



Amirkabir University of Technology
(Tehran Polytechnic)

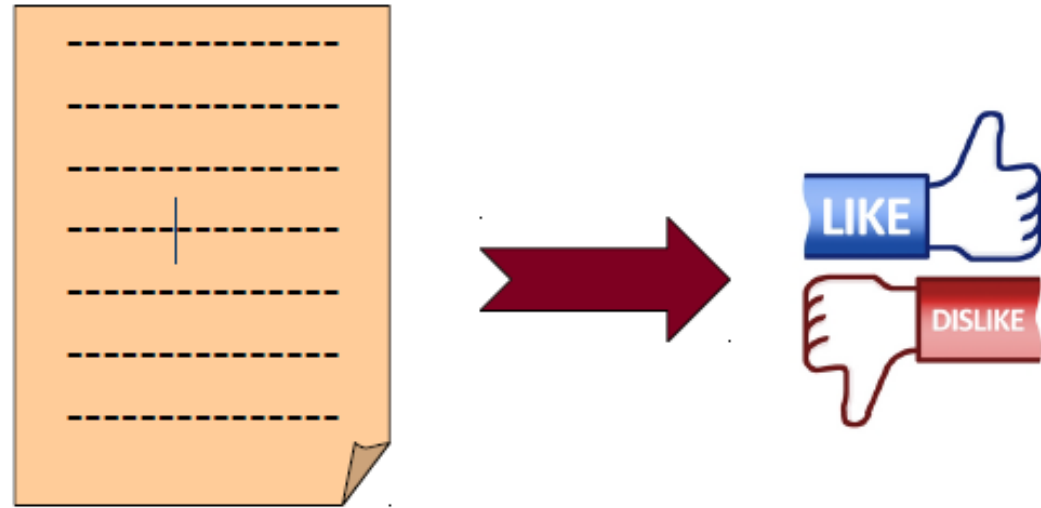
Natural Language Processing

Lecture 20: Sentiment Analysis

Amirkabir University of Technology

Dr Momtazi

Sentiment Analysis



Outline

- **Applications**
- Task
- Machine Learning Approach
- Rule-based Approach
- Aspect-based Sentiment Analysis

4



kingdom100
London, UK
Senior Contributor
42 reviews
140 helpful votes

Reviewed February 22, 2012

1 person found this review helpful

I originally selected this hotel over

Before I launch into the full review, I will note that the best thing about this hotel is the breakfast. It is superb, and any criticism would only really come down to very personal taste and would be nit-picking. Everything is catered for - a wonderful selection of fresh fruit, cereals, bread, pastries, eggs, etc. If you are a vegetarian, you can get a toaster so one can toast whatever selecting one wishes: there is also an equally large array of jams/conserves to eat with the bread. There is a good selection of cold cuts, fish, high quality cheeses, as well as the usual American style hot buffet breakfast. There are also breads and cakes in trays, and a good range of cereals, milk, yogurts, fruit, smoothies, and fruit and veg. All of this is available for an extra charge. In short, this is an exemplary hotel breakfast in both terms of quality and variety. The service was usually attentive with glasses regularly topped up, but once it started to get busy (around 9.30 onwards, especially at the weekend) one did notice a drop in service, as well as a queue to get a glass of juice. If you are a regular guest, or are to stay here, make sure you are catered for as this is the major reason for staying at this property!!

A bell boy showed me up to my room and was extremely friendly and professional and showed me the various features of the room, how to operate touch-panel light switches and how to use the TV. I was also given a key card to open the door. I was also given a keycard (I will discuss the rooms in more detail a little later) and the double glazing was far from top quality and a hissing noise could be heard where the window did not seal properly. I was told that the noise was not a problem and that I should not look out of the window whilst I was out. I returned and the problem was, as before and there was no note explaining what had happened. I went to shower and get ready to go out, the book on the desk said that I should call the front desk if I had any problems. I called the duty manager on my very out and he assumed me I would resolve the issue with the window, returned to my room, still no noise and the hissing sound never more appeared. I was told that the noise was dependent on the air pressure in the room (the quality of the air) and they advised that maintenance considered the noise to be normal. I am not sure if this is completely true, but I am not sure if the noise is a problem or not. The noise was pretty quiet so it would be rather normal.

The next day I returned and was offered a change of room, and a complimentary upgrade, which was a thoughtful gesture. They sent someone up to help with my luggage, the very first room I was shown! I smelled very strongly of stale cigar smoke, and I was told that I had been in the room before. I asked the man if he had any impressions seemed to be fine. Whilst I was getting ready to go out for dinner I noticed a tapping sound coming from the entrance/air-con unit. I called guest services who promptly sent up maintenance who advised that it was just fan noise from the hotel's air conditioning system. I was told that the tapping sound was not a problem, but to me, so I left it at that. I returned long after 10pm to find the air-con grilles covered in duct tape, and the tapping sound was still apparent in the hall. I called for a manager to come and speak to me. He arrived quickly and offered to move me yet again, bearing in mind that I had been in the room before. He said that he would try to find a better alternative. The final room was at least free of irritating noises.

[illegible]

2012
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647 Reviews

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 **ACCORHOTELS.COM**

The Ritz-Carlton, Berlin Photos (281 traveler photos)

 Eurostars Berlin Hotel

	Hilton Hotel - Berlin 4.0 out of 5, 150 reviews Last reviewed Mar 23, 2012
	Novotel Berlin Mitte 4.5 out of 5, 1,048 reviews Last reviewed Mar 23, 2012
	Abercrombie Youth Hostel 3.5 out of 5, 47 reviews Last reviewed Mar 22, 2012
	Holiday Inn Express Berlin City Centre 4.0 out of 5, 293 reviews Last reviewed Mar 22, 2012
	Ibis Berlin Potsdamer Platz 4.0 out of 5, 212 reviews Last reviewed Mar 22, 2012
	Wombats 4.5 out of 5, 147 reviews Last reviewed Mar 22, 2012
	Hotel 4 Youth am Mauerpark 4.0 out of 5, 95 reviews Last reviewed Mar 21, 2012

Hotel Reviews

tripadvisor
The Ritz-Carlton, Berlin Hotel

Home Berlin Hotels Flights Vacation Rentals Restaurants Things to Do Best of 2012 More Write a Review

Home Europe Germany Berlin Berlin Hotels The Ritz-Carlton, Berlin

The Ritz-Carlton, Berlin

Postdamer Platz 3, 10785 Berlin, Germany **Hotel amenities**

Ranked #7 of 662 hotels in Berlin
 4.5/5 (647 Reviews)
 Travelers' Choice® 2012 Winner
 Luxury Top 25 | Best Service

Show the lowest price for this hotel*

Check In: 4/6/2012 Check Out: 4/8/2012 Adults: 2

Show Prices

Booking.com Expedia.de Hotels.com LogTrav.de Venere.com euronsun.de HRS.de

281 traveler photos

647 reviews from our community

What travelers say about this hotel:

- "Club lounge" (1)
- "Brandsenburg gate" (0)
- "Postdamer Platz" (0)
- "Very good" (4)
- "Breakfast buffet" (0)
- "Luxury hotel" (0)
- "Best hotel" (0)
- "Great location" (0)
- "Well worth" (0)

See which rooms travelers prefer - 22 traveler tips

Only show reviews for: Family (0) Couples (246) Business (125)

647 reviews sorted by Date Rating English first

"A really great place to stay in Berlin"
 Reviewed March 21, 2012 **new**
 The price for the Ritz in Berlin was quite reasonable considering I was in a major European capital. That takes a bit of getting used to. It is like the prices you get staying in Chicago versus New York or San Francisco. The hotel itself is very new and nice. The service I got was excellent. They have a funny...
 Was this review helpful? **Yes** Problem with this review?

"Great location and very comfortable hotel"
 Reviewed March 14, 2012
 1 person found this review helpful
 My family of 5 stayed for 9 nights in end December/early January. We had 2 interconnecting rooms. Our rate was really reasonable and included buffet breakfast. We loved the hotel. The location is fantastic with the train station right outside the front door. We hit a little bit of wet weather and so when we wanted to get to the...
 Was this review helpful? **Yes** Problem with this review?

"Great location, excellent service."
 Reviewed March 2, 2012
 I recently stayed one night while attending the Berlin Film Festival. I was surprised to be able to get a relatively affordable club level room during his busy time. Despite arriving very early, the room was ready upon check-in and the staff, especially on the club level, was very helpful, courteous and accommodating. The room was comfortable with a plush...
 Was this review helpful? **Yes** Problem with this review?



"A Complete Letdown"

Reviewed February 22, 2012

1 person found this review helpful

I originally selected this hotel over others in Berlin - including Hotel Adlon - due to its top 3 TripAdvisor ranking at the time. I noted with dismay that ever since then its position had been continually sliding ever downwards! I really had hoped that the recent spate of less than good reviews was down to overly particular guests or the occasional bad experience, which can happen even at the best properties. As I'd booked it through a third party agent (I would advise using a price comparison web-site as I got a far better deal than if I'd booked directly with the hotel) and paid in advance there was no turning back!

Before I launch into the full review, I will note that the best thing about this hotel is the breakfast. It is superb, and any criticism would really come down to very personal taste and would be nit-picking. Everything is catered for - a wonderful selection of fresh fruit, including berries, and cereals. Lots of different breads, rolls, and even bagels, and a toaster so one can toast whatever selections one wishes; there is also an equally large array of jams/conserves to enjoy with the bread. There is a good selection of cold cuts, fish, high quality cheeses, as well as the usual American style hot buffet complete with omelettes made to order. As if this isn't enough, crepes, American pancakes, French toast, and waffles can all be made to order (at no extra charge). In short, this is an exemplary hotel breakfast in both terms of quality and variety. The service was usually attentive with glasses regularly topped up, but once it started to get busy (around 9.30 onwards, especially at the weekend) one did notice a drop in attention to detail, as well as a queue snaking its way into the bar area. If you are going to stay here, make sure you have breakfast included as it is the major redeeming factor of this property!

Upon arrival, a hair capped doorman opened my taxi door, and swiftly removed the luggage and welcomed me to the hotel. If only things had continued like this... The girl at the front desk was polite, but far from welcoming as the doorman had been. Things went wrong when she asked for my voucher; I explained that whilst I had booked through a third party I had e-mailed the hotel directly to confirm everything was as it should be and they had never mentioned the need for any voucher. She was very persistent and went away to ask someone else, and still insisted on the voucher. I advised that I could probably dig out an email once I had access to a computer and print it off for them. She still wasn't really satisfied, and a little huffy said that they would contact the travel agent for another copy. To add to this, I had been travelling since 4am that morning; whilst I did not expect the hotel to specifically know that, the front desk should always be wary that most travellers will always be somewhat weary from their journey! I'd have expected that she'd have checked me in and then contacted me if I had indeed needed to provide the voucher (which as it turned out I didn't).

A bell boy showed me up to my room and was extremely friendly and professional and showed me the various features of the room, how to operate touch-panel light switches etc. This was a thoughtful touch, and much appreciated. The room itself was an huge letdown (I will discuss the rooms in more detail a little later) and the double glazing was far from top quality and a hissing noise could be heard where the window did not seal fully on the hinged side. I complained about this, and they advised someone would look at the window whilst I was out. I returned and the problem was as before and there was no note explaining what had happened. I went to shower and get ready to go out; the box containing the vanity kit was empty which I was not best pleased with. I spoke to the duty manager on my way out and he assured me he would resolve the issue with the window. I returned from dinner, still no note and the hissing sound ever more apparent. I called the guest service department yet again (I am sure they were bored of my calls!) and they advised that maintenance considered the noise to be normal. I am not someone who requires complete silence, but it was a very particular noise and the room otherwise was pretty quiet so it would've been rather noticeable.

The next day I returned and was offered a change of room, and a complimentary upgrade, which was a thoughtful gesture. They sent someone up to help with my luggage; the very first room I was shown to smell very strongly of stale cigar smoke, so that was not to work! Then I was shown another room which on first impressions seemed to be fine. Whilst I was getting ready to go out for dinner I noticed a tapping sound coming from the entrance-alcon unit. I called guest services who promptly sent up maintenance who advised that it was just fan noise from the hotel's central air-con which would stop at 10pm. This would of course have been acceptable to me, so I left it at that. I returned long after 10pm to find the air-con grilles covered in duct tape, and the tapping sound was still apparent in the hall. I called for a manager to come and speak to me. He arrived quickly and offered to move me yet again, bearing in mind that I had moved rooms 3 times already I was not best pleased, but left with little



Viewed hotels

The Ritz-Carlton, Berlin 4.5/5 (647 Reviews)

Save

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Booking.com: Hier buchst du das Hotel. Hier buchst du das Hotel.

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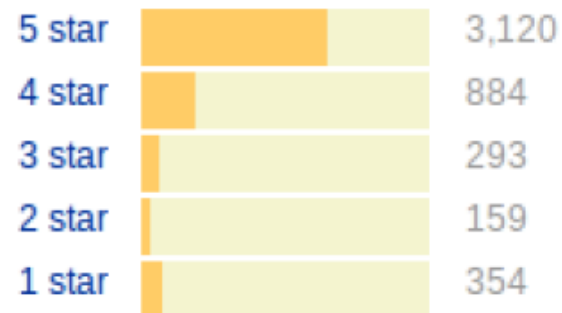
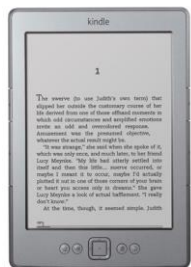
Expedia.de: Buchen Sie Online mehr als 60000 Hotels Sonderangebote und mehr.

Value
Location
Sleep Quality

Rooms
Cleanliness
Service

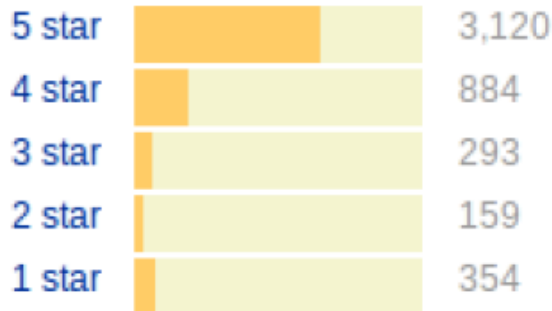
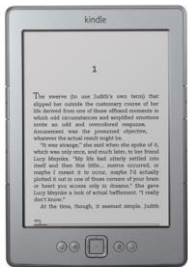
Product Reviews

★★★★☆ (4,810)
4.3 out of 5 stars



Product Reviews

★★★★★ (4,810)
4.3 out of 5 stars



Picture Quality



Ease of Use



Size



Weight




Color



Zoom






Social Media


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 48  21 = 70%


 #NottingHill's on yay! **julia roberts** get in me. I don't even know what Hugh Grant is.


 @Vanna2409 lol i loved **julia roberts** in this movie!


 RT @carnauval: Charlize Theron digs her Evil Queen persona way better than **julia roberts**. Theron balances her OTT acts & fragility well. She saves #SWATH.


 @sydd_thekydd lol I know I saw this tweet and decided to steal it. The one with **julia roberts** sucked.


 Eat Pray Love with **julia roberts** is better than the book #mustsee

 **julia roberts** was great in Pretty Space Woman.

 @cheaty I've heard good things about it! The other Snow White movie w/ **julia roberts** was great as well.

 I want someone to love me like Hugh grant loves **julia roberts** in notting hill

 RT @saratopss: She loves **julia roberts'** movies <http://t.co/rrMaXsrT>

 RT @iHeartLABlush: I love pretty woman **julia roberts** is amazing!

Event Analysis and Prediction

- Analyzing the side effects of events in different communities
- Predicting the election results
- Predicting the Stock exchange
- ...

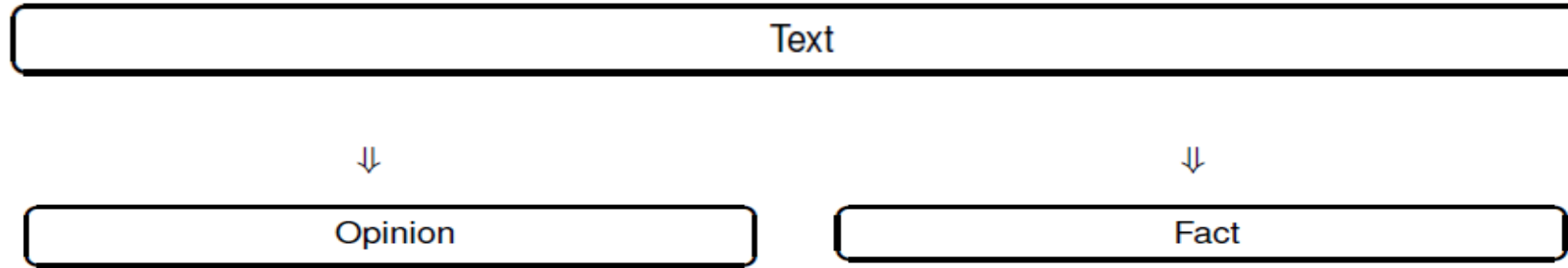
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- Applications
- **Task**
- Machine Learning Approach
- Rule-based Approach
- Aspect-based Sentiment Analysis

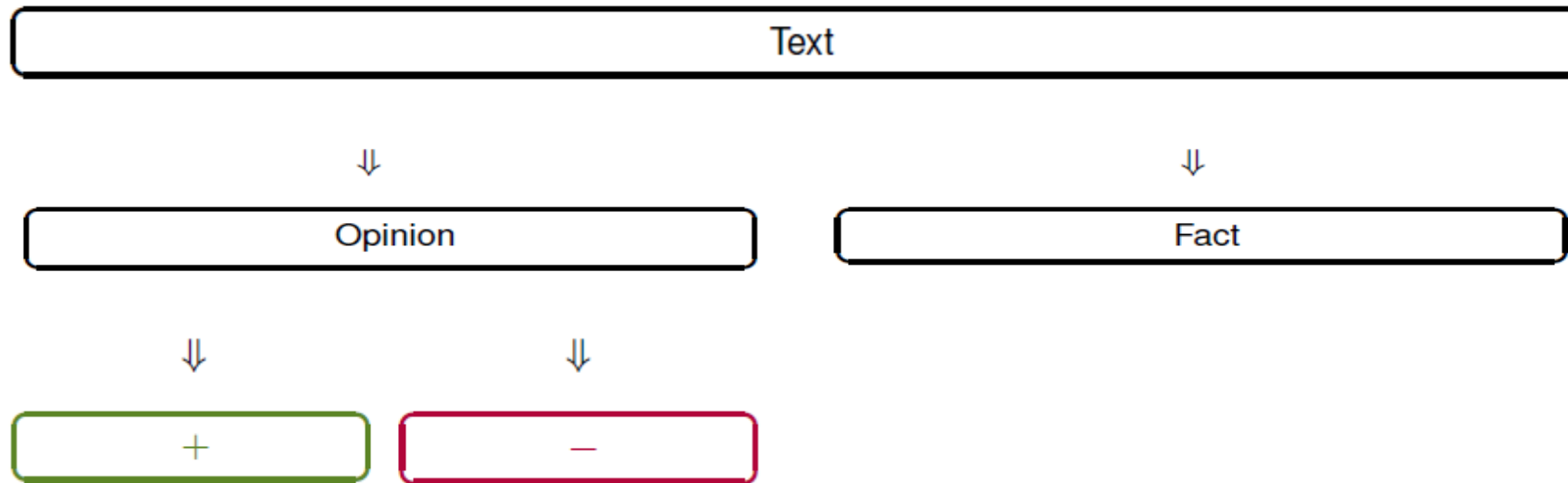
Sentiment Analysis Levels



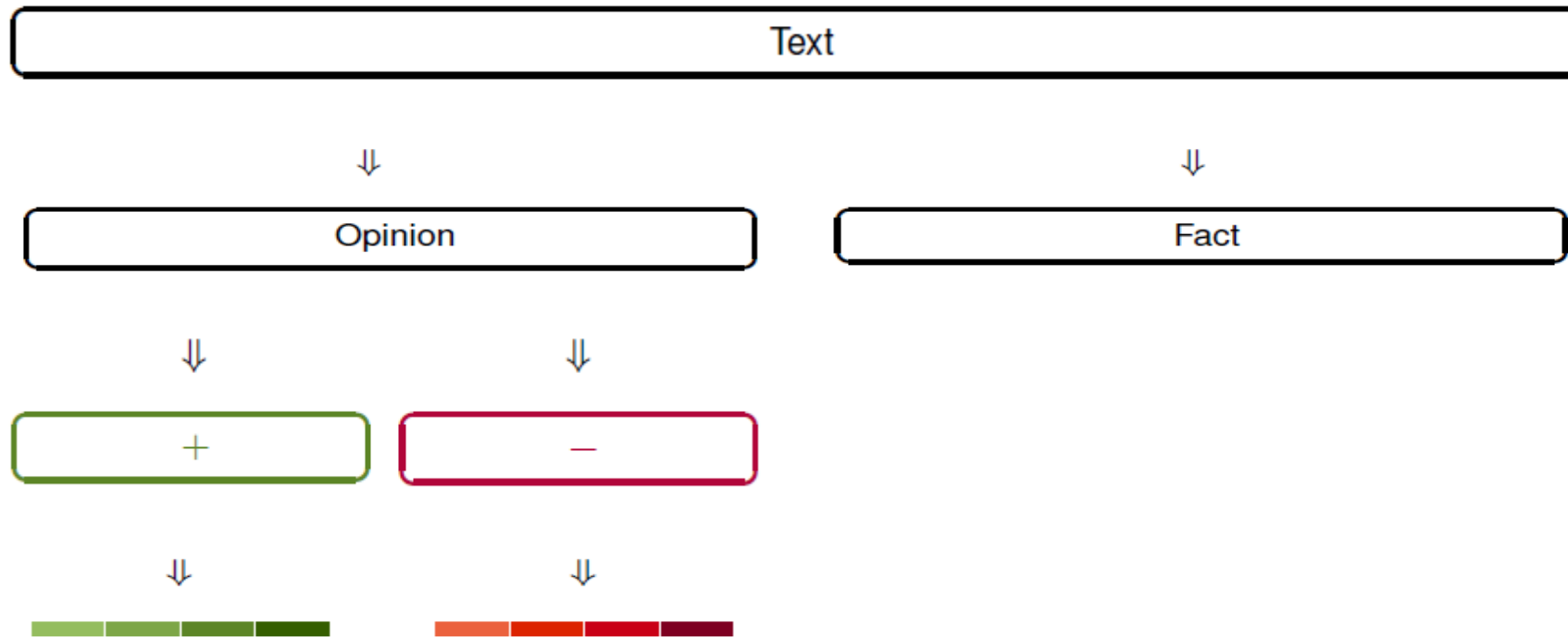
Sentiment Analysis Levels



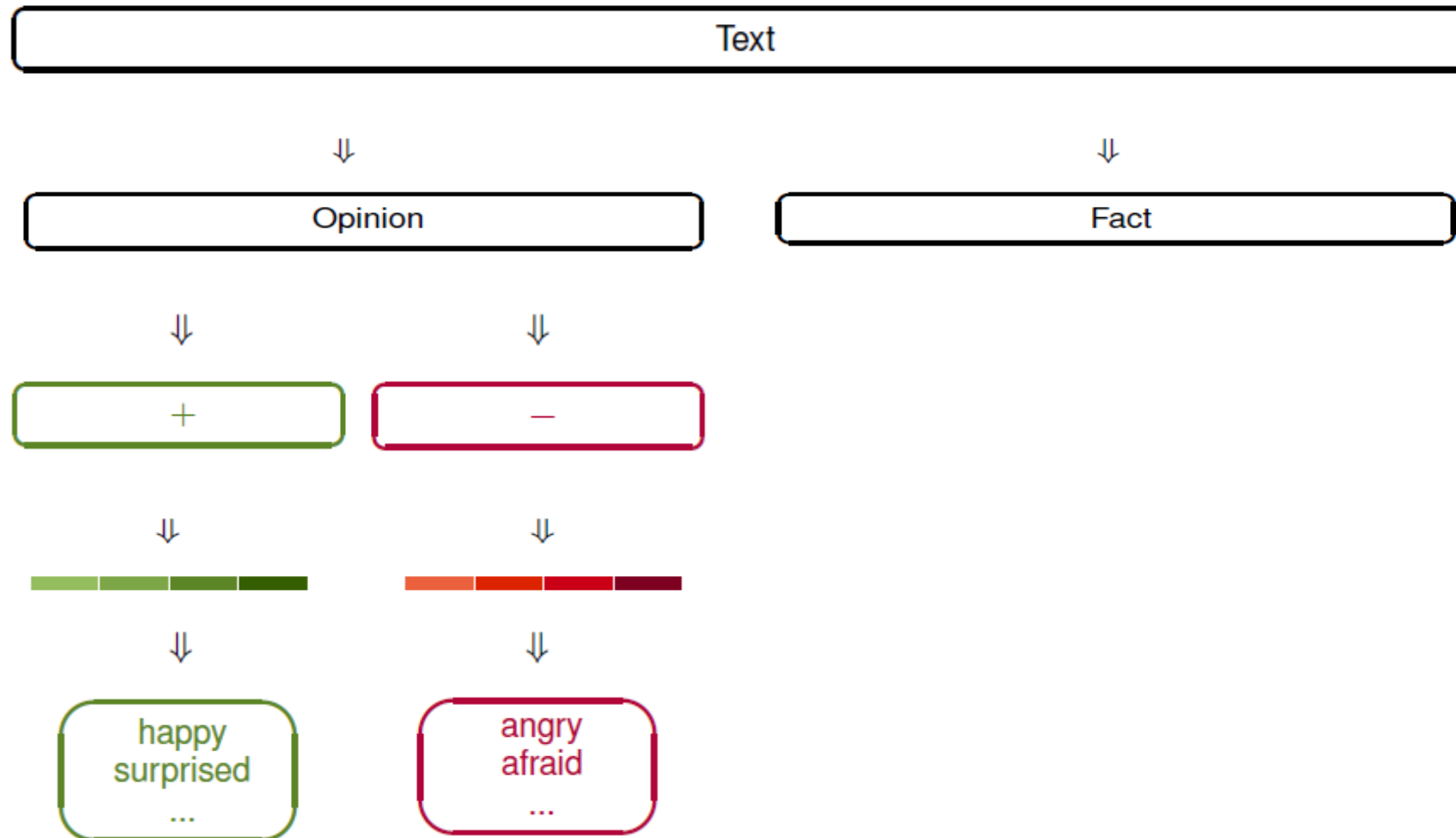
Sentiment Analysis Levels



Sentiment Analysis Levels



Sentiment Analysis Levels



Sentiment Analysis Tasks

- Opinion holder detection
- Opinion target detection
- Aspect detection

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- Opinion holder detection
- Opinion target detection
- Aspect detection

Students like Wikipedia because it is easy to use and it sounds authoritative.

op holder *target*

Sentiment Analysis Tasks

- Opinion holder detection
- Opinion target detection
- Aspect detection

Students like Wikipedia because it is easy to use and it sounds authoritative.

op holder *target*

I had a nice stay in this hotel and the rooms were very clean.

aspect

The restaurant has an amazing view but the staffs are unfriendly.

aspect *aspect*

Mixed opinions

Other Names

- Opinion mining
- Opinion extraction
- Sentiment mining
- Subjectivity detection
- Subjectivity analysis

Sentiment Analysis Approaches

- Machine learning methods
 - ⇒ classification
- Rule-based methods
 - ⇒ dictionary oriented

Outline

- Applications
- Task
- **Machine Learning Approach**
 - **Conventional Machine Learning Algorithms**
 - Deep Learning
- Rule-based Approach
- Aspect-based Sentiment Analysis

Sentiment Classification

- Using any kinds of supervised classifiers
 - K Nearest Neighbor
 - Support Vector Machines
 - Naïve Bayes
 - Maximum Entropy
 - Logistic Regression
 - ...

Features

- Word

Features

- Word
 - All words or adjectives?
 - All words works better than adjectives only

Features

- Word
 - All words or adjectives?
All words works better than adjectives only
 - Word occurrence or frequency?
Word occurrence is more useful than frequency
 - Using binary value for words
 - Replace all word counts higher than 0 in each text by 1

Features

- Negation
 - Negation words change the text polarity
 - Adding prefix NOT_ to every word between negation and next punctuation

Features

- Negation
 - Negation words change the text polarity
 - Adding prefix NOT_ to every word between negation and next punctuation

*“I did **not** like the restaurant location, but the food ...”*

I did not NOT-like NOT-the NOT-restaurant NOT-location but the food ...

Features

- Other emotions

Features

- Other emotions
 - Considering emoticons as additional features
 - :)
 - :(

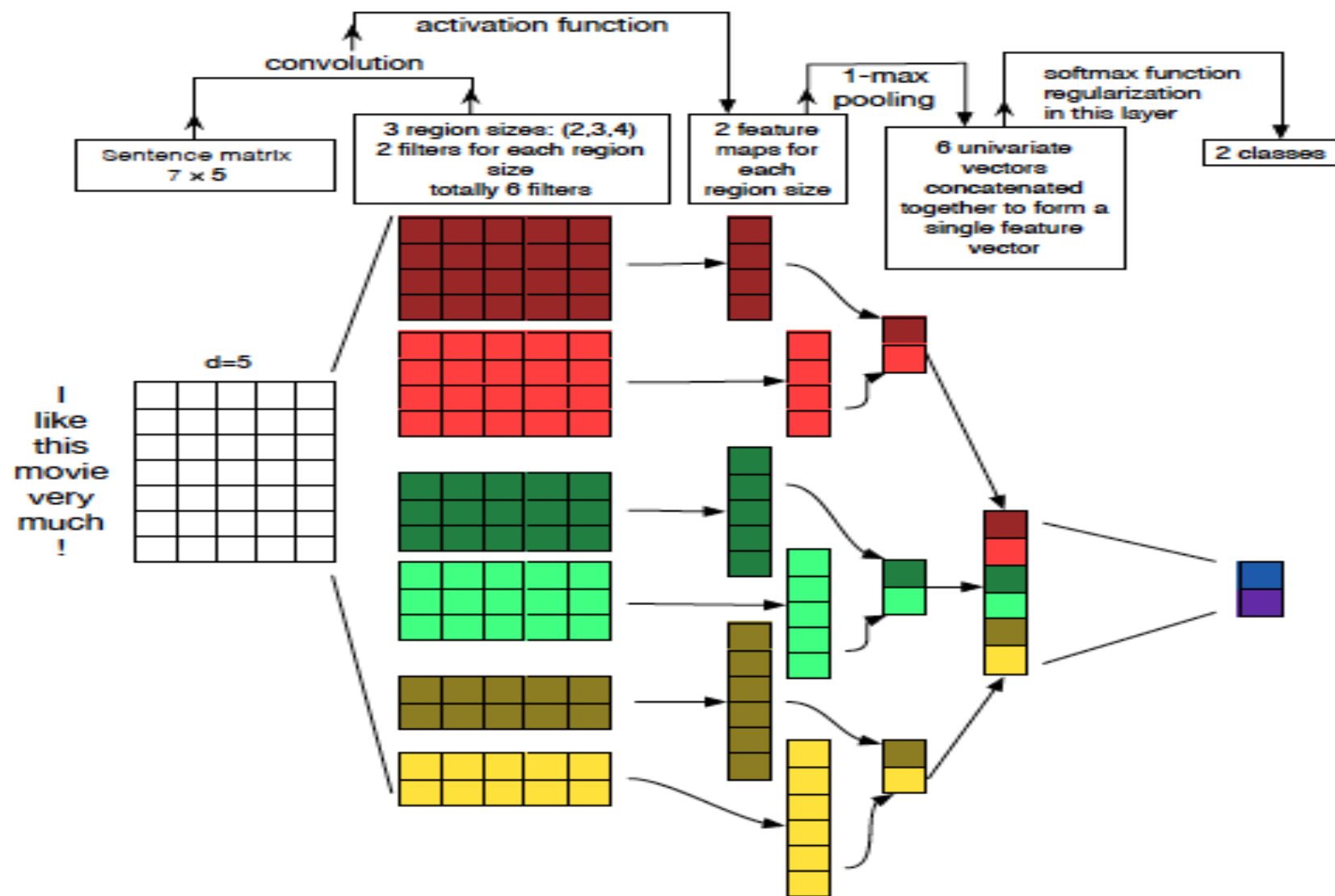
Fine-grained Analysis

- Dealing with finer classes of sentiment
-3,-2,-1,+1,+2,+3
- Approaches
 - Using multiclass classifier (6 classes in this case)
 - Using two level classifier
 - First level: polarity classifier (positive or negative)
 - Second level: strength classifier (1 or 2 or 3)

Outline

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 - Conventional Machine Learning Algorithms
 - **Deep Learning**
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CNN



Outline

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Rule-based Approach

- Looking for opinionated words in each text
- Classifying the text based on the number of positive and negative words
- Considering different rules for classification
 - Fine-grained dictionary
 - Negation words
 - Booster words
 - Idioms
 - Emoticons
 - Mixed opinions
 - Linguistic features of the language

Rule-based Approach

- Fine-grained Dictionary

"It was a good song."



"The song was excellent."



Rule-based Approach

- Negation Words

"The song was good."



*"The song was **not** good."*



Rule-based Approach

- **Booster Words**

"The song was interesting."



*"The song was **very** interesting."*



*"The song was **somewhat** interesting."*



Rule-based Approach

- Idioms

“shock horror”



Rule-based Approach

- Mixed Opinions

*"The song was **good**, but I think its title was **strange**."*



Rule-based Approach

- Linguistic Features
 - The position of negation or boosting words differ from one language to another

*"I do **not** love the song."*

Opining Dictionary

- English
 - Subjectivity Clues (2005)
 - SentiSpin (2005)
 - SentiWordNet (2006)
 - Polarity Enhancement (2009)
 - SentiStrength (2010)

Machine Learning with Opinion Dictionary

- Using opinion words as a feature in the algorithms
- Ignoring other words in the text

Adjectives alone do not work well,
but opinion words are the best features to be used

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- **Aspect-based Sentiment Analysis**

Modeling Aspect-based Sentiments

Multi-label classification

“The So called laptop Runs to Slow and I hate it! Do not buy it! It is the worst laptop ever.”

LAPTOP : OPERATION-PERFORMANCE, negative

LAPTOP : GENERAL, negative

“The restaurant was expensive, but the menu was great.”

RESTAURANT : PRICE, negative

RESTAURANT : FOOD, positive

Modeling Aspect-based Sentiments

Sequence labeling with IO or IOB schema

“Chow fun was dry. I was very disappointed with this restaurant.”

{RESTAURANT:

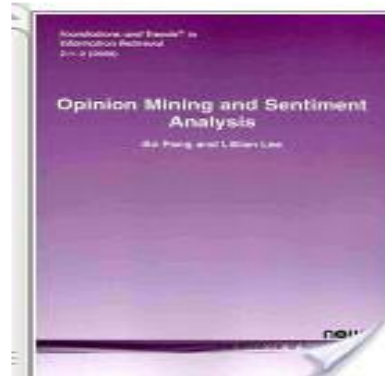
FOOD, “Chowfun”, negative, from="0"to="8"}

{RESTAURANT:

GENERAL, “restaurant”, negative, from="52"to="62"}

Further Reading

Opinion Mining and Sentiment Analysis



Bo Pang, Lillian Lee

Now Publishers Inc, 2008 - [Computers](#) - 137 pages



1 Review



An important part of our information-gathering behavior is the availability and popularity of opinion-rich resources such as weblogs. Challenges arise as people can, and do, actively use information technology. The sudden eruption of activity in the area of opinion mining and sentiment analysis is a reflection of this. [More »](#)

Sentiment Analysis and Opinion Mining



Bing Liu

Morgan & Claypool Publishers, Ordibehesht 12, 1391 AP - [Computers](#) - 167 pages



1 Review



Sentiment analysis and opinion mining is the field of study that analyzes people's opinions and emotions from written language. It is one of the most active research areas in natural language processing. It is studied in data mining, Web mining, and text mining. In fact, this research has spread to many other areas.

Further Reading

- Speech and Language Processing (3rd ed. draft)
 - Chapter 4 & 25