

## ONTOLOGY-BASED SENTIMENT ANALYSIS FOR REAL-TIME PRODUCT REPUTATION MODELING

Mahrugh Jaffar<sup>1</sup>, Muhammad Usman Javeed<sup>\*2</sup>, Muhammad Talha Jahangir<sup>3</sup>, Muhammad Khadim Hussain<sup>4</sup>, Zeeshan Raza<sup>5</sup>, Shafqat Maria Aslam<sup>6</sup>, Rao Abdul Hannan Jaffar<sup>7</sup>

<sup>1</sup> Department of Computer Science, Superior University Lahore, Lahore, Pakistan

<sup>\*2,4,5</sup> Department of Computer Science, COMSATS University of Islamabad, Sahiwal, Pakistan

<sup>3</sup> Department of Computer Science, MNS University of Engineering and Technology, Multan, Pakistan

<sup>6</sup> School of Computer Science, Shaanxi Normal University, Xi'an, Shaanxi, China

<sup>7</sup> Department of Economics, Monash University, Australia

<sup>\*2</sup>usmanjaveed@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15970486>

**Keywords**

Sentiment Analysis, Semantic Web, Ontology Modeling, SPARQL Query, E-commerce Reviews, Product Reputation

**Article History**

Received: 10 April, 2025

Accepted: 01 July, 2025

Published: 16 July, 2025

Copyright @Author

Corresponding Author:

\*Muhammad Usman Javeed

**Abstract**

Social Media Platforms Have Become Powerful Channels For User Interaction, Enabling Individuals To Create, Share, And Exchange Information And Media Within Virtual Communities And Networks. E-Commerce Websites Such as Amazon, Ebay, And Cnet Incorporate User-Generated Product Reviews and Rating Systems That Influence Purchasing Decisions. However, Existing Review Systems Are Often Centralized and Static, Limiting Their Responsiveness To Rapidly Changing Consumer Feedback. These Systems Are Vulnerable To False Evaluations And Lack The Adaptability Needed To Reflect Evolving Opinions In Real-Time. This Research Aims To Develop A Dynamic, Ontology-Driven Reputation System That Evolves Over Time To Provide More Accurate And Timely Product Ratings. The Proposed System Is Designed To Compute Dynamic Ratings By Analyzing User Reviews Through A Multi-Layered Process. It Begins With Data Collection From Online Sources, Followed By Sentiment Analysis To Extract Emotional Context And User Opinions From Product Reviews. Subsequently, A Semantic Layer Constructs Semantic Profiles That Capture The Central Ideas Relevant To Decision Support And Reputation Modeling. The Methodology Involves Creating An Adaptive Ontology, Integrating It With A Database, Mapping The Relevant Data Structures, And Generating Semantic Queries To Derive Actionable Insights. By Enabling Real-Time Adaptation and Improved Transparency, The Proposed Approach Supports Both Consumers And Manufacturers In Making Informed Decisions Based On Continuously Updated Reputational Data.

**1. INTRODUCTION**

Reputation and influence in the digital age must be earned through genuine engagement and value. Social media serves as one of the fastest and most effective means for individuals and organizations to showcase their credibility and connect with audiences. It

enables users to create, share, and exchange information, ideas, and content within virtual communities and networks. A significant application of social media today lies in the realm of e-commerce. Platforms such as Amazon, eBay, and CNET offer users the ability to review and rate products based on

their personal experiences. These online rating systems have become essential tools for guiding purchasing decisions and building trust among consumers. Any product made available on such platforms can be reviewed and evaluated, contributing to its overall acceptance and reputation in the marketplace. Clients buy various items from these sites. The clients who bought the items share their experience concerning that item online as survey [1]. This review is vital for client and producer. At whatever point a client needs to take the choice for buying of any item it is assumed a significant part [2]. Prior to buying any new item, the new buyer needs to use the survey of post buyer who are now utilizing that item. Reviews are frequently valuable for the purchasers before buying items. The reviews of the items given by the clients are especially useful for the organizations to know the positive and negative places of their items to work on the nature of the items [3]. Clients can give their customized experiences as text or as appraisals. There are two kinds of client reviews, for example, client rating (numeric rating) and client assessment (text based depiction) [4]. Client rating is a numeric rating that allows individuals to rate an item or administration with various stars. The quantity of stars can differ from 1 to 5 stars. Assessment is an assertion of counsel by a specialist on an expert matter.

A client assessment can be positive, negative, unbiased feeling or mentality about the item. The feelings present in the feedback in regards to the item includes give exhaustively in understanding the surveys and furthermore help in the investigation of the element opinions of the item. It is hard for the clients to extricate the significant data from the audits. Opinion investigation is the method involved with recognizing positive or negative feeling in verbal form. It is utilized to remove the significant data from the survey [5]. Ache and Lee indicated terms identified with the feeling examination [6]. The space of opinion examination is driven by regular language handling, man-made consciousness and data recovery framework. Feeling investigation is known as assessment mining. The assessment mining is to distinguish the gathering of individuals' viewpoint in regards to one issue or item. The point of opinion examination is to distinguish the direction of the feeling communicated in written form. This space of

examination named as Subjectivity Investigation concentrates on the feelings, opinion, assessment, way and assessment [7]. The sentence which offers some viewpoint is called abstract, while the sentence which doesn't contain any assessment is called evenhanded or verifiable [8]. Both, the report level and the sentence level examinations didn't find the exact preference of the customers and what they disliked. Perspective level executed a better analysis. Previously, Perspective level used to be called the highlight level (as it included base assessment along with the rundown) [9]. Instead of taking the language develops into consideration like (reports, passages, sentences, provisos or expressions), angle level simply take into consideration only the actual assessment. It revolves around the probability that the evaluation consists of a feeling (i.e. good or bad) and an objective (of assessment) [10]. Sentiment analysis detects the opinion of people about product either it is good or bad. But on the other hand, product reputation method is used to aggregate both types of rating. In e-commerce sites, product reputation is also very important. In such websites, user can send the ratings and reviews of various products. These ratings are used to calculate the reputation. Reputation of the product is the measurement of its quality [9] and customer satisfaction [10]. Different reputation measures such as aggregated star value (also called five star or simply star value), feature reputation and product reputation are used to calculate the reputation of a product. People or companies can post fake ratings for various reasons like promoting their product or maybe discrediting the alternative products of competitor [12].

The Decay Principle was employed to check the latest ratings and compare them with previous ratings to establish latest viewer thinking. The reputation Model may be used to employ any of the methods in the user interface to compute the data. Similarly, the window selected in hybrid decay is based on parameters, which are also taken from users (who want to compute reputation value of a product) through a user interface. But, sometimes it can be difficult for ordinary users to decide the appropriate decay principle for a product. In addition, if they select hybrid decay, then sometimes they are not able to enter optimal values for the parameters [13]. But linear decay is centralized and whole process is static.

Rating is changing with respect of time. Linear decay is not suitable for this type of rating. There is need of dynamic system [14]. This paved the way for constructing new ontology. Anew ontology is to be constructed to enable the continuous detection and taking into account latest reviews also [15]. Ontology structuring gives us real-time changes in different services which are already being stored in it.

Reasoner part uses semantic rules for the assessment of efficiency of ontologies. Ontologies record present or old intelligent techniques for decision making and their results, define the rules, and gives us a hierarchy system do decrease the time of searching. Ontologies present semantics and data together to help make easy information transfer. Ontology reasoning and modelling to help facilitate changing business needs within a time frame.

Many websites here, available in network for online business such as Amazon, EBay, Cnet. These type websites are providers of an excellent rating system of products that is used by consumers for the rating of certain products according to their usage and experience. When, any new customer wishes to buy any product he goes through the reviews and ratings by the already existing customers and gets the idea of the efficiency of the product. The review of any product existing online or offline is also important to the developers and companies as they can analyze the strengths and weaknesses of their product and those of its competitors. This analysis result in research to enhance the product quality and features. There are two type of review such as numeric review (Star) and other one is textual review (opinion). The number of stars can vary from 1 to 5 stars. A customer's rating can be good, bad, neutral, open or anonymous about the given product. However, the opinion or thinking towards the product may vary as the time passes. This variation in thinking and rating may arise due to different factors like advancement in technology, changed market trend, different customer requirement and quality changes in the given product. The existing product review systems are centralized and the whole process is static and product ratings change rapidly. It is easy to avoid false evaluation, handle new changes and reduce the time to obtain customer review from the perspective of customer and manufactures. Purpose of this research was to create a comprehensive and definite ontology which can

evolve with the passage of time. Creation of an ontology that can evolve with time We propose a system those compute dynamic rating. The process was simplified into three layers in order to achieve the desired reputation model. First layer is data collection. We took a dataset which contain reviews of product from internet. Second layer is sentiment layer in which features are extracted from reviews of product. Sentimental analysis is applied in the base of these features. Third layer is semantic layer in which we create semantic profile. Semantic profile can provide central idea of the decision support concepts. Firstly, we make an ontology. In the second step, we build a database connection. The next step is to create mapping. Last step to generate query.

## 2. LITERATURE REVIEW

It's the age of technology, people are putting their ideas on social media whenever they want to do. Social media a platform for networking, association, social interaction, online evaluation and a great source of online chastity and trustworthiness indicators data. In online business, a product can be defined as a system or thing designed for the use of buyers. Anything which is available on an online store to fulfill the needs and requirements of the customer. The difference in the services delivered public and level of fulfillment of their requirements, effect of the services plan public opinion either positive or negative.

### 2.1 Sentiment analysis

Text mining is further divided into different categories, one of which is Sentiment analysis, in which IT is used for estimating & elaborating feelings expressed in written form on media. Natural text processing are employed for this cause [16]. Sentiment analysis, also called opinion tracking, works on public's opinions, ideas, analysis, appreciations, behaviors, and mental approach about goods, services, institutions, persons, occurrences, public affairs, ideas and their elaboration [17]. The sentiment may be good, bad or neutral appreciation, feeling or behavior towards a specific context of the product from a person. Opinion dimensions are good, bad, and neutral. The review is categorized as good or bad by the opinion categorizer [18]. The sentence which expresses some opinion is called subjective, whereas

the sentence which does not contain any opinion is called objective or factual [22-25].

## 2.2 Product Reputation Model

Olaleye et al explained in their article that sentiment analysis is a prerequisite for management of the services and product reputation online (an extension of public relations). Online reputation management is a long-running way of maintaining the image of an organization by online and printed media [27]. Reputation of the product is a perception of the future behaviors and quality of the product. Numerous reputation techniques including aggregated star system (ranging from one to five stars) [28], reputation of features [29] and product reputation on the basis of features [30] are used in the literature to evaluate a product's reputation. These values of reputation are useful in making decisions for both customers and organizations [31, 32, 33]. The decay principle is applied for supporting the new ratings in place of the previous ones to show the latest and new opinions. In peer to peer (P2P) and e-commerce environment this principle is applied in three methods or aspects: use of recursive algorithm, exponential decay and window-based system. The easiest method to apply the decay principle is selecting a specific period of time and use the ratings uploaded in that period of time to calculate reputation [35, 36, 40].

## 2.3 Ontology in sentiment analysis

Ontology is a collection of features and concepts in a subject or domain area that shows relationship between concepts. Mining of opinion or Sentiment analysis is used for analyzing feedback, reviews and opinions given by customers about any services, the movies, and the products. When the buyers think about buying anything online, they have to see the online review of that product before buying that thing. Buyers around the globe using that specific product post their comments on the marketing websites from where the buyers can buy that specific product. Evaluation of all reviews is done on these websites and they are rated from zero to five. Pattern of reviews is the basis of this rating. Exact results are not awarded in this kind of ratings. Bandari et al [14] made a list of all the issues which different languages face using ontology while investigating the feelings

and emotions of reviews of the buyers and tried to solve these issues. Kontopoulos et al [40] explains in their paper that advent of Web 2.0 has significantly changed the perception of net users through making a drastic improvement in sharing of information, interoperability, and collaboration. The author suggests the deployment of techniques based on actual ontology for more effective sentiment analysis regarding posts on Twitter. It increases efficiency. Bandari Et al [41] said there are many e-commerce websites available where products are bought and users give their reviews on the products given or the services provided. The purpose of this study is to use ontology to have a survey and analysis of product reviews by customers having different languages. Our purpose is also to highlight the issues present in analyzing products reviews of different languages. So, we performed an experiment by using ontology to sentiment analysis of product reviews on a Hindi mobile phone online platform and tried to decrease the issues in such previous systems. Ali et al[42] said in their study that traffic density is being increased in urban areas at a much faster pace, especially in big cities. This system gets all the transportation and city related tweets and reviews and from this taken data we extract the opinions and use fuzzy ontology to get different transportation and city features. They used OWL and java to devise an intelligent prototype and fuzzy ontology. The results obtained from the experiments show that the experiment was very much satisfactory. Nithish et al [43] said A lot of important information cannot be distinguished from documents because much data is present on the internet. People associated marketing and sales use online forms to conduct surveys and queries to analyze their products distribution. We use OWL format and store the product description and reviews together in domain ontology. After embedding the opinions in the ontology, this method can be used to do reasoning and solving intelligent questions. Sam et al [44] proposed a design which could be a generalized model. This model analyzed unstructured reviews of the users from social media posts related to electronic products. Positive and negative factors were added to increase precision of the model. Kumar [45] explained that WWW is a universal information platform which was at beginning read only but it innovated very fast and changed from 'read only' to 'read and write' and

then it evolved into intelligent 'read write and execute' also known as semantic web. The initial experiment results show that the model was successful with 77% accuracy and we should focus on more sentiment analysis-based models. Zehra [46] suggested a system which would recommend schools having sentiment analysis on the basis of ontology. For this study, we used a private group on Facebook which reviews different schools and posts them. We designed a school ontology on the basis of taken reviews/posts manually. This increased reasoning. Ali et al [47] expressed in his paper, most products or services get more potential users due to user reviews present online. The key achievement of the suggested model is integration of Natural Language Processing model and ontology for recording reviews information by customers. The suggested model was experimentally expressed on the data from customers reviews of a digital camera by Amazon. Yergesh et al [48] states that sentiment analysis is vital and intriguing to use in natural languages. In this paper, we designed sentiment words Kazakh Dictionary. In this study, they did sentiment analysis of Kazakh language works using the dictionary based on ontology and phonological rules. A model was created which determined sentiment on basis of ontology and rule extraction. This method if used on common sentences gained 83% precision. Marstawi et al [49], argued that the existing firmware in sentiment analysis mainly sideline or remove the complex issues arising from the Lexicon based scores (SentiWordNet), while Lexicon analyses classifying the data on basis or word existence and number of words are very less. So, there is automatically very low rate of detection. The result was an OBPSS system that performed better than already existing models in mining and sentiment rating. OBPSS gives linguistic rules working at level of sentences increases the overall efficiency and provides a precise sentiment analysis. Nagano et al [50] proposed designing of a model for analyzing opinions for market research named as WOM Scouter. Other function is the comparison of two products and their features by their link traffic and recurrence in the text. Assessment through experiment expresses blog viewers liked this presented algorithm more than TF-IDF. Abdel-Hafez et al [51] explained that much of the present reputed models use the customers ratings but mostly ignore customer's review texts. Therefore, they

said that customer ratings of a product not actually express the original reputation of the product features. So, customer's review mandatory. They also provided experimental results and complete case study for comparison with other such models. Abaalkhail et al [52] explained that ontology can comprehend the relationships between concepts and the association within contents. Their experimental results show that that this ontology is as much efficient as machine learning techniques. Their presented model DFSMD has been accessible to everyone or anyone can use it to analyze different sentiment issues. Rekha [53] said about the semantic analysis that it is a technique which is devised to obtain customer opinions and reviews regarding to a certain product. These days, reviews of most of the products can be mined from web due to evolution of technology. The experimental results of presented algorithm were very satisfactory and presented features of cellphone. Polsawat [54] explained that much of the data in Social Media is being used to aid the users in selecting and buying products. The experimental results show almost 94% efficiency in sentiment analysis. Channa et al [55] explained that OWL-S and RDF-S were designed from Analytical Philosophy and their ideas about ontology and General semantics and techniques of product knowledge were assessed. Semantic languages have been famous and due to their flexibility techniques based on ontology and Semantics were suggested to design product knowledge. Ali et al [56] explained that social media have a vital role in collecting information about transportation and travel services. Systems for management and control of traffic make use of sentiment analysis which with its reasoning helps ITSs (intelligent transportation systems). The presented ontology was designed using OWL and the smart model was created with the help of Java. For the assessment of this model we used classifiers based on Machine learning. The experimental results show that model was effective and gained 93% accuracy.

#### 2.4 Comparative Analysis

The comparison chart below is designed to check various factors such as Static, Dynamic, Efficient, Accuracy, Reasoning, Polarity, Reliability, Precision and recall. Static means not moving or changing. Dynamic Means continuous changing and



developing. Efficiency is the ability to produce something with a minimum amount of effort. Accurate is exact and true. Accuracy is the degree of closeness to true value. Reasoning is a way of thinking about anything in a rational approach for forming an assumption or a conclusion. A performance is a way

of presenting a show, or any other kind of theater. Polarity is commonly used to describe if an electrically charged stream is negative or positive, the direction of a battery, the polarity of a magnet, etc. Precision is the degree to which an instrument or process will repeat the same value.

Table 1. Comparative analysis of literature review

Study	Static	Dynamic	Reliability	Precision	Recall	Accuracy	Polarity
Twitter Reviews [41]	√					√	
Languages [42]	√			√		√	
Transportation [43]	√		√			√	
Mobile [44]	√		√	√	√		√
Electronic products [45]	√		√	√			√
social web [46]	√		√		√		√
Recommendation Systems [47]	√		√		√		
Online customers' review [48]	√			√		√	
kazakh sentences [49]	√			√		√	
Product reviews [50]	√		√		√		√
Ontology-based topic extraction [51]	√			√		√	√
Ontology product's reputation model [52]	√			√			√
Multimedia [53]			√			√	
Online mobile reviews [54]	√		√	√	√	√	
Customer Reviews [55]	√		√	√		√	√
constructing product knowledge [56]	√		√	√	√	√	

## 2.5 Analysis

From the analysis of the papers mentioned in table 1, we observe that sentiment analysis or opinion mining is used to analyze the opinions, reviews, and feedback given by the customer about product. Different author uses different techniques to improve Accuracy, Efficiency, Reasoning, Performance, Reliability, Precision and Recall. Current product reputation is used to make an ontology to compute twitter post, languages, review on mobile phones, review on electronic devices and different products. Current product reputation system is centralized and the whole process is static. However, Product Ratings are change rapidly. Therefore, there is a need of dynamic system. Ontology construction is the work of this experiment. By constructing the ontology, automatic

identification and extraction of the user opinions from the reviews are possible.

## 3. PROPOSED METHODOLOGY

### 3.1 Proposed approach

In the previous section, we have discussed the product reputation system. Based on the need for a dynamic product reputation approach, we propose a semantic product reputation system answering the research issues highlighted in the state of the art. Figure 1 shows the whole process of the semantic product reputation model which is divided into three phases. First phase is data acquisition in which review is collected from internet. Second phase is sentiment layer in which features are extracted from reviews. Sentimental analysis is applied in the base of these features. In third phase, we use semantic knowledge

for purpose of making an automatic system. we develop inference based semantic rules for Dynamic

product reputation while query generation has been done.

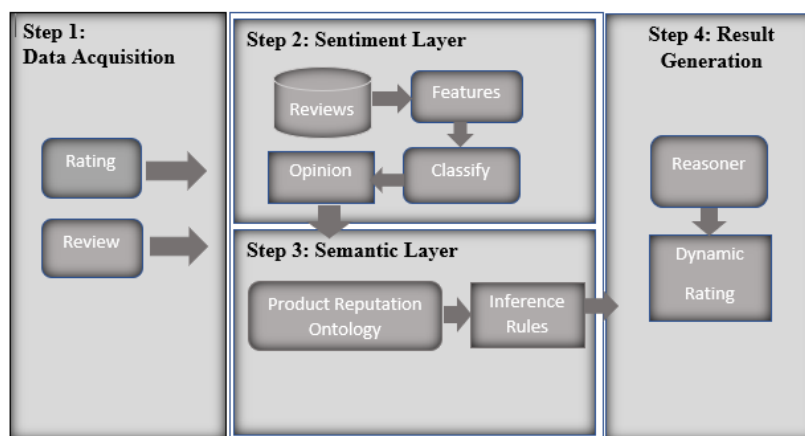


Figure1. Semantic Product Reputation System

### 3.2 Data Acquisition

First of all, we took a dataset of product reviews of Amazon from kaggle.com [57]. The dataset was designed specially to show user reviews and opinion, how it is viewed in various countries and its promotional potential. We used musical instruments as our product.

The dataset consists of:

- **ID:** Review ID
- **Manufacturer:** Amazon
- **Types:** Product Type
- **Asin:** Product Asin
- **Reviewer:** Reviewer name
- **Helpful:** Helpful for customer
- **Review Text:** Review in Text
- **Rating:** Rating of product (1-5)
- **Review Date:** Review time
- **Opinion:** Customer opinion

The extracted reviews contain opinion about customer service, review about the product, comparison with other products and suggestions to improve features of the product. There are two type of customer review such as customer rating and customer opinion. Customer rating is a numeric rating such as star rating 0-5. A customer opinion can be positive, negative or neutral appraisal, emotion or attitude about an aspect of the entity from an opinion holder. Opinion orientations are positive, negative, and neutral.

### 3.3 Sentiment Layer

The customer opinion from this dataset consists of sentences that are provided by the customer. Different online tools are available in internet for sentiment analysis. We use MonkeyLearn [56] for classifying positive, neutral and negative reviews. We create a new model. There are two types of models available. First one is classifier in which we define some tags (features) in review sentences. The other one is extractor which extract specific pieces of data from review sentence. We will create a classifier. Then, there are three kind of classifications such as topic classification, sentiment analysis and intent classification. Topic classification classifies texts based on topic and aspects. Sentiment analysis detects sentiment in text such as positive, negative or neutral. Intent classification classifies text based on intent such as complaint or feedback. We will choose sentiment analysis. Then we import our dataset here in CSV column. Our complete dataset was uploaded to the classifier. Then, we extract the features in the review. There are several features of product such as project display, product size, product function, product price and product type. This tool distinguishes positive, negative or neutral reviews based on their features of product.

### 3.4 Semantic Layer

A semantic profile can capture and represent the core concepts of a decision support system. The process begins with the development of an ontology to define

the domain knowledge. Next, a connection to the relevant database is established. In the following step, semantic mappings are created to link ontology concepts with database elements. Finally, using OWL and SPARQL, we perform queries to extract meaningful insights from the data. As time passes, product reviews given by different people change. These variations might be due to different reasons like change in user requirements, improvement in product quality, market trend and evolution of technology. Mobile phone reviews might not remain same now compared to a few days back due to reason that new phones with better specifications and sophisticated hardware might be available in market. Due to this problem, we make an ontology to automatically compute dynamic reviews. If the new product is introduced with high camera and high video speed, then people will definitely change their review. This changing review is computed by our semantic product reputation system.

### 3.5 Product reputation Ontology

In this section, we present the ontology developed using Protégé to model and highlight dynamic product reputation. The ontology captures the core concepts related to products and their associated reputations. A product is defined as a tangible good or item available on various e-commerce platforms. For illustration, we focus on Amazon, a widely used online marketplace where users can post reviews and ratings for purchased products. These user-generated reviews significantly contribute to the perceived reputation of products. Ontology, in this context, refers to a structured representation of knowledge that defines concepts and the relationships between them. Our product reputation ontology is designed to formalize these relationships and is depicted in Figure 3. The ontology incorporates multiple classes to represent different concepts within the domain.

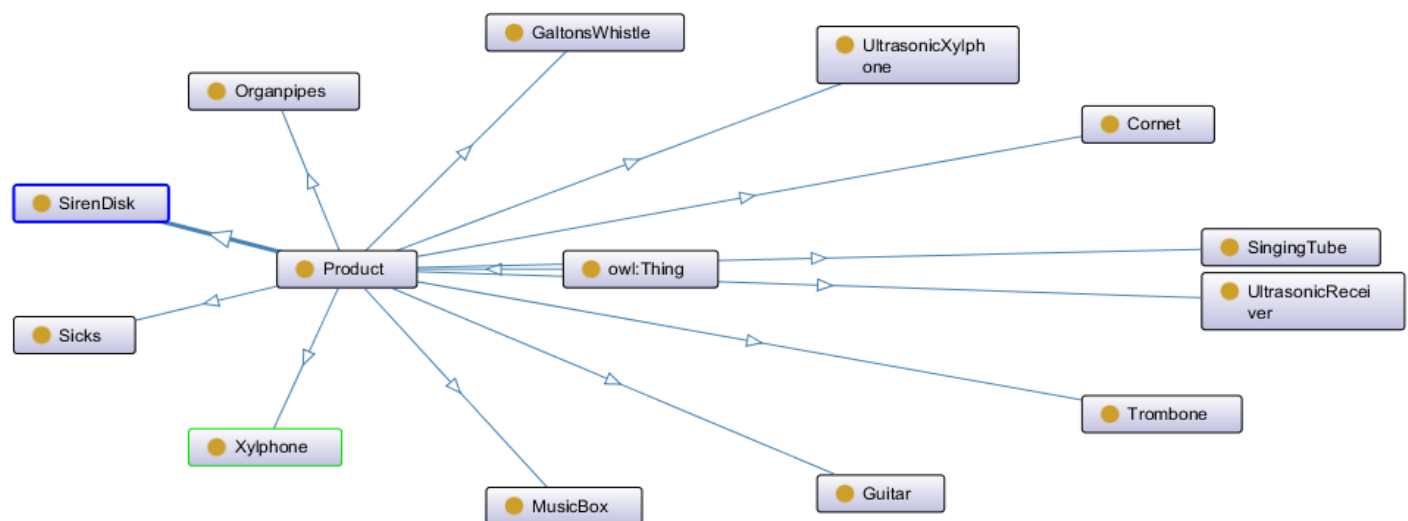


Figure 3. Product Reputation Ontology

### 3.6 Product Reputation Classes

In an ontology, classes are organized hierarchically into two types: superclasses and subclasses. The 'Product' class serves as a superclass, encompassing various specific product types as its subclasses. These include Guitar, Cornet, Sticks, Singing Tube, Music Box, Trombone, Xylophone, UltrasonicXylophone, Galton's Whistle, Siren Disk, and Ultrasonic Receiver. Object properties are used for making

relationship between two individuals. If we want relationships between individual to individual, then we make object properties.

### 3.7 Product Reputation Data Property:

In Protégé, data property is used to describe relationship between individual to literal. Our data property is Id, Manufacturer, Opinion, Rating, Review date seen, Reviewer Name, Reviews Date,



Review Text, Summary, Types and Unix Review Time as shown in figure 4.

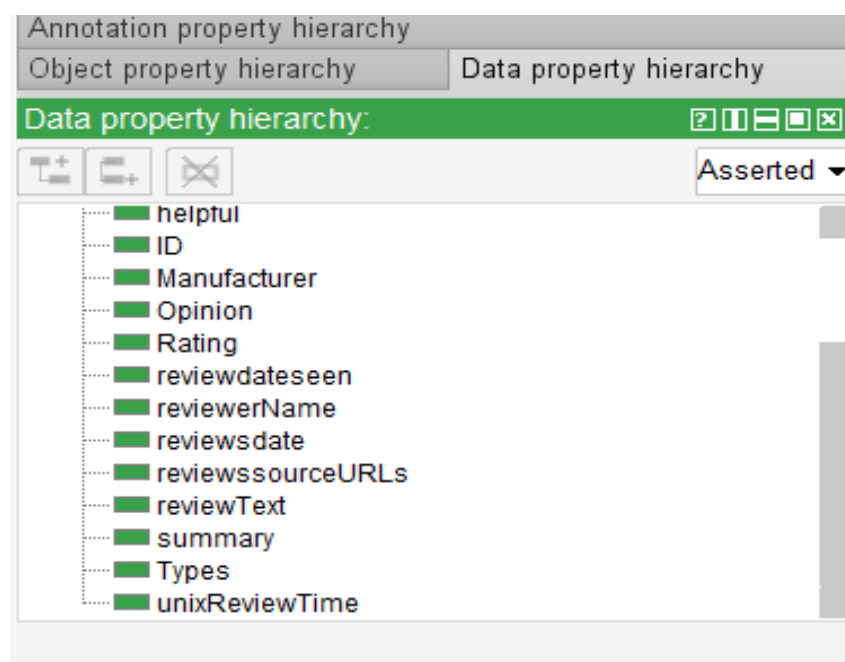


Figure 4. Product Reputation Ontology Data Property

### 3.8 Database Connectivity and Query

We uploaded the dataset in workbench, then attached the workbench to protégé. Here, we need jdbc driver, Database Username, Database Password and connection URL. Then click on Test Connection and our database connection is created. JDBC driver is used in protégé. JDBC stands Java Database Connectivity Framework. It is used to connect data sources. First download the jdbc driver. Open the protégé, go to files, click the preference and move to JDBC Driver and then add it.

In protégé, we move to ontop Mapping, three tabs are available here on the top including Datasource manager, Mapping manager and Mapping Assistant. Datasource is used to make database connection. Mapping manager is used to store mappings. Mapping assistant is used to make mapping. We select table form database.

## 4. RESULTS AND DISCUSSION

In this section, we present the semantic rule-based framework developed for modeling dynamic product reputation. The ontology was constructed using Protégé in the Ontology Web Language (OWL), enabling formal representation of domain knowledge.

For experimentation and simulation, a structured dataset was utilized, and an intermediate software component was developed to support OWL/XML parsing and integration for implementing the dynamic product reputation model, as illustrated in Figure 1. To facilitate semantic integration, ontology-to-dataset mappings were created for a variety of products including Guitar, Cornet, Galton's Whistle, Music Box, Organ Pipes, Sticks, Singing Tube, Siren Disk, Trombone, Ultrasonic Receiver, Ultrasonic Xylophone, and Xylophone. Inference-driven semantic rules were defined to capture the evolving nature of product reputation based on user-generated reviews and product attributes.

SPARQL queries were formulated to extract and validate semantic insights derived from the ontology. These queries were executed within the Protégé environment, and the Reasoner was configured and initiated via the Reasoner menu to ensure logical consistency and derive inferred knowledge. The use of semantic rules in conjunction with SPARQL enabled dynamic and explainable evaluation of product reputation across multiple product instances.

#### 4.1 Guitar

After developing the ontology in Protégé, we established mappings and applied inference-based semantic rules to distinguish between positive and

negative product reviews. The Reasoner was utilized to infer and validate these classifications. The output for the 'Guitar' product is presented in Figure 5.

Mapping ID: MAPID-824a68bc3ad544f8c208ac905d6bdfb

ID	Manufacturer	Types	asin	reviewerName	helpful	reviewText	Rating	summary	unixReview	reviewsdate	reviewdates	reviewsour	Opinion	FIELD15	FIELD16	FIELD17
1	Amazon	Guitar	1384719342	cassandra t.	[0, 0]	Not much to...	5	good	1393545600	2017-01-13	2017-09-05	http://review...	Positive	null	null	null
2	Amazon	Guitar	1384719342	Jake	[13, 14]	The product...	5	Jake	1363392000	2017-01-13	2017-09-05	http://review...	Positive	null	null	null
3	Amazon	Guitar	1384719342	Rick Bennet...	[1, 1]	The primary...	5	It Does The ...	1377648000	2017-01-13	2017-09-05	http://review...	Positive	null	null	null
4	Amazon	Guitar	1384719342	RustyBill "S...	[0, 0]	Nice winds...	5	GOOD WIN...	1392336000	2017-01-13	2017-09-05	http://review...	Positive	null	null	null
5	Amazon	Guitar	1384719342	SEAN MASL...	[0, 0]	This pop ill...	5	No more po...	1392940800	2017-01-12	2017-09-05	http://review...	Positive	null	null	null
6	Amazon	Guitar	B00004Y2UT	Bill Lewey...	[0, 0]	So good tha...	5	The Best C...	1356048000	2017-01-12	2017-09-05	http://review...	Positive	null	null	null
7	Amazon	Guitar	B00004Y2UT	Brian	[0, 0]	I have used...	5	Monster Sta...	1390089600	2017-01-12	2017-09-05	http://review...	Positive	null	null	null
8	Amazon	Guitar	B00004Y2UT	Fender Guy	[0, 0]	I now use th...	3	Didn't fit m...	1353024000	2017-01-12	2017-09-05	http://review...	Neutral	null	null	null
9	Amazon	Guitar	B00004Y2UT	G. Thomas	[0, 0]	Perfect for ...	5	Great cable	1215302400	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
10	Amazon	Guitar	B00004Y2UT	Kurt Robair	[0, 0]	Monster ma...	5	Best Instru...	1389139200	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
11	Amazon	Guitar	B00004Y2UT	Mike Tarran...	[5, 6]	Monster ma...	5	One of the b...	1334793600	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
12	Amazon	Guitar	B00005ML71	Christopher...	[0, 0]	I got it to ha...	4	It works gre...	1398124800	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
13	Amazon	Guitar	B00005ML71	Jai	[0, 0]	If you are no...	3	HAS TO GE...	1384646400	2017-01-23	2017-09-05	http://review...	Neutral	null	null	null
14	Amazon	Guitar	B00005ML71	Michael	[0, 0]	I love it. I us...	5	awesome	1371340800	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
15	Amazon	Guitar	B00005ML71	Straydogger	[0, 0]	I bought thi...	5	It works!	1356912000	2017-01-23	2017-09-05	http://review...	Positive	null	null	null
16	Amazon	Guitar	B00005ML71	Wilhelmina	[0, 0]	I bought thi...	2	Definitely N...	1376697600	2017-01-23	2017-09-05	http://review...	Negative	null	null	null
17	Amazon	Guitar	B000068NSX	C.E. "Frank"	[0, 0]	This Fender...	4	Durable Ins...	1376352000	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
18	Amazon	Guitar	B000068NSX	Charles F...	[0, 0]	wanted it ju...	5	fender 18 ft...	1373328000	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
19	Amazon	Guitar	B000068NSX	Charlo	[3, 3]	I've been us...	5	So far so go...	1363564800	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
20	Amazon	Guitar	B000068NSX	GunHawk	[0, 0]	Fender cord...	5	Add Califor...	1375833600	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
21	Amazon	Guitar	B000068NSX	MetaFan	[0, 0]	This is a co...	4	Cheap and ...	1331856000	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
22	Amazon	Guitar	B000068NSX	Ricky Shows	[0, 0]	The Fender ...	5	Fender 18 f...	1390953600	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
23	Amazon	Guitar	B000068NSX	WVowle	[0, 0]	Very good c...	4	Guitar Cable	1354924800	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
24	Amazon	Guitar	B000068NTU	Amazon Cu...	[0, 0]	Got this cab...	5	Quality cable!	1341446400	2017-01-24	2017-09-05	http://review...	Positive	null	null	null
25	Amazon	Guitar	B000068NTU	Ann Vande...	[0, 0]	When I was...	5	I Got Great...	1383177600	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
26	Amazon	Guitar	B000068NTU	Michael Ha...	[0, 0]	Can't go wro...	4	Its a Hosa	1372809600	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
27	Amazon	Guitar	B000068NTU	Pat	[0, 0]	The ends of...	5	Quality and ...	1327449600	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
28	Amazon	Guitar	B000068NTU	tada	[0, 0]	Just trying t...	5	Midi to Midi	1381795200	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
29	Amazon	Guitar	B000068NVI	b carney	[1, 1]	The Hosa X...	4	Very Heavy...	1341964800	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
30	Amazon	Guitar	B000068NVI	Dan Edman	[0, 0]	I bought the...	5	Still going	1392788000	2017-01-27	2017-09-05	http://review...	Positive	null	null	null
31	Amazon	Guitar	B000068NVI	David Burch	[0, 0]	Sturdy cord...	5	Does what I...	1337990400	2017-01-27	2017-09-05	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel

Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 5. Output of Guitar

#### 4.2 Cornet

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Cornet is shown below figure 6.

Mapping ID: MAPID-840b627720a64e59be8c9dfb15395be0

ID	Manufacturer	Types	asin	reviewerName	helpful	reviewText	Rating	summary	unixReview	reviewsdate	reviewdates	reviewsour	Opinion	FIELD15	FIELD16	FIELD17
50	Amazon	Cornet	B000068NL	C. Hill "CFH"	[0, 1]	This Hosa ...	5	Great Guitar...	1346803200	2017-03-20	2017-09-05	http://review...	Positive	null	null	null
51	Amazon	Cornet	B000068NL	C. Longo	[2, 2]	I didn't expe...	2	Cannot rec...	1309910400	2017-03-20	2017-09-05	http://review...	Negative	null	null	null
52	Amazon	Cornet	B000068NL	C. Zemer	[0, 0]	Bought this ...	5	Cable work...	1393977600	2017-03-20	2017-09-05	http://review...	Positive	null	null	null
53	Amazon	Cornet	B000068NL	David G	[0, 0]	It hums, cra...	1	I have boug...	1391904000	2017-03-20	2017-09-05	http://review...	Negative	null	null	null
54	Amazon	Cornet	B000068NL	Dr. Freud	[0, 0]	I am not har...	4	gets the job...	1370649600	2017-03-19	2017-09-05	http://review...	Positive	null	null	null
55	Amazon	Cornet	B000068NL	Dr. Marc	[0, 0]	I have found...	5	Nice cable t...	1399939200	2017-03-19	2017-09-05	http://review...	Positive	null	null	null
56	Amazon	Cornet	B000068NL	grandpa R...	[0, 0]	This is goo...	5	Well made ...	1381190400	2017-03-19	2017-09-05	http://review...	Positive	null	null	null
57	Amazon	Cornet	B000068NL	Guitarslim	[0, 0]	Pretty crapp...	5	Eh	1374710400	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
58	Amazon	Cornet	B000068NL	guitfiddlebl...	[0, 0]	I use this co...	5	great, affor...	1392163200	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
59	Amazon	Cornet	B000068NL	Hagen LeBr...	[0, 0]	This my sec...	4	Nice Cable	1397779200	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
60	Amazon	Cornet	B000068NL	Hans R	[0, 0]	Works for pr...	3	maybe not t...	1404518400	2017-06-03	2017-09-05	http://review...	Neutral	null	null	null
61	Amazon	Cornet	B000068NL	IBZANIE	[0, 0]	These cabl...	5	High quality...	1390521600	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
62	Amazon	Cornet	B000068NL	James I Va...	[0, 0]	In my opinio...	5	works as a...	1389571200	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
63	Amazon	Cornet	B000068NL	Jim R. "Pho...	[0, 0]	Hosa guitar...	5	Good cables	1343001600	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
64	Amazon	Cornet	B000068NL	Joe Averag...	[0, 0]	This produc...	5	No Complai...	1377388800	2017-06-03	2017-09-05	http://review...	Positive	null	null	null
65	Amazon	Cornet	B000068NL	Joe's Gadg...	[0, 0]	Good quali...	5	Good Quality	1373088000	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
66	Amazon	Cornet	B000068NL	Joe Toland	[0, 0]	This is a go...	5	Perfect for p...	1391385600	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
67	Amazon	Cornet	B000068NL	jschristian44	[3, 3]	This guitar ...	5	Nice high q...	1293580800	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
68	Amazon	Cornet	B000068NL	k2review	[0, 0]	Good produ...	4	Works well	1359072000	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
69	Amazon	Cornet	B000068NL	Kenwood	[0, 0]	This item is...	5	Well built ca...	1373844400	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
70	Amazon	Cornet	B000068NL	kyle c.	[0, 0]	This amp pl...	5	perfect am...	1377734400	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
71	Amazon	Cornet	B000068NL	Lee	[0, 0]	Hosa Cable...	5	Hosa Cable...	1359936000	2016-12-15	2017-09-05	http://review...	Positive	null	null	null
72	Amazon	Cornet	B000068NL	Lee	[0, 0]	...unbalanc...	3	Standard g...	1329004800	2016-12-15	2017-09-05	http://review...	Neutral	null	null	null
73	Amazon	Cornet	B000068NL	Lovesguitar	[0, 0]	This is your...	5	Hosa Electr...	1388930400	2016-12-16	2017-09-05	http://review...	Positive	null	null	null
74	Amazon	Cornet	B000068NL	Mark King	[0, 0]	Hosa cable	4	So Far So G...	1358726400	2016-12-16	2017-09-05	http://review...	Positive	null	null	null
75	Amazon	Cornet	B000068NL	Matt	[0, 1]	Its a cable...	3	average ca...	1393372800	2016-12-16	2017-09-05	http://review...	Neutral	null	null	null
76	Amazon	Cornet	B000068NL	Michael Liv...	[0, 0]	I never real...	5	Good quali...	1380844800	2016-12-16	2017-09-05	http://review...	Positive	null	null	null
77	Amazon	Cornet	B000068NL	MJK	[2, 2]	One end wa...	3	Good for th...	1371168000	2016-12-16	2017-09-05	http://review...	Neutral	null	null	null
78	Amazon	Cornet	B000068NL	M. M. Jacks...	[6, 6]	For the pric...	4	Feel a little...	1334620800	2016-12-16	2017-09-05	http://review...	Positive	null	null	null
79	Amazon	Cornet	B000068NL	Nick	[0, 0]	Hosa make...	5	Excellent	1404950400	2016-12-16	2017-09-05	http://review...	Positive	null	null	null
80	Amazon	Cornet	B000068NL	patriotsareb...	[0, 0]	Only compl...	4	Only compl...	1403913600	2016-12-15	2017-09-05	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel

Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 6. Output of Cornet

### 4.3 Galton's Whistle

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Galton's Whistle is shown in figure 7.

Mapping ID: MAPID-791cb3751cd046dc951fc1264696666

ID	Manufacturer	Types	asin	reviewerNa.	helpful	reviewText	Rating	summary	unitsReview	reviewsdate	reviewdates	reviewsour	Opinion	FIELD15	FIELD16	FIELD17
400	Amazon	Galtons Wh.	B0002CZV71	JoseAlmanya	[0, 0]	Man this is ...	5	just perfect	1340150400	2016-12-12	2017-07-03	http://review...	Positive	null	null	null
401	Amazon	Galtons Wh.	B0002CZV71	SoundSteele	[1, 2]	The Boss C...	4	Boss CS3 ...	1332374400	2016-12-12	2017-07-03	http://review...	Positive	null	null	null
402	Amazon	Galtons Wh.	B0002CZV71	StormJH1	[3, 5]	It really pain...	4	Good, but n...	1346112000	2017-03-30	2017-07-03	http://review...	Positive	null	null	null
403	Amazon	Galtons Wh.	B0002CZV71	William J. S.	[7, 8]	As a pro mu...	5	Great Unit	1315785600	2017-03-28	2017-07-03	http://review...	Positive	null	null	null
404	Amazon	Galtons Wh.	B0002CZV82	AF "Whigs"	[0, 0]	Guitarists h...	5	Does what i...	1298592000	2017-03-28	2017-07-03	http://review...	Positive	null	null	null
405	Amazon	Galtons Wh.	B0002CZV82	Charlo	[0, 1]	Think of this...	5	Solid pedal ...	1360540800	2017-03-28	2017-07-03	http://review...	Positive	null	null	null
406	Amazon	Galtons Wh.	B0002CZV82	D. Blackburn	[2, 2]	I have had t...	5	Distorts so...	1219449600	2017-03-27	2017-07-03	http://review...	Positive	null	null	null
407	Amazon	Galtons Wh.	B0002CZV82	fenderfele67	[1, 1]	This pedal i...	5	Must have	1397692800	2017-03-27	2017-07-03	http://review...	Positive	null	null	null
408	Amazon	Galtons Wh.	B0002CZV82	From Detroit	[2, 3]	This was th...	5	Classic ped...	1255737600	2017-03-27	2017-07-03	http://review...	Positive	null	null	null
409	Amazon	Galtons Wh.	B0002CZV82	James Mou...	[2, 30]	This is a ch...	1	It distorts	1258070400	2017-03-27	2017-07-03	http://review...	Negative	null	null	null
410	Amazon	Galtons Wh.	B0002CZV82	Jared Burdi...	[0, 0]	This is a di...	4	The go to di...	1313798400	2016-12-30	2017-07-03	http://review...	Positive	null	null	null
411	Amazon	Galtons Wh.	B0002CZV82	Jerry	[1, 2]	I find that i...	5	I like the so...	1375920000	2017-01-07	2017-07-03	http://review...	Positive	null	null	null
412	Amazon	Galtons Wh.	B0002CZV82	MetalFan	[0, 0]	This pedal ...	5	The classic ...	1332892800	2017-01-07	2017-07-03	http://review...	Positive	null	null	null
413	Amazon	Galtons Wh.	B0002CZV82	Otto Correct	[142, 150]	From Greg ...	2	Wish I knew...	1309392000	2017-01-07	2017-07-03	http://review...	Negative	null	null	null
414	Amazon	Galtons Wh.	B0002CZV82	Sam	[1, 4]	Here's the d...	1	Beginners ...	1329408000	2017-01-07	2017-07-03	http://review...	Negative	null	null	null
415	Amazon	Galtons Wh.	B0002CZV82	Shady Neig...	[0, 0]	This is a litt...	4	Nice pedal	1345161600	2017-01-07	2017-07-03	http://review...	Positive	null	null	null
416	Amazon	Galtons Wh.	B0002CZV82	Sherwin Ra...	[0, 0]	This is the ...	5	Boss is the ...	1332115200	2017-01-07	2017-07-03	http://review...	Positive	null	null	null
417	Amazon	Galtons Wh.	B0002CZV82	Slashaholic	[3, 4]	This pedal ...	3	The most b...	1294444800	2017-01-07	2017-07-03	http://review...	Neutral	null	null	null
418	Amazon	Galtons Wh.	B0002CZV82	StevenEddy	[0, 0]	I love these ...	5	Great pedal	1325462400	2017-01-07	2017-07-03	http://review...	Positive	null	null	null
419	Amazon	Galtons Wh.	B0002CZV82	StormJH1	[0, 0]	There's so...	4	Nostalgia...	1343174400	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
420	Amazon	Galtons Wh.	B0002CZV82	StratDude	[2, 2]	... it's a very...	3	It's been ar...	1350777600	2016-12-23	2017-07-03	http://review...	Neutral	null	null	null
421	Amazon	Galtons Wh.	B0002CZV82	StudioDude	[1, 2]	I know, I kn...	5	Truly one of...	1394755200	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
422	Amazon	Galtons Wh.	B0002CZV82	Victor	[0, 0]	This is an e...	5	Great for ol...	1292716800	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
423	Amazon	Galtons Wh.	B0002CZV82	Walter NYC	[0, 0]	First off i...	5	Great 1st P...	1324339200	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
424	Amazon	Galtons Wh.	B0002CZV82	aceofbase	[1, 2]	Good metal...	4	Good metal...	1305072000	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
425	Amazon	Galtons Wh.	B0002CZV82	Alexander V...	[0, 0]	I've had this...	4	Still the best	1265846400	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
426	Amazon	Galtons Wh.	B0002CZV82	Anon	[4, 6]	To be hone...	4	The Metal...	1314316800	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
427	Amazon	Galtons Wh.	B0002CZV82	From Detroit	[5, 5]	I have a lot...	5	Very useful...	1270857600	2016-12-24	2017-07-03	http://review...	Positive	null	null	null
428	Amazon	Galtons Wh.	B0002CZV82	H town	[3, 4]	I bought mi...	5	Great for m...	1192579200	2016-12-24	2017-07-03	http://review...	Positive	null	null	null
429	Amazon	Galtons Wh.	B0002CZV82	JA	[0, 0]	Its a great p...	5	Great	1299024000	2016-12-24	2017-07-03	http://review...	Positive	null	null	null
430	Amazon	Galtons Wh.	B0002CZV82	Josh Leger	[0, 0]	BY FAR the ...	5	BEST PEDAL...	1295273600	2016-12-23	2017-07-03	http://review...	Positive	null	null	null
431	Amazon	Galtons Wh.	B0002CZV82	MaR22 "I IG	[3, 4]	First of all	4	One of the b...	1302084800	2016-12-23	2017-07-03	http://review...	Positive	null	null	null

Test SQL Qu. (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 7. Output of Galton's Whistle

### 4.4 Music Box

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Music Box is shown in figure 8.

Mapping ID: MAPID-7f89ca91136444278ce0fc09c43907b

ID	Manufacturer	Types	asin	reviewerNa.	helpful	reviewText	Rating	summary	unitsReview	reviewsdate	reviewdates	reviewsour	Opinion	FIELD15	FIELD16	FIELD17
1275	Amazon	Music Box	B0002E1G.	EYE4GET	[0, 0]	This produc...	5	I must have ...	1317686400	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1276	Amazon	Music Box	B0002E1G.	frank arcidi...	[0, 0]	No messin...	5	Nice	1363824000	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1277	Amazon	Music Box	B0002E1G.	Fred Smith	[0, 0]	This wonder...	5	Great produ...	1368748800	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1278	Amazon	Music Box	B0002E1G.	Gregory Ma...	[0, 0]	I have had o...	5	so useful	1389139200	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1279	Amazon	Music Box	B0002E1G.	Gridley	[0, 0]	This guttan...	5	A Gem	1377993600	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1280	Amazon	Music Box	B0002E1G.	G. Thomas	[2, 4]	Not much b...	2	OK, butt	1212537600	2017-01-01	2017-05-21	http://review...	Negative	null	null	null
1281	Amazon	Music Box	B0002E1G.	Guitar Oper...	[0, 0]	Terrific All...	5	Terrific All...	1389916800	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1282	Amazon	Music Box	B0002E1G.	Gustavo Po...	[0, 0]	After years...	5	A must hav...	1388016000	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1283	Amazon	Music Box	B0002E1G.	Hagen LeBr...	[0, 0]	I've been pl...	5	The Handie...	1366416000	2017-01-03	2017-05-21	http://review...	Positive	null	null	null
1284	Amazon	Music Box	B0002E1G.	Handsome ...	[0, 0]	Not as stur...	4	Not as stur...	1297900800	2017-01-03	2017-05-21	http://review...	Positive	null	null	null
1285	Amazon	Music Box	B0002E1G.	Home in NJ	[0, 0]	It is a string...	5	Works fine	1338508800	2017-01-03	2017-05-21	http://review...	Positive	null	null	null
1286	Amazon	Music Box	B0002E1G.	Howard J. ...	[0, 0]	I have one o...	5	Put one in y...	1394064000	2017-01-03	2017-05-21	http://review...	Positive	null	null	null
1287	Amazon	Music Box	B0002E1G.	Huevos Ra...	[0, 0]	This bad bo...	5	Strange Co...	1368489600	2017-01-03	2017-05-21	http://review...	Positive	null	null	null
1288	Amazon	Music Box	B0002E1G.	jason	[0, 0]	everything y...	5	excellent	1389657600	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1289	Amazon	Music Box	B0002E1G.	J. Barrera	[0, 0]	nothing fan...	5	it works	1366156800	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1290	Amazon	Music Box	B0002E1G.	J. Edgar M...	[0, 0]	I'm not sure...	4	Capable cut...	1376524800	2017-01-02	2017-05-21	http://review...	Positive	null	null	null
1291	Amazon	Music Box	B0002E1G.	jeff h	[0, 0]	What a grea...	5	fantastic tool	1399766400	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1292	Amazon	Music Box	B0002E1G.	Jeremy D.	[0, 2]	Stripped do...	4	Well made ...	1400198400	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1293	Amazon	Music Box	B0002E1G.	Jerry Cunni...	[0, 0]	This is a pr...	4	cool	1360195200	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1294	Amazon	Music Box	B0002E1G.	Jerry Robe...	[0, 0]	Does what i...	5	Works	1402617600	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1295	Amazon	Music Box	B0002E1G.	jimmpannze...	[0, 0]	Works great...	5	Effective str...	1326844800	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1296	Amazon	Music Box	B0002E1G.	J. Kim	[1, 1]	I bought thi...	5	Excellent str...	1283731200	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1297	Amazon	Music Box	B0002E1G.	Josh Leger	[0, 0]	This tool de...	5	works wond...	1359504000	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1298	Amazon	Music Box	B0002E1G.	Joshiah Spr...	[0, 0]	A must hav...	5	Nice.	1366848000	2017-01-01	2017-05-21	http://review...	Positive	null	null	null
1299	Amazon	Music Box	B0002E1G.	J. Parks Ha...	[0, 0]	Great tool ...	5	Nice tool	1404864000	2016-12-31	2017-05-21	http://review...	Positive	null	null	null
1300	Amazon	Music Box	B0002E1G.	J. Perry Zak	[0, 0]	It cuts the st...	5	A Handy Ga...	1361318400	2016-12-31	2017-05-21	http://review...	Positive	null	null	null
1301	Amazon	Music Box	B0002E1G.	Julian	[0, 0]	Really helpf...	5	Practical	1399852800	2016-12-31	2017-05-21	http://review...	Positive	null	null	null
1302	Amazon	Music Box	B0002E1G.	Kazmier	[0, 0]	Its great for...	3	ehhhl	1403308800	2016-12-31	2017-05-21	http://review...	Neutral	null	null	null
1303	Amazon	Music Box	B0002E1G.	Kodack	[0, 0]	The wonder...	4	does the jo...	1388880000	2016-12-31	2017-05-21	http://review...	Positive	null	null	null
1304	Amazon	Music Box	B0002E1G.	L. Dustin	[0, 0]	Nice quality...	4	Winder is a...	1358035200	2016-12-31	2017-05-21	http://review...	Positive	null	null	null
1305	Amazon	Music Box	B0002E1G.	Leon2142	[0, 0]	When i bou...	5	This thing i...	1387497600	2016-12-31	2017-05-21	http://review...	Positive	null	null	null

Test SQL Qu. (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 8. Output of Music Box



#### 4.5 Organ Pipes

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Organ Pipes is shown below figure 9.

Mapping ID: MAPID-b1626158cb0041f3b2e98852c0ee9a3d

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unixReview...	reviewsdate	reviewdates...	reviewssour...	Opinion	FIELD15	FIELD16	FIELD17
510	Amazon	Organ pipes	B0002CZV...	Rick from W...	[1, 1]	It's a good b...	4	It's a capo	1399334400	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
511	Amazon	Organ pipes	B0002CZV...	SJ Holley	[0, 0]	You can nev...	5	Kyser Is Th...	1334534400	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
512	Amazon	Organ pipes	B0002CZV...	Uriah Rose	[0, 0]	I've been us...	5	One of the b...	1340150400	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
513	Amazon	Organ pipes	B0002CZV...	Victoria	[0, 2]	This is suc...	5	Couldn't As...	1399248000	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
514	Amazon	Organ pipes	B0002CZVXM	aceofbase	[0, 0]	These are t...	5	Best Strap...	1398038400	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
515	Amazon	Organ pipes	B0002CZVXM	Alexander V...	[2, 2]	In particular...	4	Probably th...	1325289600	2016-11-18...	2017-05-21...	http://review...	Positive	null	null	null
516	Amazon	Organ pipes	B0002CZVXM	Anon	[0, 0]	So I bought...	4	They work fi...	1375680800	2016-11-18...	2017-05-21...	http://review...	Positive	null	null	null
517	Amazon	Organ pipes	B0002CZVXM	aspiring sai...	[1, 1]	The screws...	4	Does NOT f...	1290038400	2016-11-18...	2017-05-21...	http://review...	Positive	null	null	null
518	Amazon	Organ pipes	B0002CZVXM	bayou bob	[0, 0]	yes, if your...	4	work fine ki...	1402448800	2016-11-18...	2017-05-21...	http://review...	Positive	null	null	null
519	Amazon	Organ pipes	B0002CZVXM	B. Hood "al...	[0, 0]	best strap l...	5	work great	1357948800	2016-11-17...	2017-05-21...	http://review...	Positive	null	null	null
520	Amazon	Organ pipes	B0002CZVXM	BigSteph66	[0, 0]	Almost drop...	5	Life saver	1361923200	2016-11-17...	2017-05-21...	http://review...	Positive	null	null	null
521	Amazon	Organ pipes	B0002CZVXM	Billbo	[2, 2]	I tried this...	4	I Prefer Sca...	1289779200	2016-11-17...	2017-05-21...	http://review...	Positive	null	null	null
522	Amazon	Organ pipes	B0002CZVXM	Bill Lewey	[0, 0]	I had to actu...	5	Work Great	1398816000	2016-11-17...	2017-05-21...	http://review...	Positive	null	null	null
523	Amazon	Organ pipes	B0002CZVXM	bman	[0, 0]	These strap...	5	Easy to inst...	1393891200	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
524	Amazon	Organ pipes	B0002CZVXM	Brian	[0, 0]	I've tried a...	5	By far the b...	1390089600	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
525	Amazon	Organ pipes	B0002CZVXM	Chris	[1, 2]	Great produ...	5	Love em	1385942400	2016-11-16...	2017-05-21...	http://review...	Positive	null	null	null
526	Amazon	Organ pipes	B0002CZVXM	Christian F...	[0, 0]	they work w...	5	Nice locks	1304467200	2016-11-15...	2017-05-21...	http://review...	Positive	null	null	null
527	Amazon	Organ pipes	B0002CZVXM	Delta Echo	[0, 0]	No complai...	5	Simple, eas...	1323734400	2016-11-15...	2017-05-21...	http://review...	Positive	null	null	null
528	Amazon	Organ pipes	B0002CZVXM	DMGenest	[4, 4]	After receiv...	4	Gibson Goo...	1301443200	2016-11-15...	2017-05-21...	http://review...	Positive	null	null	null
529	Amazon	Organ pipes	B0002CZVXM	Don B	[0, 0]	Very easy to...	5	Easy to inst...	1323216000	2016-11-14...	2017-05-21...	http://review...	Positive	null	null	null
530	Amazon	Organ pipes	B0002CZVXM	Don "On Th...	[0, 0]	This produc...	5	Want securi...	1364083200	2016-11-14...	2017-05-21...	http://review...	Positive	null	null	null
531	Amazon	Organ pipes	B0002CZVXM	D.T.	[0, 0]	I have two s...	5	Great Lock...	1395273600	2016-11-13...	2017-05-21...	http://review...	Positive	null	null	null
532	Amazon	Organ pipes	B0002CZVXM	Eric A. Rog...	[0, 0]	It's worth a...	5	An essentia...	1360886400	2016-11-13...	2017-05-21...	http://review...	Positive	null	null	null
533	Amazon	Organ pipes	B0002CZVXM	Gary G	[0, 0]	Oh Yeah, L...	5	Great Buy	1351468800	2016-11-12...	2017-05-21...	http://review...	Positive	null	null	null
534	Amazon	Organ pipes	B0002CZVXM	GeekParrot	[0, 0]	I have had t...	5	Sturdy and...	1357862400	2016-11-12...	2017-05-21...	http://review...	Positive	null	null	null
535	Amazon	Organ pipes	B0002CZVXM	Gordy Styles	[0, 0]	these dunlo...	5	save your a...	1358208000	2016-11-12...	2017-05-21...	http://review...	Positive	null	null	null
536	Amazon	Organ pipes	B0002CZVXM	GreatAPG	[0, 0]	Very high q...	5	Going to get...	1388800000	2016-11-12...	2017-05-21...	http://review...	Positive	null	null	null
537	Amazon	Organ pipes	B0002CZVXM	Hannah Ba...	[0, 0]	I've had the...	5	you should...	1383436800	2016-11-12...	2017-05-21...	http://review...	Positive	null	null	null
538	Amazon	Organ pipes	B0002CZVXM	Hittespot	[0, 0]	This is the...	5	Working Pe...	1376092800	2016-11-11...	2017-05-21...	http://review...	Positive	null	null	null
539	Amazon	Organ pipes	B0002CZVXM	HLB "HLB"	[0, 0]	What's grea...	4	Vastly Sup...	1351123200	2016-11-11...	2017-05-21...	http://review...	Positive	null	null	null
540	Amazon	Organ pipes	B0002CZVXM	IBZANE	[0, 0]	Straplocks...	4	Dont know...	1346284800	2016-11-11...	2017-05-21...	http://review...	Positive	null	null	null
541	Amazon	Organ pipes	B0002CZVXM	Jake	[0, 0]	I have never...	5	What a fant...	1392854400	2016-11-11...	2017-05-21...	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 9. Output of Organ pipes

#### 4.6 Sicks

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The figure 10 shows the output of Sicks.

Mapping ID: MAPID-9867cbe8cb842ca9ff7a3b324b1432

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unixReview...	reviewsdate	reviewdates...	reviewssour...	Opinion	FIELD15	FIELD16	FIELD17
775	Amazon	Sicks	B0002D0C...	Bob "Bob in...	[0, 0]	I've used ev...	5	Tortex Picks...	1218672000	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
776	Amazon	Sicks	B0002D0C...	bobby 12333	[0, 0]	I bought the...	5	Great Picks	1371254400	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
777	Amazon	Sicks	B0002D0C...	Brian	[0, 0]	Love these...	5	Tortex Picks	1390089600	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
778	Amazon	Sicks	B0002D0C...	Cesar Augu...	[0, 0]	I've always...	5	Great price...	1354147200	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
779	Amazon	Sicks	B0002D0C...	Chava Perez	[0, 0]	I know that...	5	Cool	1391040000	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
780	Amazon	Sicks	B0002D0C...	Chris30542	[0, 0]	I use Dunlo...	5	Just right f...	1388534400	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
781	Amazon	Sicks	B0002D0C...	Chris	[0, 0]	I've been us...	5	pick of the...	1355097600	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
782	Amazon	Sicks	B0002D0C...	David Y.	[0, 0]	Great picks...	5	Good all ro...	1388016000	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
783	Amazon	Sicks	B0002D0C...	D. Jones "T...	[1, 1]	I think Torte...	5	Great picks...	1269907200	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
784	Amazon	Sicks	B0002D0C...	D. Villella "g...	[0, 0]	I've been a...	5	My favorite...	1354838400	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
785	Amazon	Sicks	B0002D0C...	Everanor	[0, 0]	I like the pic...	5	Great!	1362700800	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
786	Amazon	Sicks	B0002D0C...	From Detroit	[1, 1]	Yes. The 1...	5	Blue Tortex...	1255737600	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
787	Amazon	Sicks	B0002D0C...	GamerBoy	[1, 1]	Whatever si...	5	My Favorite...	1347736000	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
788	Amazon	Sicks	B0002D0C...	Gordy Styles	[0, 0]	I've always...	5	great picks!	1358208000	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
789	Amazon	Sicks	B0002D0C...	Hagen LeBr...	[0, 0]	I've been pl...	2	Not the Wor...	1402358400	2017-03-17...	2017-04-03...	http://review...	Negative	null	null	null
790	Amazon	Sicks	B0002D0C...	Hannah Ba...	[0, 0]	thankfully...	5	great picks	1383436800	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
791	Amazon	Sicks	B0002D0C...	Hurley T tho...	[0, 0]	I was lookin...	5	Very sturdy...	1291075200	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
792	Amazon	Sicks	B0002D0C...	J.C.	[1, 1]	I've been us...	5	Picks	1395187200	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
793	Amazon	Sicks	B0002D0C...	Jean Hann...	[0, 0]	I love these...	5	Favorite pick	1361232000	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
794	Amazon	Sicks	B0002D0C...	Jeffrey A. H...	[0, 0]	If you don't...	5	Good Picks	1388448000	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
795	Amazon	Sicks	B0002D0C...	Joehorse	[0, 0]	Good picks...	4	Good picks...	1314316800	2017-03-17...	2017-04-03...	http://review...	Positive	null	null	null
796	Amazon	Sicks	B0002D0C...	Jon S	[0, 0]	I used to us...	5	Just about...	1379376000	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
797	Amazon	Sicks	B0002D0C...	Jorge Barb...	[0, 0]	If you thoug...	5	Quality	1351900800	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
798	Amazon	Sicks	B0002D0C...	JuanKiDaz	[0, 0]	Finally deci...	5	Great picks	1291075200	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
799	Amazon	Sicks	B0002D0C...	Kazmir	[0, 0]	I think these...	5	Always usin...	1403308800	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
800	Amazon	Sicks	B0002D0C...	Mark Burge...	[0, 0]	I've used th...	5	If you need...	1386288000	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
801	Amazon	Sicks	B0002D0C...	Mark R. Seg...	[0, 0]	In a fit of bor...	5	Still the best	1357689600	2017-03-16...	2017-04-03...	http://review...	Positive	null	null	null
802	Amazon	Sicks	B0002D0C...	M. M. Jacks...	[0, 0]	These will p...	5	Nice, servic...	1334620800	2017-03-16...	2017-03-27...	http://review...	Positive	null	null	null
803	Amazon	Sicks	B0002D0C...	Moe	[0, 0]	I like it. Grip...	5	Simply good	1358121600	2017-03-16...	2017-03-27...	http://review...	Positive	null	null	null
804	Amazon	Sicks	B0002D0C...	MojoMMJojo	[0, 0]	Tortex is gr...	5	excellent	1402099200	2017-03-15...	2017-03-27...	http://review...	Positive	null	null	null
805	Amazon	Sicks	B0002D0C...	Mr. GvThang	[0, 0]	The thicke...	5	My favorite...	1372204800	2017-03-15...	2017-03-27...	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 10. Output of Sicks

#### 4.7 Singing Tube

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The figure 11 illustrate the output of Singing Tube.

Mapping ID: MAPID-787f63c23dea4958a256261b234a76f

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unixReview...	reviewsdate	reviewdates...	reviewssour...	Opinion	FIELD15	FIELD16	FIELD17
875	Amazon	Singing tube	B0002D0C1K	Kenwood	[1, 1]	This pick is ...	4	Good for Str...	1375920000	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
876	Amazon	Singing tube	B0002D0C1K	Mrs. Smith	[0, 1]	Since they ...	3	Gator Grip?	1364428800	2017-03-15...	2017-05-21...	http://review...	Neutral	null	null	null
877	Amazon	Singing tube	B0002D0C1K	NPunk42	[0, 0]	I'm glad I tr...	4	Contextually	1363219200	2017-03-15...	2017-05-21...	http://review...	Positive	null	null	null
878	Amazon	Singing tube	B0002D0C1K	R. Heisler	[0, 0]	These have...	4	Love these ...	1389052800	2017-03-15...	2017-05-21...	http://review...	Positive	null	null	null
879	Amazon	Singing tube	B0002D0C1K	Rolf J Craven	[0, 1]	I started doi...	3	So-so	1364774400	2017-03-15...	2017-05-21...	http://review...	Neutral	null	null	null
880	Amazon	Singing tube	B0002D0C1K	Walter S. E...	[0, 0]	I've been try...	4	Worth a try	1375315200	2017-03-15...	2017-05-21...	http://review...	Positive	null	null	null
881	Amazon	Singing tube	B0002D0C1K	AF "Whigs"	[12, 12]	First, I love...	3	Good & Bad	1315440000	2017-03-15...	2017-05-21...	http://review...	Neutral	null	null	null
882	Amazon	Singing tube	B0002D0C1K	Amazon Cu...	[0, 0]	I got these ...	5	Great pick f...	1288288800	2017-03-15...	2017-05-21...	http://review...	Positive	null	null	null
883	Amazon	Singing tube	B0002D0C1K	Boiler98	[3, 4]	So, these pi...	3	These Are ...	1327104000	2017-03-15...	2017-05-21...	http://review...	Neutral	null	null	null
884	Amazon	Singing tube	B0002D0C1K	cincinnati...	[0, 0]	I always fin...	4	Very good s...	1332028800	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
885	Amazon	Singing tube	B0002D0C1K	D. Dulin "D...	[2, 3]	These pick...	5	Love these	1298505600	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
886	Amazon	Singing tube	B0002D0C1K	DMAVBASS	[1, 2]	I dont know ...	3	Stubby is ...	1338508800	2017-03-11...	2017-05-21...	http://review...	Neutral	null	null	null
887	Amazon	Singing tube	B0002D0C1K	frank arcidi	[0, 0]	Looking for ...	3	OK	1365552000	2017-03-10...	2017-05-21...	http://review...	Neutral	null	null	null
888	Amazon	Singing tube	B0002D0C1K	Frederick B...	[3, 5]	The thing a...	3	Small, Hard...	1230940800	2017-03-10...	2017-05-21...	http://review...	Neutral	null	null	null
889	Amazon	Singing tube	B0002D0C1K	Hagen LeBr...	[0, 0]	I admit I'm n...	5	Perfect Pick...	1387843200	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
890	Amazon	Singing tube	B0002D0C1K	J. Edgar M...	[3, 3]	If you're wor...	5	Thick, easy ...	1375833600	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
891	Amazon	Singing tube	B0002D0C1K	Joshua Cu...	[2, 2]	When I first ...	5	Amazing Pl...	1250640000	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
892	Amazon	Singing tube	B0002D0C1K	KP	[0, 0]	I have them ...	5	Love these!	1363132800	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
893	Amazon	Singing tube	B0002D0C1K	Marc	[2, 2]	These pick...	4	Superb gut...	1289088000	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
894	Amazon	Singing tube	B0002D0C1K	Michael W...	[0, 0]	Currently m...	5	My favorite	1393804800	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
895	Amazon	Singing tube	B0002D0C1K	Sunn Kram	[0, 0]	I first want ...	5	Wow, I'm a...	1227830400	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
896	Amazon	Singing tube	B0002D0C1K	MoJoMJojo	[1, 1]	another ite...	1	to big	1402092000	2017-03-10...	2017-05-21...	http://review...	Negative	null	null	null
897	Amazon	Singing tube	B0002D0C1K	Peter Holub	[0, 0]	The right pi...	3	Good pick n...	1373241600	2017-03-10...	2017-05-21...	http://review...	Neutral	null	null	null
898	Amazon	Singing tube	B0002D0C1K	Rock Morton	[1, 1]	I bought the...	4	Lexan Stub...	1367020800	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
899	Amazon	Singing tube	B0002D0C1K	Solaceinsor...	[0, 0]	I bought my ...	5	Make sure y...	1286812000	2017-03-10...	2017-05-21...	http://review...	Positive	null	null	null
900	Amazon	Singing tube	B0002D0C1K	Sunn Kram	[3, 4]	I've been us...	4	My Long Tl...	1319068800	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
901	Amazon	Singing tube	B0002D0C1K	trebe	[0, 0]	How a gutta...	5	this pick hel...	1377302400	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
902	Amazon	Singing tube	B0002D0C1K	Truvor	[0, 0]	Using the st...	5	Can't use a...	1381536000	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
903	Amazon	Singing tube	B0002D0C1K	Audie	[0, 0]	I use differe...	5	Dunlop Jazz...	1389979200	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
904	Amazon	Singing tube	B0002D0C1K	Brynn	[0, 0]	As a beginn...	5	Never Usin...	1357696000	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
905	Amazon	Singing tube	B0002D0C1K	Christian M...	[0, 0]	I've been pl...	5	Give em s...	1300406400	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null
906	Amazon	Singing tube	B0002D0C1K	C. B. "Cib"	[0, 0]	Real nice G...	4	Good Fun!	1384819200	2017-03-11...	2017-05-21...	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows  
Go to Settings to activate Windows.

Update Cancel

Reasoner active Show Inferences

Figure 11. Output of Singing Tube

#### 4.8 Siren Disk

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Siren Disk is shown below figure 12.

Mapping ID: MAPID-ftb420f671dc144939be838b5ceef968

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unixReview...	reviewsdate	reviewdates...	reviewssou...	Opinion	FIELD15	FIELD16	FIELD17
1014	Amazon	Siren disk	B0002D0E8S	Andrew	[1, 1]	Very good s...	5	Awesome s...	1339545600	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1015	Amazon	Siren disk	B0002D0E8S	Antidote	[0, 0]	Good stitchi...	5	Perfect for ...	1394409600	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1016	Amazon	Siren disk	B0002D0E8S	AT	[1, 1]	I needed a ...	5	Great!	1360454400	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1017	Amazon	Siren disk	B0002D0E8S	AWB	[0, 0]	A very good ...	5	I love it	1398297600	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1018	Amazon	Siren disk	B0002D0E8S	B. Hood "al...	[0, 0]	perfect size ...	5	great for us ...	1365120000	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1019	Amazon	Siren disk	B0002D0E8S	Brynn	[1, 1]	I was displ...	5	Great!	1357689600	2017-02-24...	2017-05-21...	http://review...	Positive	null	null	null
1020	Amazon	Siren disk	B0002D0E8S	D. Howard	[0, 0]	A nice simp...	5	At this price...	1387756800	2017-02-16...	2017-05-21...	http://review...	Positive	null	null	null
1021	Amazon	Siren disk	B0002D0E8S	D. Limbach...	[0, 0]	It's comfort...	4	Nothing Fa...	1376438400	2017-02-15...	2017-05-21...	http://review...	Positive	null	null	null
1022	Amazon	Siren disk	B0002D0E8S	D. Oliver	[0, 0]	For the mo...	5	Great Gutta...	1392336000	2017-02-15...	2017-05-21...	http://review...	Positive	null	null	null
1023	Amazon	Siren disk	B0002D0E8S	G. Botta	[0, 0]	I've only us...	4	Basic strap	1397520000	2017-02-15...	2017-05-21...	http://review...	Positive	null	null	null
1024	Amazon	Siren disk	B0002D0E8S	GeekParrot	[0, 0]	This is just ...	5	Simple, ea...	1357862400	2017-02-15...	2017-05-21...	http://review...	Positive	null	null	null
1025	Amazon	Siren disk	B0002D0E8S	Gordy Styles	[2, 2]	I've always ...	5	the best str...	1358208000	2017-02-14...	2017-05-21...	http://review...	Positive	null	null	null
1026	Amazon	Siren disk	B0002D0E8S	Hannah Ba...	[0, 0]	I've had this...	5	Great strap...	1383436800	2017-02-14...	2017-05-21...	http://review...	Positive	null	null	null
1027	Amazon	Siren disk	B0002D0E8S	Henry W...	[0, 0]	For at great...	5	Great Strap...	1372032000	2017-02-14...	2017-05-21...	http://review...	Positive	null	null	null
1028	Amazon	Siren disk	B0002D0E8S	ju	[1, 1]	What you s...	4	Call me the...	1353888000	2017-02-19...	2017-05-21...	http://review...	Positive	null	null	null
1029	Amazon	Siren disk	B0002D0E8S	Jerome Ve...	[0, 0]	Made of qu...	5	basic strap	1365120000	2017-02-19...	2017-05-21...	http://review...	Positive	null	null	null
1030	Amazon	Siren disk	B0002D0E8S	Jerry	[0, 0]	Great inexp...	5	Great inexp...	1390608000	2017-02-19...	2017-05-21...	http://review...	Positive	null	null	null
1031	Amazon	Siren disk	B0002D0E8S	Joehorse	[0, 0]	A very attrac...	5	Just what I...	1390780800	2017-02-19...	2017-05-21...	http://review...	Positive	null	null	null
1032	Amazon	Siren disk	B0002D0E8S	John	[0, 0]	This is a gre...	5	long and sh...	1308009600	2017-02-18...	2017-05-21...	http://review...	Positive	null	null	null
1033	Amazon	Siren disk	B0002D0E8S	Kev	[0, 0]	Great build ...	5	Awesome s...	1377216000	2017-02-18...	2017-05-21...	http://review...	Positive	null	null	null
1034	Amazon	Siren disk	B0002D0E8S	Kodack	[0, 0]	Cheaply m...	5	cheap	1385510400	2017-02-18...	2017-05-21...	http://review...	Neutral	null	null	null
1035	Amazon	Siren disk	B0002D0E8S	Kreature	[1, 2]	I really dmi...	5	A Basic Gul...	1329955200	2017-02-18...	2017-05-21...	http://review...	Positive	null	null	null
1036	Amazon	Siren disk	B0002D0E8S	Luckystray	[0, 0]	I like purpl...	5	Strap for th...	1385512000	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1037	Amazon	Siren disk	B0002D0E8S	Lyfie3891	[1, 2]	this makes ...	5	great strap	1322006400	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1038	Amazon	Siren disk	B0002D0E8S	Marlinj Bro...	[0, 0]	So sexy wtl...	5	Ernie Ball S...	1374105600	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1039	Amazon	Siren disk	B0002D0E8S	Mark A Willi...	[0, 0]	Got three of...	4	Great strap	1398643200	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1040	Amazon	Siren disk	B0002D0E8S	M. Lovela...	[0, 0]	This is a ve...	5	Ernie Ball C...	1384496000	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1041	Amazon	Siren disk	B0002D0E8S	mit	[1, 1]	Product do...	5	Great, chea...	1318896000	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1042	Amazon	Siren disk	B0002D0E8S	Paula Galla...	[1, 2]	I have both...	5	Well made...	1317081600	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1043	Amazon	Siren disk	B0002D0E8S	Queastor "...	[0, 0]	Nothing sp...	3	Nothing Sp...	1385769600	2017-02-16...	2017-05-21...	http://review...	Neutral	null	null	null
1044	Amazon	Siren disk	B0002D0E8S	Roger M. B...	[0, 0]	Finally I fou...	5	A long Strap	1372723200	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null
1045	Amazon	Siren disk	B0002D0E8S	Rojimbo	[0, 0]	the hole at t...	3	regular.	1394409600	2017-02-17...	2017-05-21...	http://review...	Neutral	null	null	null
1046	Amazon	Siren disk	B0002D0E8S	Roy Aaron...	[0, 0]	I'm sure ga...	4	Straps	1309046400	2017-02-17...	2017-05-21...	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows  
Go to Settings to activate Windows.

Update Cancel

Figure 12. Output of Siren Disk

#### 4.9 Trombone

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The figure 13 illustrate the output of Trombone.



Mapping ID: MAPID-844150ce7ba54b8293acdb11b1ff1804

ID	Manufacturer	Types	asin	reviewerName	helpful	reviewText	Rating	summary	unixReview	reviewsdate	reviewdates	reviewssour	Opinion	FIELD15	FIELD16	FIELD17
100	Amazon	Trombone	B000068NZC	tada	[0, 0]	Well made, ...	5	Recommend	1369526400	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
101	Amazon	Trombone	B000068NZG	Jason Lewis	[0, 0]	The listing f...	5	Product shi...	1371686400	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
102	Amazon	Trombone	B000068NZG	Mike Tarran...	[0, 0]	First, the re...	5	Solved a bl...	1372118400	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
103	Amazon	Trombone	B000068NZG	Rexomus T...	[0, 0]	I use this ca...	5	Good adapt...	1400716800	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
104	Amazon	Trombone	B000068NZG	Rob W. "So...	[12, 12]	This adapte...	4	Light Weigh...	1229299200	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
105	Amazon	Trombone	B000068NZG	TriggerHappy	[0, 0]	Well made, ...	4	Good const...	1356825600	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
106	Amazon	Trombone	B000068O1N	Alfredo	[0, 0]	Havent use...	4	Nice Cabies	1387929600	2017-01-06	2017-09-05	http://review...	Positive	null	null	null
107	Amazon	Trombone	B000068O1N	Emkeener	[0, 0]	Great stere...	5	Perfect	1358035200	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
108	Amazon	Trombone	B000068O1N	Capt'n Bob	[0, 0]	Another qua...	5	GOOD INS...	1384128000	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
109	Amazon	Trombone	B000068O1N	Darren ON...	[0, 0]	When I orde...	5	Excellent in...	1392595200	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
110	Amazon	Trombone	B000068O1N	David J. Hu...	[0, 0]	These are s...	5	They work g...	1373500800	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
111	Amazon	Trombone	B000068O1N	HMMWV "G...	[0, 0]	On my mixe...	5	I needed thi...	1318723200	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
112	Amazon	Trombone	B000068O1N	Lee	[0, 0]	I still operat...	5	Soundman ...	1329004800	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
113	Amazon	Trombone	B000068O1N	Markom "Ma...	[0, 0]	I use these ...	5	Good price ...	1297728000	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
114	Amazon	Trombone	B000068O1N	N. McArthur	[0, 0]	When you r...	5	Just the rig...	1381190400	2017-01-07	2017-09-05	http://review...	Positive	null	null	null
115	Amazon	Trombone	B000068O3D	Cooper the ...	[1, 1]	I play my f...	5	Use to Plug...	1385792000	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
116	Amazon	Trombone	B000068O3D	Dad	[0, 0]	plugged it i...	5	plugged it i...	1359158400	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
117	Amazon	Trombone	B000068O3D	E. Temple	[0, 0]	I bought a f...	5	Sound Engi...	1329350400	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
118	Amazon	Trombone	B000068O3D	JdoubieH	[0, 0]	I carry this i...	5	The exact c...	1368230400	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
119	Amazon	Trombone	B000068O3D	Jeffrey A. H...	[0, 0]	This is what...	4	Almost 5-St...	1346630400	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
120	Amazon	Trombone	B000068O3D	John	[2, 2]	It's hard not ...	5	It works!	1384300800	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
121	Amazon	Trombone	B000068O3D	Josh Leger	[0, 0]	Cables are ...	5	Works good...	1357257600	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
122	Amazon	Trombone	B000068O3X	Adam	[0, 0]	Picked up a...	5	Inexpensive...	1327881600	2017-01-08	2017-09-05	http://review...	Positive	null	null	null
123	Amazon	Trombone	B000068O3X	Amazon Cu...	[0, 0]	This L Jack...	4	Good	1375747200	2017-01-11	2017-09-05	http://review...	Positive	null	null	null
124	Amazon	Trombone	B000068O3X	Astraeus	[1, 1]	These little ...	4	Does the job	1369440000	2017-01-11	2017-09-05	http://review...	Positive	null	null	null
125	Amazon	Trombone	B000068O3X	AT	[0, 0]	If you need ...	5	Great pedal...	1360454400	2017-01-11	2017-09-05	http://review...	Positive	null	null	null
126	Amazon	Trombone	B000068O3X	Cheri	[0, 0]	Bought this ...	5	Great Dura...	1394828000	2017-01-10	2017-09-05	http://review...	Positive	null	null	null
127	Amazon	Trombone	B000068O3X	Chris Hayden	[0, 0]	Good little c...	5	Works great	1359504000	2017-01-10	2017-09-05	http://review...	Positive	null	null	null
128	Amazon	Trombone	B000068O3X	Dan Edman	[0, 0]	These are g...	5	Good cables	1392768000	2017-01-10	2017-09-05	http://review...	Positive	null	null	null
129	Amazon	Trombone	B000068O3X	Franklin J	[0, 0]	Works just f...	5	Works just f...	1355875200	2017-01-10	2017-09-05	http://review...	Positive	null	null	null
130	Amazon	Trombone	B000068O3X	Greg Runyo	[0, 0]	exactly what...	5	good produ...	1403913600	2017-01-10	2017-09-05	http://review...	Positive	null	null	null
131	Amazon	Trombone	B000068O3X	Nullman6	[3, 3]	These are a...	5	Good Bufo	1296172800	2017-01-23	2017-09-05	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure13. Output of Trombone

#### 4.10 Ultrasonic Receiver

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Ultrasonic Receiver is shown in figure 14.

Mapping ID: MAPID-be3de461140a4283bb54ff502ea0e0b6

ID	Manufacturer	Types	asin	reviewerName	helpful	reviewText	Rating	summary	unixReview	reviewsdate	reviewdates	reviewssour	Opinion	FIELD15	FIELD16	FIELD17
1175	Amazon	Ultrasonic ...	B0002DV6...	RON IN US...	[0, 0]	I don't like L...	2	I do not like...	1402704000	2017-02-03	2017-05-21	http://review...	Negative	null	null	null
1176	Amazon	Ultrasonic ...	B0002DV6...	the goat	[1, 1]	put them on...	4	okay	1364428800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1177	Amazon	Ultrasonic ...	B0002DV7U2	airchamp "a...	[0, 0]	I purchased...	5	inexpensive...	1401148800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1178	Amazon	Ultrasonic ...	B0002DV7U2	almost I	[2, 3]	I have owne...	3	Good for wh...	1315563200	2017-02-03	2017-05-21	http://review...	Neutral	null	null	null
1179	Amazon	Ultrasonic ...	B0002DV7U2	Andrew	[0, 0]	It is not the...	2	Choose so...	1339545600	2017-02-03	2017-05-21	http://review...	Negative	null	null	null
1180	Amazon	Ultrasonic ...	B0002DV7U2	Clam Canoe	[0, 1]	Total flimsy...	1	Terrible. I w...	1386547200	2017-02-03	2017-05-21	http://review...	Negative	null	null	null
1181	Amazon	Ultrasonic ...	B0002DV7U2	David Span...	[2, 2]	Excellent co...	5	Fender Mini...	1299369600	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1182	Amazon	Ultrasonic ...	B0002DV7U2	Joe Morris	[1, 1]	I love these...	5	Cool, but us...	1374192000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1183	Amazon	Ultrasonic ...	B0002DV7U2	Jr Fentress	[0, 0]	This stand i...	5	Great electri...	1391040000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1184	Amazon	Ultrasonic ...	B0002DV7U2	jsnchmpn	[1, 2]	...for somet...	1	Great Mount!	1389225600	2017-02-03	2017-05-21	http://review...	Negative	null	null	null
1185	Amazon	Ultrasonic ...	B0002DV7U2	Kevin "K"	[0, 0]	I needed a...	5	Great stand...	1365206400	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1186	Amazon	Ultrasonic ...	B0002DV7U2	Michael Hal...	[0, 0]	Fender cam...	4	Standup for...	1358121600	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1187	Amazon	Ultrasonic ...	B0002DV7U2	Rick	[0, 0]	I needed so...	5	Perfect.	1397608400	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1188	Amazon	Ultrasonic ...	B0002DV7U2	Rick "Rick A...	[0, 0]	This stand...	5	Good for Fe...	1334880000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1189	Amazon	Ultrasonic ...	B0002DV7U2	Robert D. H...	[15, 16]	The fender...	5	Good stand...	1334448000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1190	Amazon	Ultrasonic ...	B0002DV7U2	W. Perry	[0, 0]	I've bought...	5	Gotta have L...	1394928000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1191	Amazon	Ultrasonic ...	B0002DV7U2	YeAnother...	[3, 3]	I have two o...	5	works great...	1319500800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1192	Amazon	Ultrasonic ...	B0002DV7ZM	Amazon Cu...	[0, 0]	This fender...	5	Fender Mini...	1382659200	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1193	Amazon	Ultrasonic ...	B0002DV7ZM	Cabbott	[0, 0]	Easy to pac...	5	Amazing val...	1398988800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1194	Amazon	Ultrasonic ...	B0002DV7ZM	Calvin Young	[0, 0]	It holds all...	5	simple and...	1325289600	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1195	Amazon	Ultrasonic ...	B0002DV7ZM	Chris	[0, 0]	this thing is...	5	yup yup	1382076800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1196	Amazon	Ultrasonic ...	B0002DV7ZM	Danyl J. Hea...	[0, 0]	This stand...	5	Fender onc...	1384300800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1197	Amazon	Ultrasonic ...	B0002DV7ZM	David Burch	[0, 0]	This is an g...	4	Pretty good...	1329523200	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1198	Amazon	Ultrasonic ...	B0002DV7ZM	DELOS DU...	[0, 0]	Small light...	5	There are...	1362280000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1199	Amazon	Ultrasonic ...	B0002DV7ZM	DNCB "First...	[0, 0]	It is so sma...	5	Oh I love thi...	1352419200	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1200	Amazon	Ultrasonic ...	B0002DV7ZM	Dr. Freud	[0, 0]	this little st...	5	great little st...	1344556800	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1201	Amazon	Ultrasonic ...	B0002DV7ZM	Ell Bee "Lin"	[2, 2]	Not your av...	4	Unobtrusive	1364656000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1202	Amazon	Ultrasonic ...	B0002DV7ZM	E. Reyes "C...	[12, 13]	I have 7 of...	5	Great stand...	1345766400	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1203	Amazon	Ultrasonic ...	B0002DV7ZM	GregoryEEEE	[0, 0]	Inexpensive...	5	Great produ...	1343952000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1204	Amazon	Ultrasonic ...	B0002DV7ZM	GunHawk	[0, 0]	I've got thre...	5	This makes...	1375920000	2017-02-03	2017-05-21	http://review...	Positive	null	null	null
1205	Amazon	Ultrasonic ...	B0002DV7ZM	Jai	[0, 0]	I like the siz...	4	GOOD MINI	1384646400	2017-02-03	2017-05-21	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows Update Cancel  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 14. Output of Ultrasonic Receiver

#### 4.11 Ultrasonic Xylophone

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The Output of Ultrasonic Xylophone is shown in figure 15.

Mapping ID: MAPID-bba2f8c6fa7546f8afe688059159c8c9

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unireview...	reviewsdate	reviewdates...	reviewssou...	Opinion	FIELD15	FIELD16	FIELD17
675	Amazon	Ultrasonic X...	B0002D01K4	fean0evil	[0, 0]	Its a tight fit...	5	Tight Fit	1377388800	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
676	Amazon	Ultrasonic X...	B0002D01K4	idgut	[0, 0]	Very nice ca...	5	Love it	1384409600	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
677	Amazon	Ultrasonic X...	B0002D01K4	Javier Fern...	[3, 3]	Hello, I bou...	5	WHAT YOU	1282198400	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
678	Amazon	Ultrasonic X...	B0002D01K4	jayustin	[0, 0]	this case is...	5	best home f...	1383896000	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
679	Amazon	Ultrasonic X...	B0002D01K4	Keane O'Ke...	[5, 5]	The case is...	5	Very nice ca...	1294876800	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
680	Amazon	Ultrasonic X...	B0002D01K4	Laytonium	[0, 0]	I use this fo...	5	Awesome...	1390435200	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
681	Amazon	Ultrasonic X...	B0002D01K4	Matl	[0, 0]	An affordabl...	5	Works for m...	1383609600	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
682	Amazon	Ultrasonic X...	B0002D01K4	Mike Diamo...	[0, 0]	I bought the...	5	Perfect cas...	1388643200	2017-04-14	2017-05-21	http://review...	Positive	null	null	null
683	Amazon	Ultrasonic X...	B0002D01K4	MK Hill 'MK	[0, 0]	I do some g...	4	Epiphone c...	1388211200	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
684	Amazon	Ultrasonic X...	B0002D01K4	SuperGlide	[1, 1]	I could not b...	5	Wow!	1389139200	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
685	Amazon	Ultrasonic X...	B0002D01K4	W. Perry	[0, 0]	I'm not muc...	5	Great budg...	1394928000	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
686	Amazon	Ultrasonic X...	B0002D01...	B. T. Cornet...	[0, 0]	Ordered on...	5	Nice outer c...	1339718400	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
687	Amazon	Ultrasonic X...	B0002D01...	Dan	[0, 0]	If you're lo...	5	Very nice!	1388793600	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
688	Amazon	Ultrasonic X...	B0002D01...	Jared Burdi...	[4, 9]	As the title...	5	Bare Minim...	1309046400	2017-04-07	2017-05-21	http://review...	Negative	null	null	null
689	Amazon	Ultrasonic X...	B0002D01...	J. Perry 'Zak'	[1, 1]	This house...	5	Does the job	1360972800	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
690	Amazon	Ultrasonic X...	B0002D01...	Kim K.	[0, 0]	This bag...	5	Great Gigbag	1369353600	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
691	Amazon	Ultrasonic X...	B0002D01...	kodiakcowb...	[0, 0]	This bag fit...	5	Fits Epipho...	1383177600	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
692	Amazon	Ultrasonic X...	B0002D01...	Mimi Pham	[0, 0]	Good qualit...	4	Fit my Epip...	1388188800	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
693	Amazon	Ultrasonic X...	B0002D01...	Randy V. Br...	[1, 1]	This gigbag...	3	Provides So...	1389744000	2017-04-07	2017-05-21	http://review...	Neutral	null	null	null
694	Amazon	Ultrasonic X...	B0002D01...	RS17	[8, 8]	At \$20, L...	4	More for Les	1308009600	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
695	Amazon	Ultrasonic X...	B0002D01PY	Christopher...	[0, 0]	Rugged, ro...	5	Best money	1358640000	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
696	Amazon	Ultrasonic X...	B0002D01PY	Ecadad	[0, 0]	I got this for...	5	Does what I...	1340582400	2017-04-07	2017-05-21	http://review...	Positive	null	null	null
697	Amazon	Ultrasonic X...	B0002D01PY	Julian	[0, 2]	I got this for...	1	Got this for...	1376006400	2017-04-01	2017-04-05	http://review...	Negative	null	null	null
698	Amazon	Ultrasonic X...	B0002D01PY	Julian	[0, 0]	No problem...	5	Good	1399852800	2017-04-07	2017-04-05	http://review...	Positive	null	null	null
699	Amazon	Ultrasonic X...	B0002D01PY	kenb	[1, 1]	I'm using thi...	5	It works	1372982400	2017-04-07	2017-04-05	http://review...	Positive	null	null	null
700	Amazon	Ultrasonic X...	B0002D01PY	Lip Davis	[0, 0]	I could not b...	5	I bought thi...	1354233600	2017-04-06	2017-04-05	http://review...	Positive	null	null	null
701	Amazon	Ultrasonic X...	B0002D01PY	The Picker	[0, 0]	nuff said wo...	5	have a bunc...	1363392000	2017-04-05	2017-04-05	http://review...	Positive	null	null	null
702	Amazon	Ultrasonic X...	B0002D02UJ	Autumn	[23, 26]	Summary fo...	5	This will mo...	1376006400	2017-04-01	2017-04-05	http://review...	Positive	null	null	null
703	Amazon	Ultrasonic X...	B0002D02UJ	Charles For...	[1, 1]	First off, let...	5	Absolutely an...	1386979200	2017-04-01	2017-04-05	http://review...	Positive	null	null	null
704	Amazon	Ultrasonic X...	B0002D02UJ	Fletcher Ch...	[2, 2]	This is NOT...	4	This review	1397779200	2017-04-01	2017-04-05	http://review...	Positive	null	null	null
705	Amazon	Ultrasonic X...	B0002D02UJ	Linda S. Fre...	[1, 1]	It is my son...	5	Great Guitar!	1374537600	2017-04-01	2017-04-05	http://review...	Positive	null	null	null
706	Amazon	Ultrasonic X...	B0002D02UJ	naul dav	[28, 29]	this thing ni...	5	WOW!!!!!!	1291852800	2017-04-01	2017-04-03	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 15. Ultrasonic Xylophone

#### 4.12 Xylophone

After developing Ontology in Protégé, we created mapping, applied inference based semantic rules and got the results from Reasoner to distinguish between positive and negative reviews. The figure 16 shows the Output of Xylophone.

Mapping ID: MAPID-1d90d6b55fe4813b8d2e15cea23a1fd

ID	Manufacturer	Types	asin	reviewerNa...	helpful	reviewText	Rating	summary	unireview...	reviewsdate	reviewdates...	reviewssou...	Opinion	FIELD15	FIELD16	FIELD17
200	Amazon	Xylophone	B0000AQR...	Lee	[0, 1]	I use this to ...	4	The old sta...	135064800	2016-12-23	2017-09-05	http://review...	Positive	null	null	null
201	Amazon	Xylophone	B0000AQR...	Rob W. "So...	[9, 10]	Considerin...	4	One Half Of...	1229126400	2016-12-23	2017-09-05	http://review...	Positive	null	null	null
202	Amazon	Xylophone	B0000AQR...	Steve	[0, 0]	I use this fo...	5	The standard	1381276800	2016-12-23	2017-09-05	http://review...	Positive	null	null	null
203	Amazon	Xylophone	B0000AQR...	T	[0, 0]	This mic is ...	4	good mic	1365811200	2016-12-27	2017-09-05	http://review...	Positive	null	null	null
204	Amazon	Xylophone	B0000AQR...	A. Garza "A...	[0, 0]	I bought thi...	5	This Shure i...	1389312000	2016-12-27	2017-09-05	http://review...	Positive	null	null	null
205	Amazon	Xylophone	B0000AQR...	Charles F.	[0, 0]	these are m...	5	Shure	1374537600	2016-12-27	2017-09-05	http://review...	Positive	null	null	null
206	Amazon	Xylophone	B0000AQR...	Clayton A. C...	[0, 0]	The industr...	5	Industry sta...	1387152000	2016-12-27	2017-09-05	http://review...	Positive	null	null	null
207	Amazon	Xylophone	B0000AQR...	Dalts	[3, 4]	It is not a ba...	4	Good produ...	1327795200	2016-12-27	2017-09-05	http://review...	Positive	null	null	null
208	Amazon	Xylophone	B0000AQR...	dashreeve	[2, 2]	How do you...	4	standard	1325808000	2016-12-26	2017-09-05	http://review...	Positive	null	null	null
209	Amazon	Xylophone	B0000AQR...	David L. Va...	[246, 259]	The first rul...	4	Good for vo...	1147737600	2016-12-26	2017-09-05	http://review...	Positive	null	null	null
210	Amazon	Xylophone	B0000AQR...	Federico Pa...	[0, 0]	legendary p...	5	very very sat...	1402368400	2016-12-26	2017-09-05	http://review...	Positive	null	null	null
211	Amazon	Xylophone	B0000AQR...	Humbrecht	[0, 0]	Great all ar...	5	Great all-ar...	1360022400	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
212	Amazon	Xylophone	B0000AQR...	Javier Fern...	[1, 1]	I've just got t...	5	Great produ...	1309910400	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
213	Amazon	Xylophone	B0000AQR...	Jazzgryl52	[1, 1]	no complai...	5	jazzgryl52	1379116800	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
214	Amazon	Xylophone	B0000AQR...	Joyfulsinger	[0, 0]	Anice additi...	5	Quality at a...	1356393600	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
215	Amazon	Xylophone	B0000AQR...	Lee	[0, 0]	This mic wo...	4	Good all ar...	1350604800	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
216	Amazon	Xylophone	B0000AQR...	Li "Amazon..."	[0, 0]	I bought two...	4	Good	1396596000	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
217	Amazon	Xylophone	B0000AQR...	Rob W. "So...	[5, 5]	In the immo...	4	Takes A Lic...	1229126400	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
218	Amazon	Xylophone	B0000AQR...	Samuel Chell	[19, 21]	I made the...	5	A Shure Bet...	1245110400	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
219	Amazon	Xylophone	B0000AQR...	Stabon	[0, 0]	There are pl...	4	Industry Sta...	1379203200	2016-12-31	2017-09-05	http://review...	Positive	null	null	null
220	Amazon	Xylophone	B0000AQR...	T	[0, 0]	The mic is ...	4	good mic	1365811200	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
221	Amazon	Xylophone	B000165D...	aceofbase	[1, 1]	This is a we...	5	Good value	1305072000	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
222	Amazon	Xylophone	B000165D...	Bobby W.	[0, 0]	Didn't know...	5	Good cable	1303257600	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
223	Amazon	Xylophone	B000165D...	C.E. "Frank"	[0, 0]	I use this ca...	4	Works as it ...	1321574400	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
224	Amazon	Xylophone	B000165D...	Dalts	[0, 0]	Received it...	1	DIED after 4...	1359244800	2016-12-30	2017-09-05	http://review...	Negative	null	null	null
225	Amazon	Xylophone	B000165D...	Dan Edman	[0, 0]	These thing...	1	Crap	1392768000	2016-12-30	2017-09-05	http://review...	Negative	null	null	null
226	Amazon	Xylophone	B000165D...	David G	[0, 0]	Pay a coupl...	4	Does the jo...	1391904000	2016-12-30	2017-09-05	http://review...	Positive	null	null	null
227	Amazon	Xylophone	B000165D...	HMMWV "C...	[4, 6]	Everyone d...	5	This gets 5 ...	1272326400	2017-01-03	2017-09-05	http://review...	Positive	null	null	null
228	Amazon	Xylophone	B000165D...	James Dul...	[0, 0]	This is a gr...	5	Very Satisfi...	1395100800	2017-01-03	2017-09-05	http://review...	Positive	null	null	null
229	Amazon	Xylophone	B000165D...	John Doe	[0, 0]	The product...	4	Feels chea...	1290212000	2017-01-03	2017-09-05	http://review...	Positive	null	null	null
230	Amazon	Xylophone	B000165D...	Jon F	[0, 0]	I bought a p...	5	It Works	1362096000	2017-01-03	2017-09-05	http://review...	Positive	null	null	null
231	Amazon	Xylophone	B000165D...	I Rannort	[0, 0]	This was o...	4	Great produ...	1360281600	2017-01-03	2017-09-05	http://review...	Positive	null	null	null

Test SQL Qu... (100 rows)

Activate Windows  
Go to Settings to activate Windows.

Reasoner active Show Inferences

Figure 16. Output of Xylophone

### 5. CONCLUSION AND FUTURE WORK

As time passes, product reviews given by different people change. These variations might be due to different reasons like change in user requirements, improvement in product quality, market trend and evolution of technology. This research is focused to make automatic product reputation model to compute dynamic rating. Our Proposed model has different layers such as sentiment layer and semantic layer. Reviews are collected from internet such as

amazon, then features are extracted from those reviews. Sentiment analysis is applied in the base of these features. In second layer, we use semantic knowledge to infer new knowledge for scaling past ratings. We have developed an ontology by using protégé tool. An inference based semantic rules for Dynamic product reputation are defined and query generation has been done using SPARQL query to validate results. We have developed automatic product reputation model to compute dynamic

(changing) rating of product. We performed sentiment analysis manually. In future, work can be done to fully automate the sentiment analysis by coding in java.

## REFERENCES

- Nithish, R., Sabarish, S., Kishen, M. N., Abirami, A. M., & Askarunisa, A. (2013, December). An Ontology based Sentiment Analysis for mobile products using tweets. In 2013 Fifth International Conference on Advanced Computing (ICoAC) (pp. 342-347). IEEE.
- Alfrjani, R.: A new approach to ontology-based semantic modelling for opinion mining. In: 2016 im-AMSS 18th International Conference on Computer Modelling and Simulation
- Zehra, S., Wasi, S., Jami, I., Nazir, A., Khan, A., Waheed, N.: Ontology-based sentiment analysis model for recommendation systems. In: Proceedings of the 9th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (KEOD 2017), pp. 155-160.
- Schouten, K., Frasincar, F.: Survey on aspect-level sentiment analysis. IEEE Trans. Knowledge Data Eng. 28(3), 813-830 (2016)
- Ali, F., Kwak, D., Khan, P., Riazul Islam, S.M., Kim, K.H., Kwak, K.S.: Fuzzy ontology-based sentiment analysis of transportation and city feature reviews for safe traveling. JO-Transp. Res. Part C: Emerg. Technol. <https://doi.org/10.1016/j.trc.2017.01.014>
- Pang, B., Lee, L.: Opinion mining and sentiment analysis (Foundations and Trends (R) in Information Retrieval) (2008)
- Liu, B.: Sentiment analysis and opinion mining. Synth. Lect. Hum. Lang. Technol. 5(1), 1-167012)
- H.-K. Oh, S.-W. Kim, S. Park, M. Zhou, Can you trust online ratings? a mutual reinforcement model for trustworthy online rating systems, IEEE Transactions on Systems, Man, and Cybernetics: Systems 45 (12) (2015) 1564-1576.
- L. Xiong, L. Liu, Peertrust: Supporting reputation-based trust for peer-to-peer electronic communities, Knowledge and Data Engineering, IEEE Transactions on 16 (7) (2004) 843-857.
- Garcin, F., Faltings, B., Jurca, R., 2009a. Aggregating reputation feedback. In: Proceedings of the First International Conference on Reputation: Theory and Technology-ICORE. Vol. 9. p. 63.
- Hu, M., Liu, B., 2004. Mining and summarizing customer reviews. In: Proceedings of the tenth ACM SIGKDD international conference on Knowledge discovery and data mining. ACM, pp. 168-177.
- Abdel-Hafez, A., Xu, Y., Tjondronegoro, D., 2012. Product reputation model: An opinion mining based approach. In: SDAD 2012 The 1st International Workshop on Sentiment Discovery from Affective Data. p. 16.
- Farooq, U., Nongaillard, A., Ouzrout, Y., & Qadir, M. A. (2016). A multi source product reputation model. Computers in Industry, 83, 55-67.
- Bandari, S., & Bulusu, V. V. (2020). Survey on ontology-based sentiment analysis of customer reviews for products and services. In Data Engineering and Communication Technology (pp. 91-101). Springer, Singapore.
- “SWRL: A Semantic Web Rule Language Combining OWL and RuleML.” [Online]. Available: <https://www.w3.org/Submission/SWRL/>. [Accessed: 06-Feb-2020].
- R. M. Tong, An operational system for detecting and tracking opinions in on-line discussion, in: Working Notes of the ACM SIGIR 2001 Workshop on Operational Text Classification, Vol. 1, 2001, p. 6.
- M. Taboada, J. Brooke, M. Tofiloski, K. Voll, M. Stede, Lexicon-based methods for sentiment analysis, Computational linguistics 37 (2) (2011) 267-307.
- S. Dasgupta, V. Ng, Mine the easy, classify the hard: a semi-supervised approach to automatic sentiment classification, in: Proceedings of the Joint Conference of the 47th Annual Meeting of the ACL and the 4<sup>th</sup> International Joint Conference on Natural Language Processing of



- the AFNLP: Volume 2-Volume 2, Association for Computational Linguistics, 2009, pp. 701-709.
- B. Pang, L. Lee, S. Vaithyanathan, Thumbs up?: sentiment classification using machine learning techniques, in: Proceedings of the ACL-02 conference on Empirical methods in natural language processing-Volume 10, Association for Computational Linguistics, 2002, pp. 79-86.
- Joshi, N. S., & Iktat, S. A. (2014). A survey on feature level sentiment analysis. *International Journal of Computer Science and Information Technologies*, 5(4), 5422-5425.
- Javeed, M. U., Shafqat Maria Aslam, Hafiza Ayesha Sadiqa, Ali Raza, Muhammad Munawar Iqbal, & Misbah Akram. (2025). Phishing Website URL Detection Using a Hybrid Machine Learning Approach. *Journal of Computing & Biomedical Informatics*. Retrieved from <https://jcibi.org/index.php/Main/article/view/989>
- M.U. Javeed, M. S. Ali, A. Iqbal, M. Azhar, S. M. Aslam and I. Shabbir, "Transforming Heart Disease Detection with BERT: Novel Architectures and Fine-Tuning Techniques," 2024 International Conference on Frontiers of Information Technology (FIT), Islamabad, Pakistan, 2024, pp. 1-6, doi: 10.1109/FIT63703.2024.10838424
- Javeed, M., Aslam, S., Farhan, M., Aslam, M., & Khan, M. (2023). An Enhanced Predictive Model for Heart Disease Diagnoses Using Machine Learning Algorithms. *Technical Journal*, 28(04), 64-73. Retrieved from <https://tj.uettaxila.edu.pk/index.php/technical-journal/article/view/1828>
- Aslam, S., Usman Javeed, M. ., Maria Aslam, S. ., Iqbal, M. M., Ahmad, H. ., & Tariq, A. . (2025). Personality Prediction of the Users Based on Tweets through Machine Learning Techniques. *Journal of Computing & Biomedical Informatics*, 8(02). Retrieved from <https://www.jcibi.org/index.php/Main/article/view/796>
- Javeed, M. U., Shafqat Maria Aslam, Hafiza Ayesha Sadiqa, Ali Raza, Muhammad Munawar Iqbal, & Misbah Akram. (2025). Phishing Website URL Detection Using a Hybrid Machine Learning Approach. *Journal of Computing & Biomedical Informatics*, 9(01). Retrieved from <https://jcibi.org/index.php/Main/article/view/989>
- Muhammad Usman Javeed, Hafiza Ayesha Sadiqa, Mahrugh Jaffar, Shafqat Maria Aslam, Muhammad Khadim Hussain, Zeeshan Raza, & Muhammad Azhar. (2025). A DEEP LEARNING APPROACH FOR SECURING IOT SYSTEMS WITH CNN-BASED PREDICTION OF WORST-CASE RESPONSE TIME. *Spectrum of Engineering Sciences*, 3(7), 376-385. Retrieved from <https://www.sesjournal.com/index.php/1/article/view/599>
- Shakeel, H. ., Akram, M. ., Javeed, M. U., Azhar, M. ., Aslam, S. M. ., Saifullah, & Mumtaz, M. T. . (2025). LncRNAs Disease: A text mining Approach to Find the role of lncRNA in Aging. *Journal of Computing & Biomedical Informatics*, 9(01). Retrieved from <https://www.jcibi.org/index.php/Main/article/view/1000>
- P. Chiranjeevi, D. T. Santosh, and B. Vishnuvardhan, Survey on sentiment analysis methods for reputation evaluation. In *cognitive informatics and aoft computing*. Singapore: Springer, 2019
- B. Pang, L. Lee, S. Vaithyanathan, Thumbs up?: sentiment classification using machine learning 6. techniques, in: Proceedings of the ACL-02 conference on Empirical methods in natural language processing-Volume 10, Association for Computational Linguistics, 2002, pp. 79-86.
- A. Finn, N. Kushmerick, B. Smyth, Genre classification and domain transfer for information filtering, in: *Advances in information retrieval*, Springer, 2002, pp. 353-362
- K. Dave, S. Lawrence, D. M. Pennock, Mining the peanut gallery: Opinion extraction and semantic classification of product reviews, in: *Proceedings of the 12th international conference on World Wide Web*, ACM, 2003, pp. 519-528.
- J. Lee, J. C. Oh, A node-centric reputation computation algorithm on online social networks, in: *Applications of Social Media and*

- Social Network Analysis, Springer, 2015, pp. 1-22.
- A. Jsang, R. Ismail, The beta reputation system, in: Proceedings of the 15th bled electronic commerce conference, 2002, pp. 41-55
- Ayday, E., Lee, H., Fekri, F.: An Iterative Algorithm For Trust And Reputation Management. Proceedings of the International Symposium on Information Theory, pp. 2051-2055. IEEE. (2009)
- A. A. Selcuk, E. Uzun, M. R. Pariente, A reputation-based trust management system for p2p networks, in: Cluster Computing and the Grid, 2004. CCGrid 2004. IEEE International Symposium on, IEEE, 2004, pp. 251-258.
- Jøsang, A. and Haller, J.: Dirichlet Reputation Systems. Proceedings of the Second International Conference on Availability, Reliability and Security, pp. 112-119. IEEE. (2007).
- Riggs, T., Wilensky, R.: An Algorithm For Automated Rating Of Reviewers. Proceedings of the First ACM/IEEE-CS joint conference on Digital libraries, pp. 381-387. ACM.. (2001)
- Lauw, H. W., Lim, E. P., Wang, K.: Quality and Leniency in Online Collaborative Rating Systems. ACM Transactions on the Web (TWEB), 6(1), 4. (2012).
- Sabater, J., Sierra, C.: Reputation And Social Network Analysis In Multi-Agent Systems. in Proceedings of the first international joint conference on Autonomous agents and multiagent systems. pp. 475-482. (2002).
- Farooq, U., Nongaillard, A., Ouzrout, Y., & Qadir, M. A. (2016). A multi source product reputation model. Computers in Industry, 83, 55-67.
- Kontopoulos, E., Berberidis, C., Dergiades, T., & Bassiliades, N. (2013). Ontology-based sentiment analysis of twitter posts. Expert systems with applications, 40(10), 4065-4074.
- Bandari, S., & Bulusu, V. V. (2020). Survey on ontology-based sentiment analysis of customer reviews for products and services. In Data Engineering and Communication Technology (pp. 91-101). Springer, Singapore.
- Ali, F., Kwak, D., Khan, P., Islam, S. R., Kim, K. H., & Kwak, K. S. (2017). Fuzzy ontology-based sentiment analysis of transportation and city feature reviews for safe traveling. Transportation Research Part C: Emerging Technologies, 77, 33-48.
- Nithish, R., Sabarish, S., Kishen, M. N., Abirami, A. M., & Askarunisa, A. (2013, December). An Ontology based Sentiment Analysis for mobile products using tweets. In 2013 Fifth International Conference on Advanced Computing (ICoAC) (pp. 342-347). IEEE.
- Sam, K. M., & Chatwin, C. (2015). Ontology-based sentiment analysis model of customer reviews for electronic products. In Encyclopedia of Information Science and Technology, Third Edition (pp. 892-904). IGI Global.
- Kumar, A., & Joshi, A. (2017). Ontology driven sentiment analysis on social web for government intelligence. In Proceedings of the Special Collection on eGovernment Innovations in India (pp. 134-139)
- Zehra, S., Wasi, S., Jami, S. I., Nazir, A., Khan, A., & Waheed, N. (2017, November). Ontology-based Sentiment Analysis Model for Recommendation Systems. In KEOD (pp. 155-160).
- Ali, M. M., Doumbouya, M. B., Louge, T., Rai, R., & Karray, M. H. (2020). Ontology-based approach to extract product's design features from online customers' reviews. Computers in Industry, 116, 103175.
- Yergesh, B., Bekmanova, G., Sharipbay, A., & Yergesh, M. (2017, July). Ontology-based sentiment analysis of kazakh sentences. In International Conference on Computational Science and Its Applications (pp. 669-677). Springer, Cham.
- Marstawi, A., Sharef, N. M., Aris, T. N. M., & Mustapha, A. (2017, January). Ontology-based aspect extraction for an improved sentiment analysis in summarization of product reviews. In Proceedings of the 8th International Conference on Computer Modeling and Simulation (pp. 100-104)
- Nagano, S., Inaba, M., Mizoguchi, Y., Iida, T., & Kawamura, T. (2008, August). Ontology-based topic extraction service from weblogs. In 2008 IEEE International Conference on Semantic Computing (pp. 468-475). IEEE.



- Abdel-Hafez, A., & Xu, Y. (2013, November). Ontology-based product's reputation model. In 2013 IEEE/WIC/ACM International Joint Conferences on Web Intelligence (WI) and Intelligent Agent Technologies (IAT) (Vol. 3, pp. 37-40). IEEE.
- Abaalkhail, R., Alzamzami, F., Aloufi, S., Alharthi, R., & El Saddik, A. (2018, August). Affectional ontology and multimedia dataset for sentiment analysis. In International Conference on Smart Multimedia (pp. 15-28). Springer, Cham.
- Singh, W. (2017, March). Sentiment analysis of online mobile reviews. In 2017 International Conference on Inventive Communication and Computational Technologies (ICICCT) (pp. 20-25). IEEE.
- Polsawat, T., Arch-int, N., Arch-int, S., & Pattanachak, A. (2018, June). Sentiment Analysis Process for Product's Customer Reviews Using Ontology-Based Approach. In 2018 International Conference on System Science and Engineering (ICSSE) (pp. 1-6). IEEE.
- CHANNA, N., KEERIO, A., & PATHAN, K. (2014). SEMANTIC AND ONTOLOGY BASED METHODS FOR CONSTRUCTING PRODUCT KNOWLEDGE IN OWL. S. Sindh University Research Journal-SURJ (Science Series), 46(4).
- Ali, F., Kwak, D., Khan, P., El-Sappagh, S., Ali, A., Ullah, S., ... & Kwak, K. S. (2019). Transportation sentiment analysis using word embedding and ontology-based topic modeling. Knowledge-Based Systems, 174, 27-42.
- Hou, Y., Li, J., He, Z., Yan, A., Chen, X., & McAuley, J. (2024, March 6). Bridging Language and Items for Retrieval and Recommendation (introducing AmazonReviews2023 dataset). arXiv. Available at GitHub.

