est suffix or by words like “more”, “less”, “better”, “least”

Explicit vs. Implicit Opinions

Explicit opinion: an opinion (e.g., on an attribute of an entity) expressed explicitly in a subjective sentence, e.g.

- *'The screen of this smartphone is difficult to read.'*
- *'The story of this book is very interesting.'*

Implicit opinion: an opinion (e.g., on an attribute of an entity) implied in an objective sentence, e.g.

- *'The shop charges much more than I expected.'*
- *'This laptop computer is not suitable for people who want to bring it along with them to different places.'*

More challenges

- **Ambiguous words**
 - This music cd is literal waste of time (negative)
 - Please throw your waste material here (neutral)
- **Sarcasm** detection and handling
 - “All the features you want - too bad they don’t work. :-P”
- (Almost) no or few resources and tools for low/scarce resource languages like Indian/African languages

Difficulty depending on Data Type

- **Difficulty depending on the data type:**
 - Tweets from Twitter are the easiest as being short and straight to the point
 - Reviews are next: entities are given and there is little noise
 - Discussions, comments, and blogs are most difficult as they contain multiple entities, comparisons, noise, sarcasm, etc.

Cultural Difference in Product Reviews?

