

# Techniques and Applications for Sentiment Analysis

Communications of the ACM | April 2013 | Vol. 56 | nº 4

DOI:10.1145/2436256.2436274

**Ronen Feldman**

Hebrew University

ronen.feldman@huji.ac.il

**Airton Bordin Junior**

airtonbjunior@gmail.com

**Prof. Dr. Nádia Félix Felipe da Silva**

nadia@inf.ufg.br



# Roteiro

- Introduction
  - Context
  - Problem
  - Objective
- Sentiment Analysis
- Sentiment Lexicon
- Applications
- Research Issues
- Conclusion



# Context

**JAN  
2017**

## GLOBAL DIGITAL SNAPSHOT

KEY STATISTICAL INDICATORS FOR THE WORLD'S INTERNET, MOBILE, AND SOCIAL MEDIA USERS

TOTAL  
POPULATION



we  
are  
social

**7.476**  
BILLION

URBANISATION:  
**54%**

INTERNET  
USERS



**3.773**  
BILLION

PENETRATION:  
**50%**

ACTIVE SOCIAL  
MEDIA USERS



we  
are  
social

**2.789**  
BILLION

PENETRATION:  
**37%**

UNIQUE  
MOBILE USERS



**4.917**  
BILLION

PENETRATION:  
**66%**

ACTIVE MOBILE  
SOCIAL USERS



**2.549**  
BILLION

PENETRATION:  
**34%**



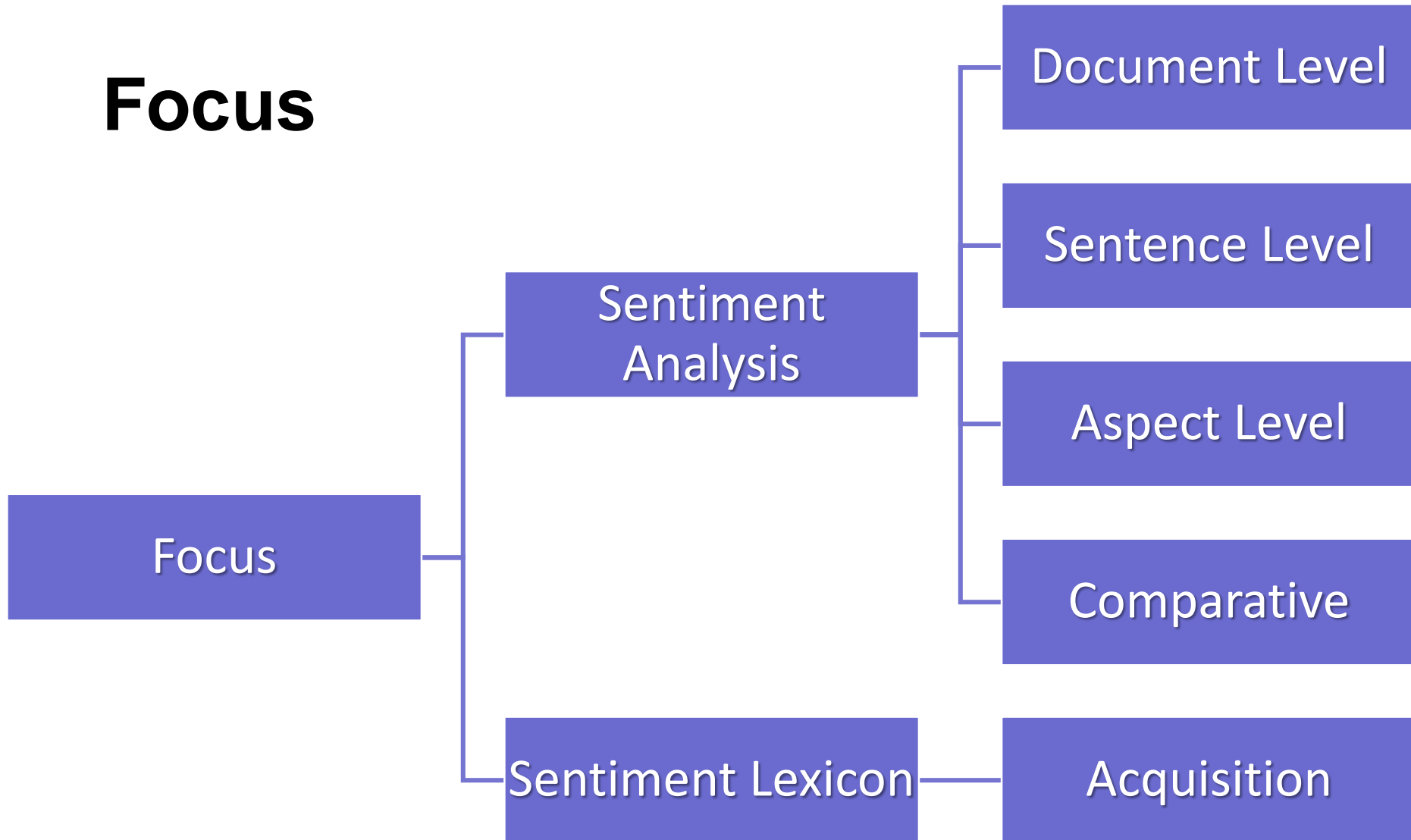
# Objective

- Present the main research problems related to Sentiment Analysis (SA) and some of the techniques used to solve them
- Review some of the major application areas where sentiment analysis is being used today

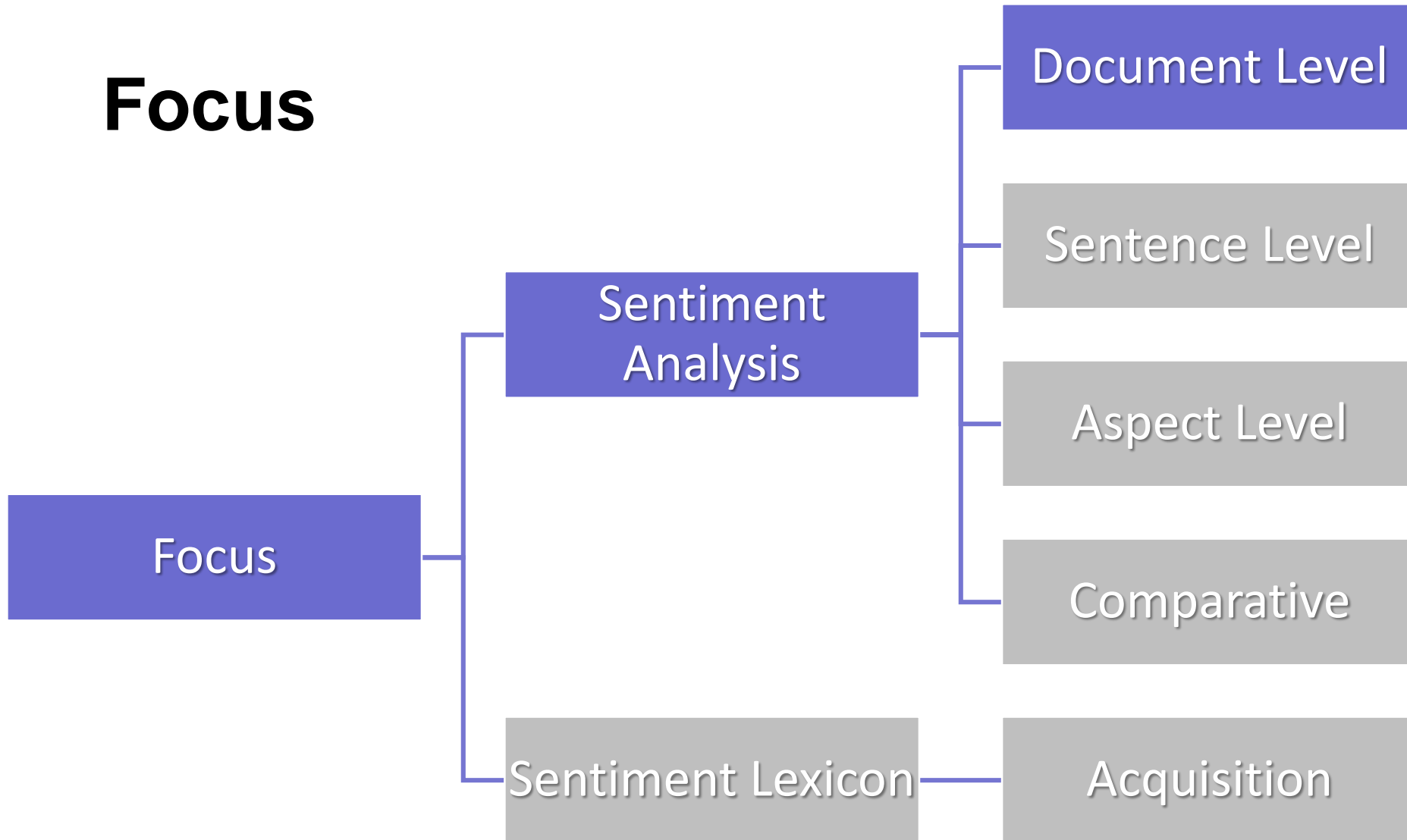
# Objective

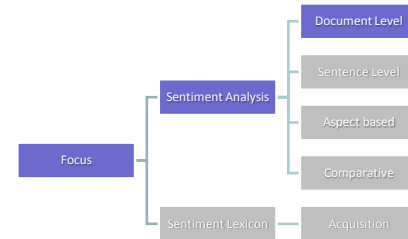
- Present the main research problems related to Sentiment Analysis (SA) and some of the techniques used to solve them
- Review some of the major application areas where sentiment analysis is being used today

# Focus



# Focus

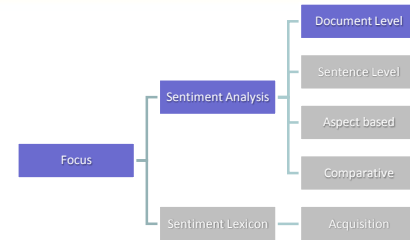




# SA – Document Level

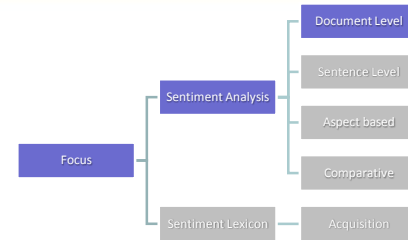
- Assumed that the document contains an opinion on one main object expressed by the author of the document
- Two main approaches
  - Supervised learning
  - Unsupervised learning



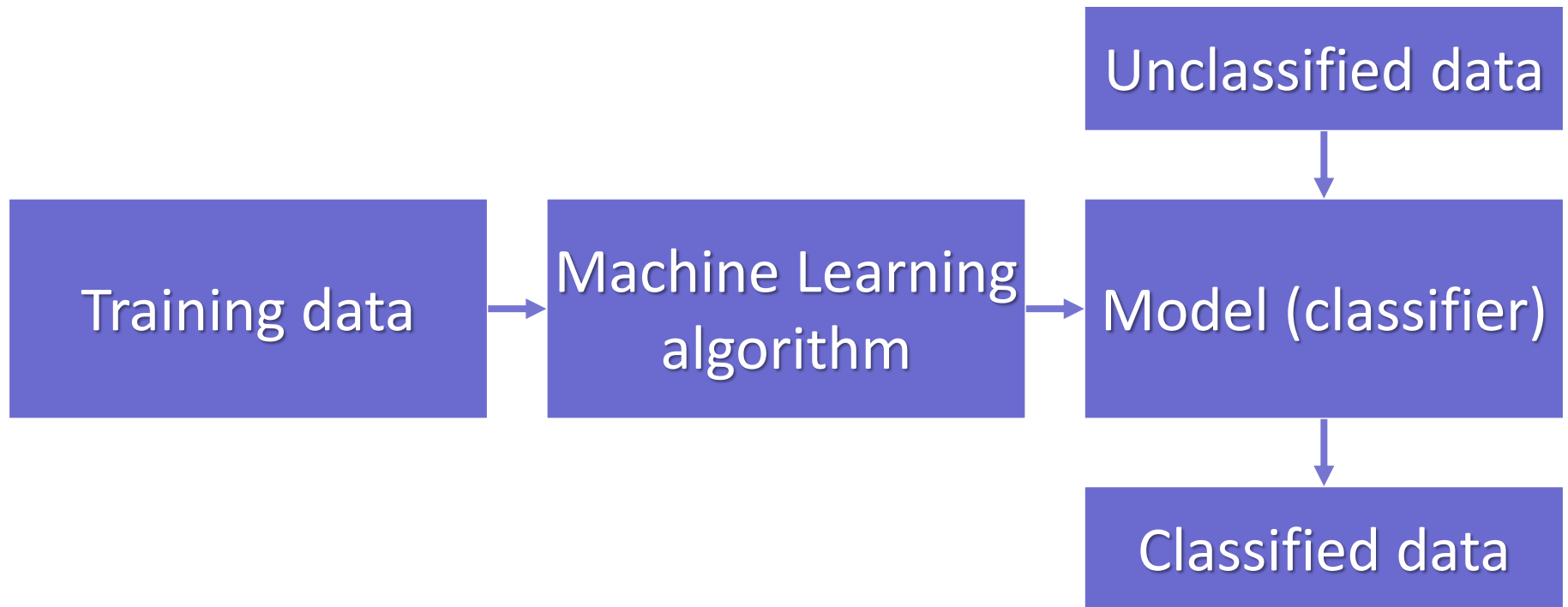


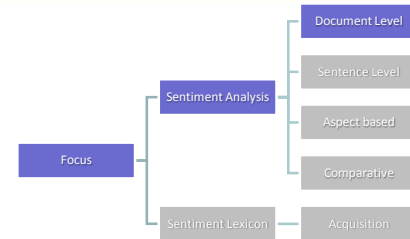
# SA – Document Level

- Supervised learning
  - Finite set of classes
  - Training data is available
  - Classes
    - Positive/negative/neutral
    - Numeric scale (stars)
  - SVM, KNN, Naïve Bayes, Logistic Regression, Genetic programming



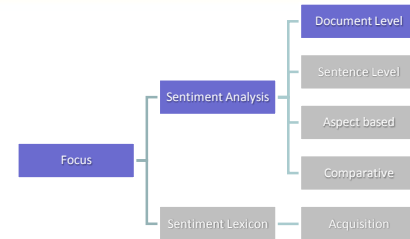
# SA – Document Level





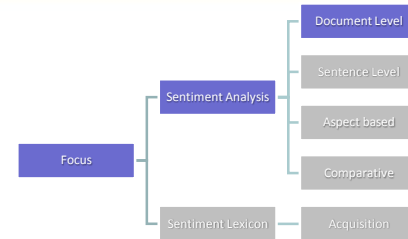
# SA – Document Level

- Important representations
  - Bag of words
  - TFIDF
  - Part of Speech (PoS)
  - Sentiment Lexicons



# SA – Document Level

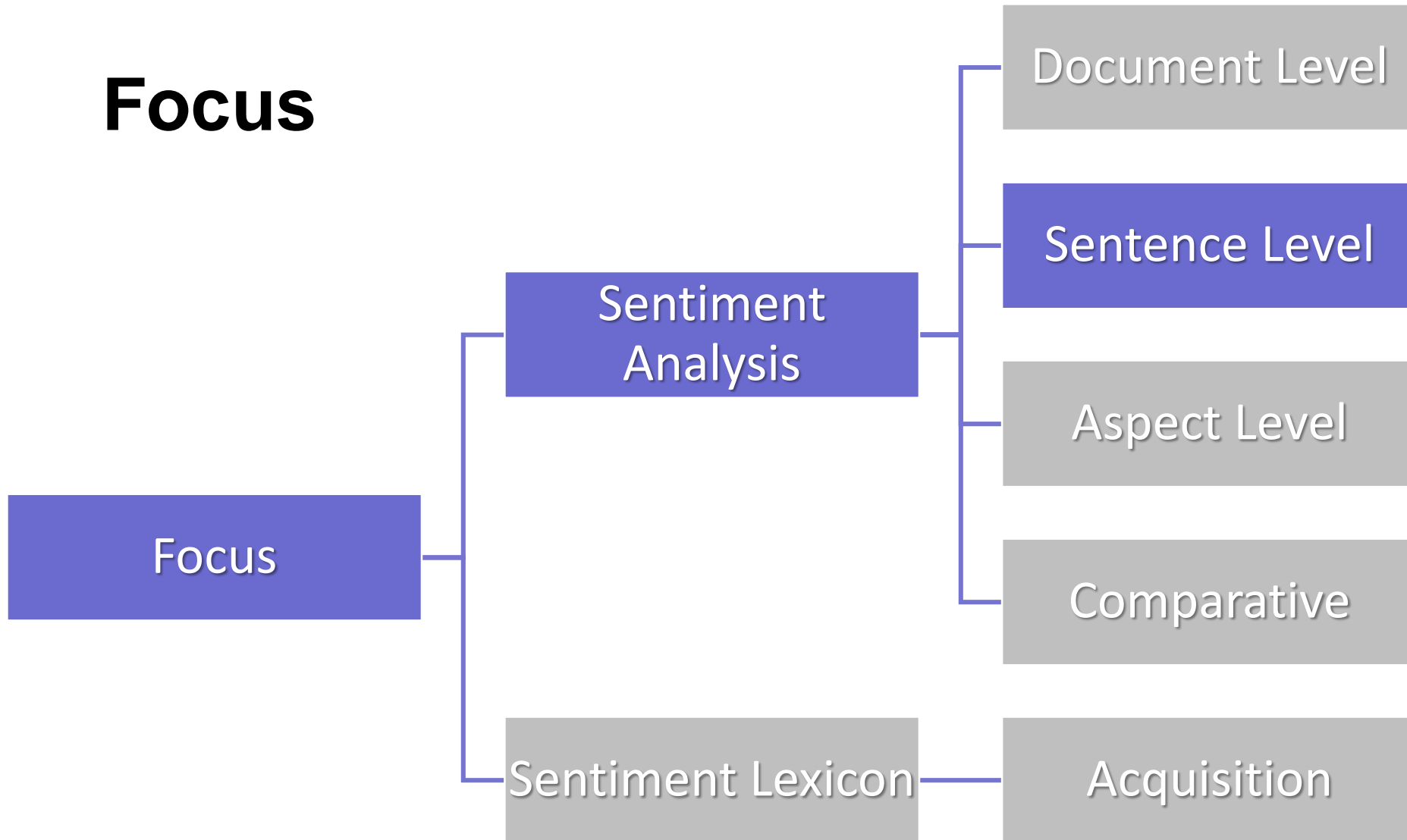
- Unsupervised learning
  - Semantic orientation (SO) specific phrases
  - PMI (Pointwise Mutual Information) of the phrase with two sentiment words
  - $PMI(P, W)$ 
    - Statistical dependence between phrase P and word W based on their co-occurrence in a corpus

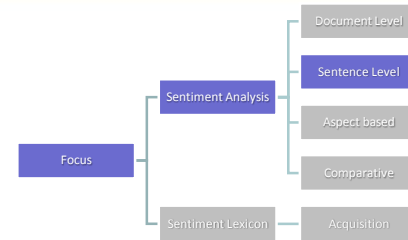


# SA – Document Level

- Unsupervised learning
  - The two words used in Turney (2002) are ‘excellent’ and ‘poor’
  - The SO measures whether P is closer in meaning to the positive word (‘excellent’) or the negative word (‘poor’)

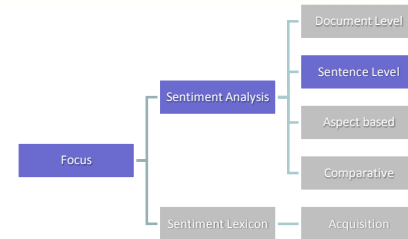
# Focus





# SA – Sentence Level

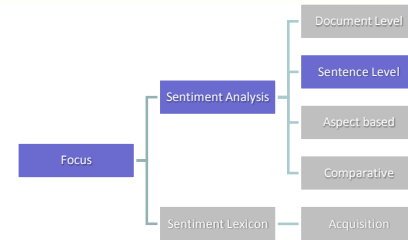
- Assume
  - We know the identity of the entity discussed in the sentence
  - There is a single opinion in each sentence



# SA – Sentence Level

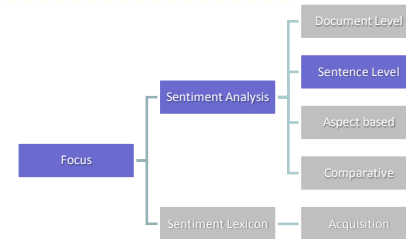
- Before analyzing the polarity of the sentences we must determine if the sentences are subjective or objective
  - Only subjective sentences will be analyzed





# SA – Sentence Level

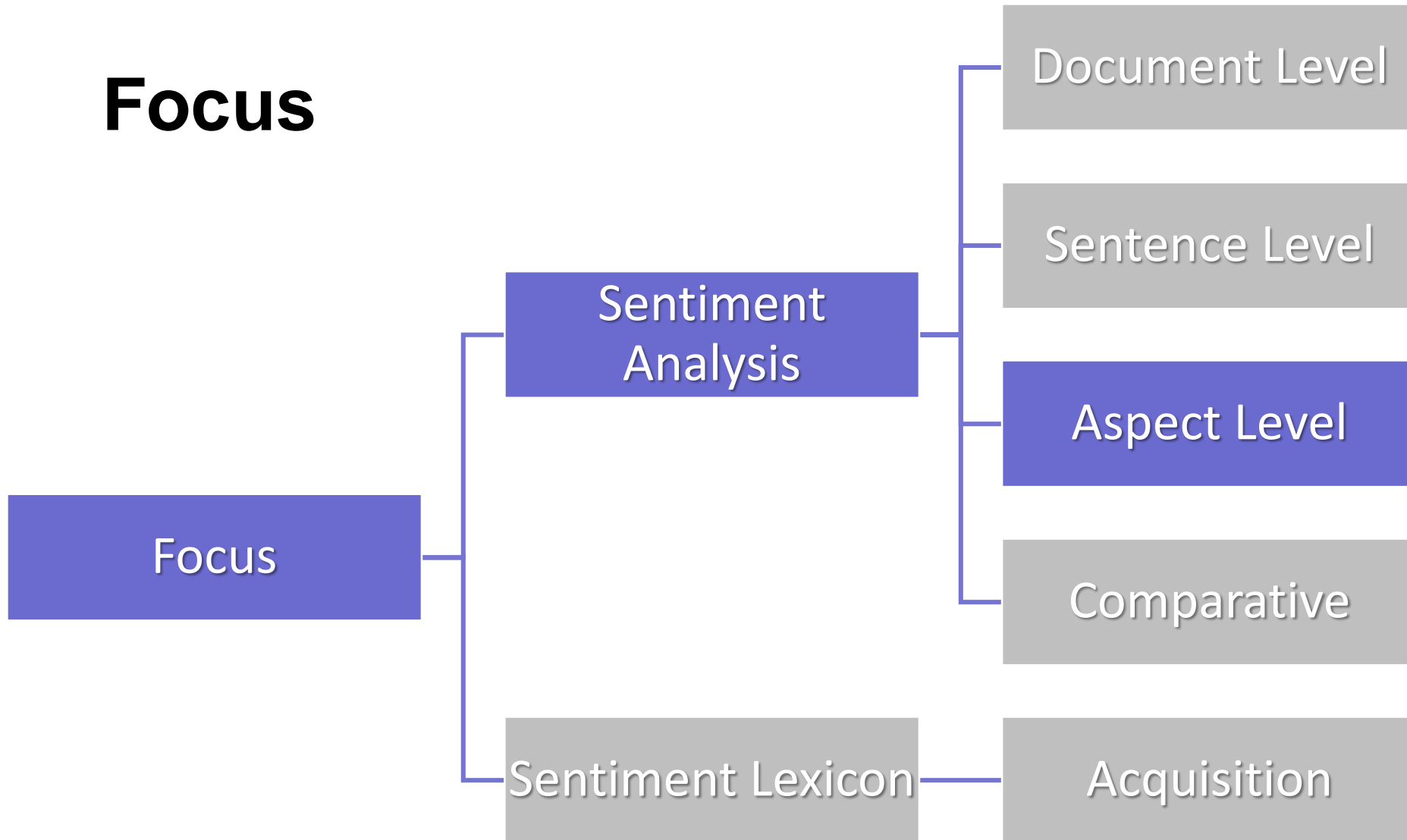
- Most approaches are based on supervised learning
- Unsupervised approach is similar of Turney (2002)

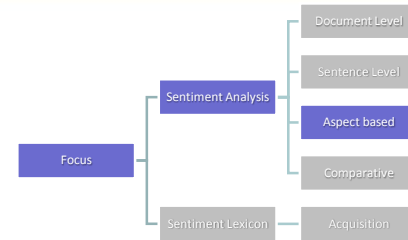


# SA – Sentence Level

- Handle different types of sentences by different strategies
- Sentences that need unique strategies
  - Conditional
  - Question
  - Sarcastic

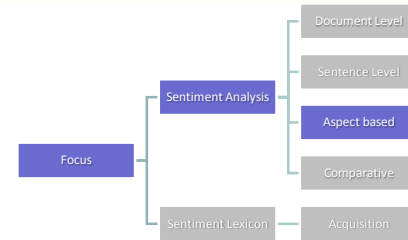
# Focus





# SA – Aspect Level

- In many cases, people talk about entities that have many aspects (attributes) and they have a **different opinion about each of the aspects**
- Often happens in reviews about products or in discussion forums



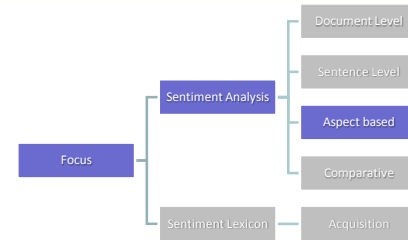
# SA – Aspect Level

★★★★☆ I want to love it, I really do. But I can't.

By [waetherman](#) on November 15, 2011

**Verified Purchase**

*“As a long-time Kindle fan I was eager to get my hands on a Fire. There are some great aspects; the device is quick and for the most part dead-simple to use. The screen is fantastic with good brightness and excellent color, and a very wide viewing angle. But there are some downsides too; the small bezel size makes holding it without inadvertent page-turns difficult, the lack of buttons makes controls harder, the accessible storage memory is limited to just 5GB.”*



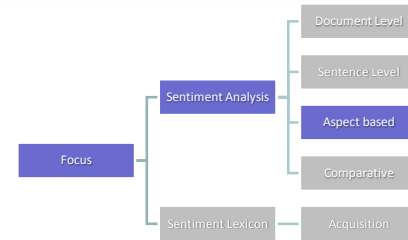
# SA – Aspect Level

★★★★☆ I want to love it, I really do. But I can't.

By [waetherman](#) on November 15, 2011

**Verified Purchase**

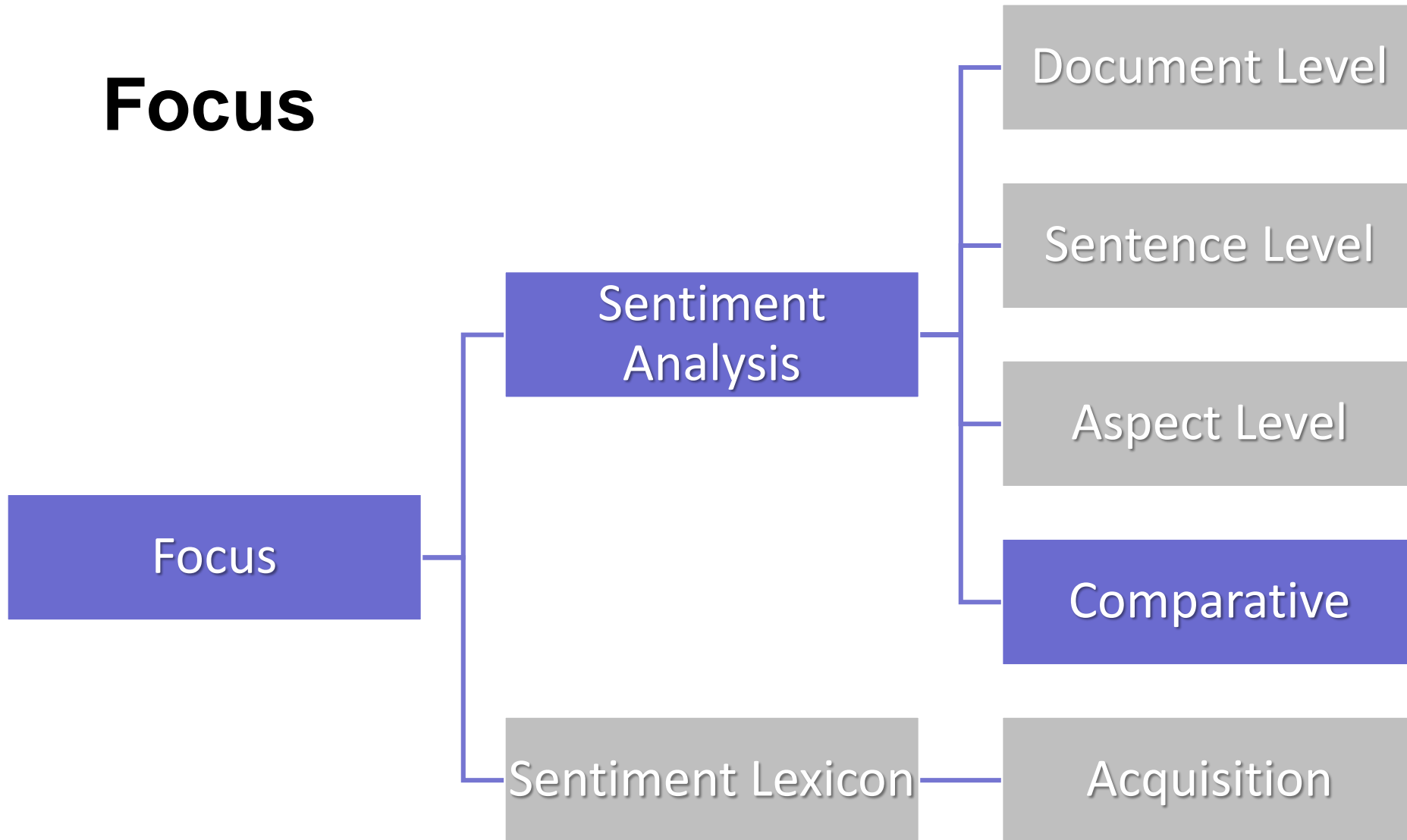
*“As a long-time Kindle fan I was eager to get my hands on a Fire. There are some great aspects; the **device** is **quick** and for the most part **dead-simple to use**. The **screen** is **fantastic** with **good brightness** and **excellent color**, and a very **wide viewing angle**. But there are some downsides too; the **small bezel** size makes **holding** it without inadvertent page-turns **difficult**, the lack of **buttons** makes **controls harder**, the accessible **storage memory** is **limited** to just 5GB.”*



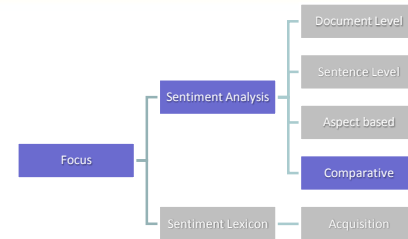
# SA – Aspect Level

- Can view the problem of aspect identification as an information extraction problem
  - Use a tagged corpus to train a sequence classifier such as a Conditional Random Field (CRF)
- Implicit aspects

# Focus

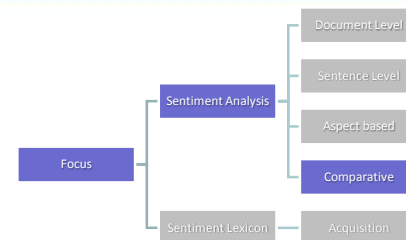






# SA – Comparative

- In many cases users do not provide a direct opinion about one product but instead provide comparable opinions
- The goal of SA in this case is to identify the sentences that contain comparative opinions, and to extract the preferred entity(-ies) in each opinion.



# SA – Comparative

- Comparative adjectives adverbs
  - ‘more,’ ‘less,’ and words ending with –er (for example, ‘lighter’)
- Superlative adjectives and adverbs
  - ‘most,’ ‘least,’ and words ending with –est (for example, ‘finest’)
- Additional phrases
  - ‘favor,’ ‘exceed,’ ‘outperform,’ ‘prefer,’ ‘than,’ ‘superior,’ ‘inferior,’ ‘number one’

# Focus

Focus

Sentiment  
Analysis

Document Level

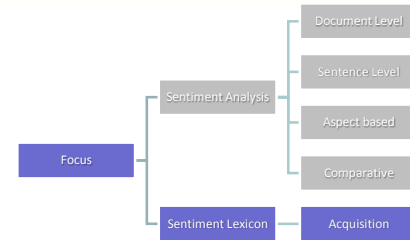
Sentence Level

Aspect Level

Comparative

Sentiment Lexicon

Acquisition



# Sentiment Lexicon

- Most crucial resource for most sentiment analysis algorithms
- Acquisition
  - Manual
  - Dictionary
    - Sentiwordnet
  - Corpus
    - Sentiment consistency

# Applications

Chesapeake Energy Corporation (NYSE:CHK)

0 אהבתי [Add to Portfolio](#)

From: 04/21/2012

To: 05/22/2012



Show

W

M

3M

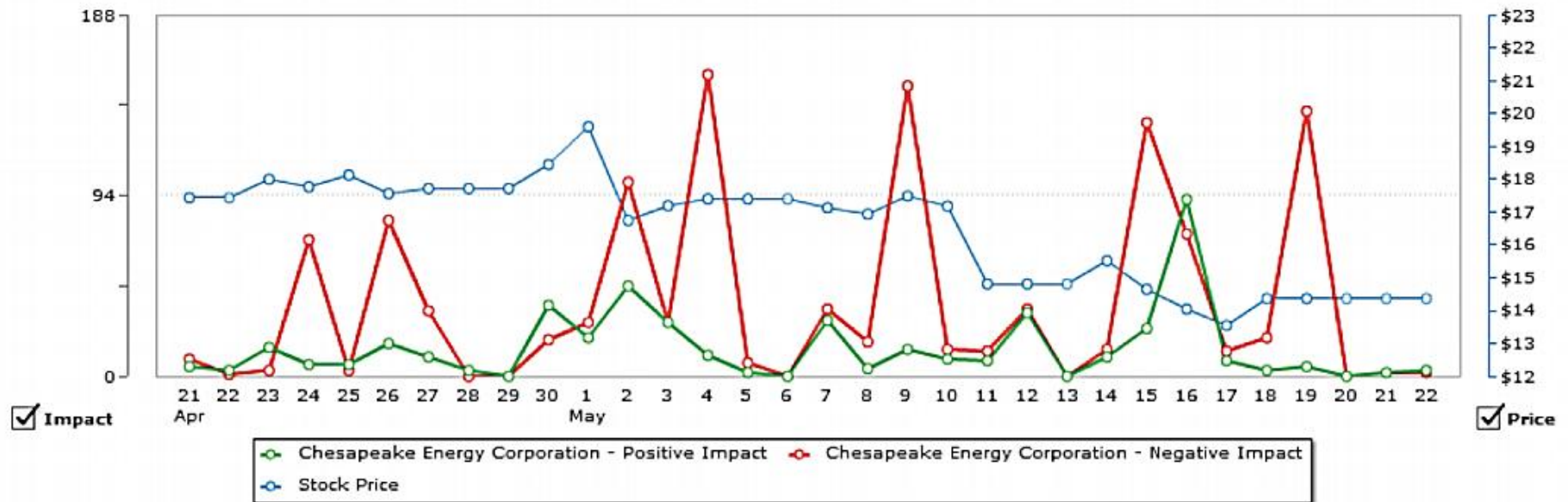
6M

Y

Upside: 31.42% Latest Target Price: 22

Impact

Price



# Applications

Articles

Events

Filter

By Event Type:

- ☒ All
- ☒ Acquisition
- ☒ Analyst Recomm...
- ☒ Deals
- ☒ Employment
- ☒ Financial
- ☒ Legal
- ☒ Partnerships
- ☒ Product
- ☒ Stock Price Change

Set Filter

Sort by: Most Recent

⊖	<b>Analyst Rating</b> Moody's downgrades Chesapeake outlook to negative 5/9/2012   bizjournals.com
⊖	<b>Analyst Rating</b> Moody's Lowers Chesapeake Outlook To Negative On Spending Gap 5/9/2012   online.wsj.com
⊖	<b>Stock Price Change</b> Chesapeake Energy Corp (NYSE:CHK) shares were trading at \$16.93 while reporting down 1.17% from yesterdays close. 5/9/2012   themumbaitimes.com
⊖	<b>Lawsuit</b> Chesapeake Sued Over Claims on Executives?? Jet Use 5/9/2012   bloomberg.com
⊖	<b>Investigation</b> The Securities and Exchange Commission has opened an informal inquiry into Chesapeake's well program and the transactions involving McClendon. 5/8/2012   finance.yahoo.com
⊖	<b>Investigation</b> The Securities and Exchange Commission has opened an informal inquiry into Chesapeake's well program and the transactions involving McClendon. 5/8/2012   finance.yahoo.com

Article Preview

Send this story to a friend Email address of friend (insert comma between multiple addresses): Your email address: Copy Me Add a brief note: Send Email Processing... **Moody's downgrades Chesapeake outlook to negative** Houston Business Journal by Olivia Pulsinelli, Web producer Date: Wednesday, May 9, 2012, 1:35pm CDT Moody's Investors Service has downgraded Chesapeake Energy Corp.'s rating outlook from stable to negative, citing the company's spending funding gap and CEO Aubrey McClendon's potential effect on Chesapeake's business. Moody's Investors Service has downgraded Chesapeake Energy Corp.'s (NYSE: CHK) rating outlook from stable to negative, citing the company's spending funding gap and CEO Aubrey McClendon's potential effect on the oil and gas driller's business prospects. Moody's said Wednesday it also downgraded the ratings outlooks for Chesapeake Midstream Partners LP (NYSE: CHKM) and Chesapeake Oilfield Operating LLC from stable to negative. The downgrades are due to Chesapeake's first quarter results, which indicate a larger spending funding gap for 2012 because of lower natural gas prices and increased



# Research Issues

- Automatic entity resolution
- Sarcasm
- Noisy texts
- Sentiment to objective statements

# Conclusion

- Reviewed some of the main research problems within the field of SA
- Discussed ways to solve each of these problems
- Described some of the major applications
- Provided a few major open challenges



# Techniques and Applications for Sentiment Analysis

Communications of the ACM | April 2013 | Vol. 56 | nº 4

DOI:10.1145/2436256.2436274

**Ronen Feldman**

Hebrew University

ronen.feldman@huji.ac.il

**Airton Bordin Junior**

airtonbjunior@gmail.com

**Prof. Dr. Nádia Félix Felipe da Silva**

nadia@inf.ufg.br



# Introduction



*“The king suite was spacious, clean, and well appointed. The reception staff, bellmen, and housekeeping were very helpful. Requests for extras from the maid were always provided. The heating and air conditioning functioned well; this was good as the weather was variable. The sofa bed was the best I’ve ever experienced. The king size bed was very comfortable. The building and rooms are very well soundproofed. The neighborhood is the best for shopping, restaurants, and access to subway. Only “complaint” has to do with high-speed Internet access. It’s only available on floors 8–12.”*

# Introduction

	<div></div> <div>★★★★★</div> <p>Odiei mt ruim trava tudo 5 estrela</p>
	<div></div> <div>★★★★★</div> <p>Mto engraçado mas n consegui dar nenhuma risada ate agora.</p>
	<div></div> <div>★★★★★</div> <p>Ruin</p>
	<div></div> <div>★★★★★</div> <p>Rhian Se for bom eu aviso mais se for ruim falo</p>