

COMBATIVE INTELLIGENCE OF PRODUCT USING OPINION MINING

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Abstract

One of the cornerstones of a company's risk management is competitive intelligence. For the company's competitive atmosphere, it offers permanent lighting. Businesses are encouraged to evaluate their advantages over rivals due to the growing prevalence of Information and Communication Technologies (ICT), which include blogs, social networking sites, online shopping sites, and forums. This data offers the organization a fresh resource that aids in identifying, evaluating, and managing the different hazards connected to its operations and goods. These days, a corporation can improve its goods and services by making effective use of these data. An outline of opinion mining for competitive intelligence will be provided in this paper. We will attempt to compile the main findings from the various stages of product opinion mining.

Introduction

Overview

Gathering and evaluating consumer feedback on goods and services from a variety of internet sources is the goal of product opinion mining for competitive intelligence. Gaining competitive intelligence, tracking rival products, and identifying a company's offerings' advantages, disadvantages, and opportunities for improvement are the goals. A survey from the American Futures Group consulting firm indicates that 82% of large enterprises and over 90% of the Forbes top 500 global firms adopt "CI"(Competitive intelligence) for risk management and decisions. By the end of the 20th century, the overall production value of the "CI"(Competitive intelligence)industry had reached 70 billion U.S. dollars [2]. Using strategies including transfer learning, model evaluation, deployment, and continuous monitoring, the strategy entails data collection, preprocessing, feature engineering, and model construction. Anticipated consequences encompass comprehending consumer inclinations, directing product innovation, facilitating competitive differentiation tactics, refining client experiences, and augmenting overall competitiveness. Opinion mining helps businesses succeed in highly competitive marketplaces by helping them make well-informed decisions, improve their services, and provide great customer experiences.

Why the topic has been chosen?

- ✚ Product Opinion Mining enables businesses to gather and examine consumer feedback regarding their offerings as well as those of their rivals [21]. By providing a fresh perspective on customer preferences, problems, and opportunities for development, this useful data offers businesses a new resource.
- ✚ Companies can use opinion-mining information to inform product development, feature additions, and marketing tactics by comprehending client opinions and attitudes [10]. By doing this, they may better match their products to the needs of their clients, set themselves apart from rivals, and obtain a competitive advantage.
- ✚ Businesses can find areas for improvement in their goods, services, and general consumer experiences by examining customer feedback and opinions. Long-term success depends on addressing these problems because doing so can boost customer happiness, brand reputation, and customer loyalty.

- ✚ Advances in NLP and machine learning have made it feasible to automatically analyze and extract insights from large datasets.

Industry or Research needs

Developing more sophisticated NLP algorithms to accurately interpret and categorize opinions, even those with nuanced or ambiguous language. Enhancing the ability of NLP models to understand the context and sentiment of opinions within complex sentences and varied linguistic structures.

As businesses operate on a global scale, there is a need to analyze opinions in multiple languages, requiring research into multilingual NLP models and cross-linguistic sentiment analysis.

Monitoring online opinions helps companies address negative sentiments promptly, maintaining and improving their brand reputation.

Research into how opinion mining techniques can be applied across different industries (e.g., electronics, fashion, automotive) to ensure broad applicability and reliability.

Problem Statement

What is the problem addressed here?

The problem being addressed is the difficulty in efficiently and accurately extracting valuable insights from the vast amount of unstructured product reviews available online. Traditional methods of analyzing these reviews are often labor-intensive, prone to bias, and incapable of keeping up with the constant influx of new data. Businesses struggle to keep pace with the rapid and dynamic changes in consumer preferences, which are influenced by factors like lifestyle trends, technological advancements, demographic shifts, and environmental concerns. This results in a disconnect between what companies offer and what consumers currently desire.

Who is affected by this problem?

Using user feedback to determine a product's exact benefits and drawbacks is proving to be challenging for product managers and developers [1] [2] [13] [14]. In the lack of a comprehensive grasp of customer mood, marketing teams find it challenging to modify their approach. In addition, customer service teams are struggling to deal more proactively with ongoing issues and boost customer satisfaction.

When their recommendations are disregarded or not taken into account, current clients get irritated because they feel abandoned. Unfavourable reviews or the business's seeming inaction could turn off prospective clients. And, concerned about the company's ability to adapt products based on customer feedback, impacting long-term success and profitability.

Why it is important to solve the problem?

Resolving this issue is critical because it gives companies access to insightful consumer data, which improves competitive positioning, improves customer satisfaction, and facilitates better product development.

Businesses may improve both product quality and customer satisfaction by identifying common pain points and areas for development through a thorough analysis of product reviews [1][2][9]. Product reviews can provide valuable insights into unfulfilled customer wants and areas for innovation, which can help shape future features or completely new goods. Demonstrating responsiveness to customer feedback through visible improvements in products can enhance brand reputation and build customer trust. Businesses that successfully use opinion mining to get feedback on their products stand to benefit from a competitive advantage over their rivals in terms of increased customer responsiveness and adaptability.

Objectives and Methodology

This project aims to enable businesses to efficiently track and adapt to dynamic changes in customer preferences, understand the causes behind these shifts, and develop a versatile opinion-mining model applicable across various industries. By leveraging advanced Natural Language Processing (NLP) techniques and continuous learning mechanisms, the project aims to extract actionable insights from consumer feedback, facilitating data-driven decision-making and strategic planning. Collaborative case studies and pilot studies with industry partners will refine the approach, while data visualization tools will present findings in an easily interpretable format. Addressing this problem is crucial for enhancing competitive positioning, improving customer satisfaction, and driving innovation and growth. By understanding and proactively responding to evolving consumer preferences, businesses can maintain market relevance, foster customer loyalty, and ensure long-term success.

Research questions that intend to address

1. How can businesses adapt to Dynamic changes in customer preferences?
2. What are the main causes of shifting consumer tastes, and how can businesses foresee and proactively address these changes?
3. Developing a Generic opinion-mining model for various businesses.
4. What policies and procedures can businesses put in place to encourage flexibility and responsiveness in modifying their goods, services [6], and entire portfolio to conform to changing consumer demands?

Approach to Addressing the Research Questions

- According to author [5], use technologies to gather and compile feedback from customers on a range of platforms, including social media, reviews, and surveys. Configuring the systems to gather input via email surveys, internet forums, and customer service exchanges, among other channels.
- Implement ABSA (Aspect-Based Sentiment Analysis.) to dissect customer feedback into specific aspects (e.g., product features, customer service) and determine the sentiment associated with each aspect.
- Use NLP techniques [10,11] to detect emotions in customer feedback, providing deeper insights into customer satisfaction and dissatisfaction. Develop models to predict future customer opinions based on historical data, helping businesses anticipate shifts in preferences.
- Conduct time-series analysis on opinion data to identify emerging trends and shifts in customer sentiment over time. Moreover, develop models capable of analyzing feedback in multiple languages to cater to a global customer base.
- Use cross-lingual transfer learning techniques to adapt models from one language to another, enhancing their applicability in diverse linguistic contexts.
- Use pre-trained models like BERT, GPT, or RoBERTa [10] [22] and fine-tune them on domain-specific datasets to create adaptable opinion-mining models.
- Implement self-training algorithms [1][18] where the model iteratively improves by using its own predictions on unlabeled data as training examples. And, use clustering and topic modeling to identify prevalent themes and topics in unlabeled datasets, providing insights without extensive manual labeling.

Research Strategies/Methods

Mixed-Methods Approach: combining quantitative techniques (data analysis, opinion mining, sentiment analysis, machine learning models) [1][12][24], with qualitative techniques (literature research, case studies, expert interviews).

Design science Research: Addressing the challenge of adjusting to shifting client preferences by creating and assessing an artifact (decision support system or framework) [8].

Action Research: Working with partners in the industry, putting solutions into practice in real-world settings, and continuously improving the strategy in response to comments and observations.

Technologies Used

Natural Language Processing: Utilize advanced NLP techniques for opinion mining and feature extraction. Implement models like BERT and GPT [10][13], for accurate sentiment classification and context understanding.

Machine Learning: There are two types of learning methods in this approach: supervised and unsupervised. Labelled training documents are required by the supervised learning algorithms. On the other hand, when it is challenging to locate these labelled training papers, unsupervised methods are employed.

In OC, there are numerous techniques and algorithms for supervised classifiers. Support Vector Machine (SVM) [1], Naïve Bayes, Artificial Neural Network (ANN) [18], and maximum entropy are the most widely used classifiers. Numerous machine learning techniques have been studied for the classification of opinions.

Data visualization tools: Develop interactive dashboards using tools like Tableau or Power BI [2][5], to present findings in an easily interpretable format.

Comparative and Trend Analysis: To compare feature data and sentiment among competitors, use statistical techniques. Conduct time-series analysis to identify trends and shifts in consumer preferences over time.

Legal, Social, Ethical, and Professional Considerations

When dealing with legal, social, ethical, and professional issues in computing projects, there are several risks and considerations that need to be addressed:

Legal Risks

Regarding data privacy and compliance with legislation like the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR), handling consumer data, such as opinions and feedback, presents questions. Ensuring that no copyrights, patents, or trademarks are violated by the project, particularly when using pre-trained models or third-party libraries.

Social consideration

Clearly communicating to users how their data will be used and ensuring informed consent is obtained, especially when using data from social media and review sites. And, Keeping consumers' trust through ethical and responsible data management, making sure that data mining techniques don't violate users' privacy or result in the exploitation of personal data.

Ethical consideration

Based on the training data, the sentiment analysis and opinion mining models may display biases that produce unfair or biased results for particular groups. Gathering and examining consumer views and comments without appropriate authorization or openness may be regarded as a privacy breach. In addition, make sure that the AI models are created and applied ethically, taking into account any potential harm to people or the community.

Professional consideration

Following the ethical standards and code of conduct established by associations such as the ACM and BCS. Maintaining current knowledge of the most recent developments, industry best practices, and moral issues around sentiment analysis and opinion mining. including pertinent parties to guarantee that the project tackles issues and demands that are encountered in the actual world, such as end users, industry partners, and domain specialists.

Background

Sentiment analysis and opinion mining have become essential tools for deciphering and drawing conclusions from the massive amounts of unstructured data that are readily accessible on the internet, including product reviews, social media posts, and online forums. As was mentioned, the "sudden eruption of activity" in this field has been caused by the increased accessibility of resources that are rich in opinions as well as the growing need for systems that are capable of immediately analyzing and comprehending opinions as first-class objects.

This project would be conducted in the context of the necessity for businesses in a variety of industries to quickly adjust to shifting consumer tastes in order to maintain their competitiveness in distinct marketplaces. As internet platforms have grown in popularity, so too have the potential and obstacles for utilizing the information they provide for us to acquire about others' opinions.

The dominant literature in this field can be broadly categorized into two main areas: (1) opinion mining and sentiment analysis techniques, and (2) applications and use cases.

Opinion Mining and Sentiment Analysis Techniques

ML Approaches: Methods for sentiment categorization, aspect extraction, and topic modeling—both supervised and unsupervised, according to the author [1].

Lexicon-Based Approaches: According to the author [22], using sentiment lexicons [34] and corpus-based methods for opinion mining.

Natural Language Processing: Text preprocessing, feature engineering, and language models (e.g., BERT, GPT, RoBERTa) [10][14] for opinion mining tasks.

Transfer Learning and domain adaption: Fine-tuning pre-trained language models on domain-specific datasets.

Aspect-based sentiment analysis: Identifying and analyzing sentiments [34][32] associated with specific aspects or features of a product or service.

Opinion holder and target identification: The source and target of opinion, Particularly relevant for news articles and social media.

Applications and Use Cases

Product and service reviews: Analyzing customer opinions and sentiments towards various aspects of products and services.

Brand reputation and competitive intelligence: Monitoring customer sentiments towards a brand and its competitors.

Marketing and customer experience: Tailoring marketing campaigns, personalized recommendations, and customer experiences based on opinion insights.

Social media monitoring: Analyzing public opinions and sentiments on social media platforms for various purposes, including politics and policy.

Quality assurance and continuous improvement: Identifying areas for improvement in products, services, and customer experiences based on customer feedback.

Opinion mining and sentiment analysis are well-established fields that have seen continuous advancements in the last 20 years. But it's also a fast-moving target, propelled by ongoing developments in machine learning, natural language processing, and the accessibility of massive datasets.

Although opinion mining and sentiment analysis as theories and methodologies have been examined in great detail, the proposed study intends to expand and modify these approaches to the particular field of responding to dynamic shifts in customer preferences. In order to deliver practical recommendations for product development, marketing tactics, and customer experience enhancements, this entails merging opinion mining insights with other pertinent data sources, such as market trends and competition analysis.

Aspect-based sentiment analysis, transfer learning, and decision support systems are just a few of the well-proven methods and theories that will be used in this project. They have all been effectively implemented in a variety of fields. Nevertheless, domain-specific innovations and adjustments might be needed for their application to the particular difficulty of adjusting to shifting customer preferences.


People outside of the institution are probably going to be interested in the research outcomes, especially businesses that operate in highly competitive marketplaces where success depends on knowing and catering to customer preferences. The project's findings and solutions can be

advantageous for a variety of industries, including automotive, consumer electronics, retail, hospitality, and others where client preferences are ever-changing. Furthermore, the project's focus on leveraging opinion mining and sentiment analysis for competitive intelligence and decision support aligns with the growing interest in data-driven decision-making and the need for companies to stay agile and responsive to market changes.

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Student and First Supervisor Project Sign-Off			
	Name	Signature	Date
STUDENT: I agree to complete this project:	Guru Prasanth Marimuthu	<div style="text-align: right; font-size: small; margin-bottom: 5px;">21-06-2024</div> <div style="text-align: center;">  Guru prasanth marimuthu </div> <div style="text-align: center; font-size: x-small; margin-top: 5px;">Signed by: 383af003-4bce-476c-b390-78c22b05796f</div>	07/06/2024
SUPERVISOR: I approve this project proposal:			
Supervisor Comments/Feedback			

