

1 Define the following with suitable examples:

1. **Opinion:** An opinion is a personal viewpoint, judgement about a particular subject or an issue. Opinions are different from facts in a sense that opinions are subjective and reflect other people's feelings and sentiments about events and their properties. For example: - "The Avengers movie was interesting". Here the opinion is about the "Avengers movie" which can change from person to person.
2. **Direct Opinion:** Direct opinion is also called as direct appraisal. It means giving a positive or negative and straightforward opinion about a specific aspect of an object or a service without referring to any other object. It is when one clearly states what they feel about a particular quality. For example: - "Samsung phones have an outstanding camera quality", this represents a direct opinion that Samsung phones have a great camera quality.
3. **Comparative Opinion:** In Comparative opinion a positive or negative comparison is done between objects or a specific aspect of an object/service by referring to another service. For example, "Google pixel 8 has a better processing power than Samsung galaxy s22", here a comparison is done between pixel 8 and galaxy s22 and an opinion is given about the processing power this is called as comparative opinion.
4. **Implicit and Explicit Opinion:** Explicit opinions describe something as being expressed clearly without any confusion, whereas, implicit opinion is the opposite of explicit in which opinions are not directly expressed but can be implied through the individual's behavior. For example: - "I think Sherlock Holmes book is fantastic", this is an explicit opinion where as "My expectations from the movie Star Wars were more", this is an implicit opinion.
5. **Opinion words and phrases:** Opinion words are those words which are often used to express sentiments either it can be positive or negative. For example, beautiful, excellent, good etc. On the other hand, opinion phrases describe someone's opinion in a phrase for example: - "I think it's great".

2 Discuss the task of subjectivity classification with examples.

Subjectivity classification is a task in NLP which is used to determine whether a sentence expresses an opinion or not i.e., whether the sentence is subjective or objective. For example: -

1. The battery life of this camera is very good
2. Camera is a good device for capturing photographs

Here both the sentences contain opinion bearing word good, despite first sentence is subjective and second one is objective [1]

3 What are the different levels of sentiment classification? Explain with suitable examples.

The different levels of sentiment classification are as follows: -

1. **Document-Level Sentiment Classification:-** This level determines the overall sentiment expressed in an opinionated document. For example, it determines whether the reviewer's opinion is positive or negative about a product.
2. **Sentence-Level Sentiment Classification:-** It dives more deeper as compared to document level sentiment classification. In this, individual sentences within the document are classified as positive or negative opinions. For example, each sentence in a product review can be classified as a positive or negative opinion.

3. **Feature-Based Sentiment Analysis:-** It focuses more on the feature part the sentence. For example, in a product review sentence, the analysis would identify the product features that have been commented on and classify the opinions expressed about them.

4 Discuss the existing techniques for document-level sentiment classification.

Most of the existing techniques for document-level sentiment classification are based on supervised learning approach, but there are few unsupervised learning approaches as well. Existing supervised learning methods can be applied to sentiment classification, for example naïve Bayesian and Support Vector Machine (SVM) etc. Pang et al [3] used this approach to classify movie reviews into two classes, positive and negative. It was shown that using unigrams as features performed well with both naïve bayes and SVM

5 Discuss the shortcomings of document-level sentiment analysis and sentence-level sentiment classification.

Limitations of Document Level Sentiment analysis:-

1. It assumes that each opinionated document indicates opinion on a single object and the opinions are from a single opinion holder.
2. Many techniques are based on supervised learning algorithm which require labeled training data this may not be applicable for other documents.

Limitations of sentence Level Sentiment analysis: -

1. It relies on classifying individual sentences as positive or negative, this approach may not capture the overall sentiment of the document.
2. It can struggle with comparative and superlative sentences which represent a different type of evaluation compared to direct opinions.

6 Explain with examples how and where the linguistic concepts of

6.1 Part of speech tagging and

6.2 syntactic dependency parsing are used in document-level sentiment classification.

1. **Part of speech tagging:-** Part of speech tagging is used in document-level sentiment classification to identify and extract important features from the text. By assigning a specific POS tag to each word in a document, such as noun, verb, etc., it helps in identifying the opinion words that indicate positive or negative opinions. For example, in the sentence "This camera produces beautiful pictures,"the adjective "beautifulis a opinion word, indicating a positive sentiment towards the camera.
2. **Syntactic Dependency Parsing:-** It is use to analyze the relationships between words in a sentence and extract valuable information about the sentiment expressed. It helps in identifying the syntactic structure of the sentence and the dependencies between words. This information is then used to determine the sentiment orientation of the opinion words. For example, in the sentence "This car is beautiful and spacious,"the dependency parsing will identify the relationship between the adjective "beautifuland spacious,indicating that both words have a positive sentiment orientation.

7 What is pointwise mutual information (PMI)? Explain how it is used for opinion classification with a method based on Unsupervised learning.

PMI calculates the association between a phrase and reference words, to estimate the sentiment of the phrase. The PMI is computed by comparing the co-occurrence probability of the phrase with the reference words to the probability of their occurrence if they were statistically independent. The log of this ratio provides the amount of information gained about the presence of one word when the other is observed. The opinion orientation of a phrase is then determined based on its PMI values with the reference words.

8 Discuss three applications of sentiment classification

1. **Product Reviews:** - Sentiment classification can be used to analyze product reviews and determine the overall sentiment expressed by customers. This helps companies understand how their products are perceived in the market and identify areas for improvement. For example, by classifying reviews as positive or negative, companies can identify common issues or features that customer like or dislike
2. **Social Media Monitoring:** - Sentiment classification can be applied to analyze social media posts and comments to understand public opinion about a particular topic or event. This is useful for businesses and organizations to estimate public sentiment towards their brand, or events. By classifying social media posts as positive, negative, or neutral, companies can track the sentiment trends and make informed decisions.
3. **Market Research:** - Sentiment classification can be used in market research to analyze customer feedback and opinions. By classifying survey responses or customer feedback as positive, negative, or neutral, companies can gain insights into customer satisfaction, identify areas for improvement, and make data-driven decisions.

8.1 References

- [1] Ahmad Kamal, "SSubjectivity Classification using Machine Learning Techniques for Mining Feature-Opinion Pairs from Web Opinion Sources"
- [2] Liu, B., 2010. Sentiment analysis and subjectivity. Handbook of natural language processing, 2(2010), pp.627-666.
- [3] B. Pang, L. Lee, and S. Vaithyanathan, "Thumbs up? Sentiment classification using machine learning techniques," Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)