

Sentiment Analysis of Amazon Product Reviews using Machine Learning

K. Ashok Kumar, Research Scholar, Veltech Rangarajan Dr.Sagunthala,R&D Institute of Science and Technology, Avadi, Chennai.

C. Jagadeesh, Asst. Professor, Department of ECE, AVN Institute of Engineering and Technology, Hyderabad.

Pravin Kshirsagar, Professor and Head, Department of ECE, AVN Institute of Engineering and Technology, Hyderabad.

Swagat. M. Marve, Assistant Professor, Department on E&TC FabTech College of Engineering and Research Sangola

Article Info

Volume 82

Page Number: 5245 - 5254

Publication Issue:

January-February 2020

Abstract:

The web could be a giant virtual house whereby to precise and share individual evaluations, influencing something of life, with implications for advertising and voice communication alike. Social media area unit influencing clients' potentialities by the approach of shaping their attitudes and behaviors. Chase the social media activities could be a great way to live customers' loyalty, retentive a tune on their sentiment towards brands or merchandise. Social media area unit the subsequent logical advertising space. Currently, Facebook dominates the virtual advertising and promoting space, followed fastidiously by twitter. this paper describes a sentiment analysis examine finished on over one thousand FB posts concerning newscasts, examination the sentiment for rai - the Italian public broadcasting service - toward the rising and a lot of dynamic private organization la7. this incorporates a investigate maps investigate results with observations created by approach of the Observatories di Pavia, that is associate degree Italian institute of analysis specialized in media analysis at the theoretical and empirical level, engaged within the analysis of political voice communication within the mass media. this examine takes to boot under consideration the statistics provided through audited regarding news audience, correlating the analysis of social media, of Facebook particularly, with measurable facts, accessible to the general public domain. We tend to used supervised gaining information of technique on an oversized scale amazon dataset to polarize it and obtain fine accuracy.

Article History

Article Received: 18 May 2019

Revised: 14 July 2019

Accepted: 22 December 2019

Publication: 26 January 2020

Keywords: Segmentation analysis, Implementation of Machine Learning

I. INTRODUCTION

First, this paper can do the analysis about NPS rating by means of rating records and can determine the connection between whether or not or not shoppers wish to propose amazon merchandise or now not, and therefore the results of the NPS score. Also, through the statistical analysis of NPS score, this paper can deliver the elaborated facts and insights concerning the foremost appropriate time to unleash financial gain promotion and activities.2d, this paper can consciousness on the system gaining information of in-text statistics, to get the direct

relationship between fine and poor rating, and rating. Amazon will use this machine-learning to verify huge quantities of Nan price in rating by means that of the tremendous and negative score. moreover, the matter content statistics analysis can deliver merchandise a fresh rating, distinctive from the rating, that would facilitate to stay or enhance the sale, product fine, and emptor offerings.1/3, this paper can summarize the foremost going down phrases all told evaluations and divide them into the businesses of positive evaluations and unhealthy opinions. The employment of these most occurring

phrases, I create one-of-a-kind word clouds to end the facts visualization of the matter content statistics. Surely, it is to boot a prompt thanks to noting producer and on-line merchandiser platforms concerning the advantages and downsides of merchandise and transactions. Fourth, primarily based at the nps Analysis and text statistics in system mastering, the more analysis topic is about the way to enhance NPS score of returning shopper, a charm to the capability.

Customers to boot, aiming at producers and on-line shopping for internet sites, I will be able to provide recommendations concerning the way to properly use these consequences from the analysis. First steps to transfer put together numerous processes—gaining information of, lexical, knowledge-based, and so on.—had been taken within the 2004 AAAI spring conference wherever linguists, pc scientists, and different concerned researchers 1st aligned pursuits and planned shared obligations and benchmark facts sets for the systematic procedure studies on having an impact on, enchantment, perspicacity, and sentiment within the matter content.

A distinctive technique for deciding sentiment is employing a scaling device whereby words usually related to having a foul, impartial, or effective sentiment with them square measure given Associate in Nursing associated selection on a scale (maximum terrible the maximum amount as most effective) or truly from zero to an amazing higher limit consisting . This makes it viable to regulate the sentiment of a given fundamental quantity relative to its surroundings (normally on the amount of the sentence). While a bit of unstructured matter content is analyzed the usage of the linguistic communication process, each plan among the particular surroundings is given a score based mostly completely on the style sentiment words relate to the thought and its connected score. This enables the motion to additional refined info of sentiment as a result of its miles currently possible to control the sentiment value of inspiration relative to changes

that may surround it. Words, as Associate in Nursinging example, that intensify, lighten up or negate the sentiment expressed with the help of the thought will have an effect on its rating. Rather, texts may be given an outstanding and negative sentiment energy score if the goal is to work out the sentiment in an exceedingly matter content in preference to the overall polarity and power of the matter content.

II. LITERATURE ASSESSMENT

Relevant literature measure in-textual content statistics in gismo going to apprehend Erik boiy and Marie-Francine moens in their thesis a system mastering approach to sentiment analysis in multilingual internet texts Stated that “sentiment analysis, to boot mentioned as opinion mining may be a form of facts extraction from matter content of growth analysis and Commercial hobby.” System finding out techniques for sentiment category gain interest because of their practicality to model several capabilities and in doing this, taking footage context their simpler ability to changing enter, and therefore the risk to live the certificate a uncertainty by means that of that a class is created.”

Sentiment analysis in Czech social media the employment of supervised system mastering, ivanhabernal, Tomas Ptacek Associate in Nursingingd Josef Steinberger provided an in-depth study of machine-learning ways for sentiment analysis of Czech social media. To boot, they provide a proof for the key issue of victimization device learning for sentiment analysis “lies in engineering an adviser set of features”. Given the case that the majority of the studies in automatic c sentiment analysis of social media has been accomplished English and Chinese, their innovation evolved existing language-based entirely sentiment analysis.

Relevant literature review in NPS study Ludvíok eager and Michal mi čík outlined the cause in their cross-check “is to analysis the degree of patron oriented communication and appearance for its relevance the web promoter score” and “is likewise to provide the power of

- a) However salespeople speak with customers.
- b) If they meet recommendation to patron-orientated communication
- c) What may be taken under consideration in client orientated communication with regards to consumer loyalty of their paper Patron-oriented communication in retail.

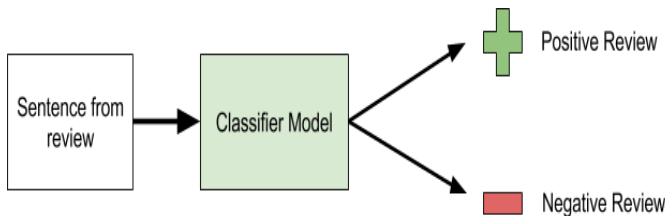


Fig. 1: Classifier Model from Review

Web promoter rating Robert Remus planned “a theme for expressly modeling and representing the negation of Word n-grams in Associate in Nursing increased phrase of gram characteristic space” and mentioned device going to apprehend Primarily based entirely on negation comprehensively in modeling and representing negation in statistics-pushed Machine studying-based sentiment analysis. Based on many literature papers, the most is that the triumphant technique to try and do the matter content statistics sentiment analysis is system going to apprehend. Thus my analysis is likewise primarily based entirely on device gaining information. However, innovation purpose is that I will not specialize in any datasets of social media, that has been mentioned all the time, but discern out consumer’s feedback. The knowledge set I take advantage of on this analysis paper is prepared merchandise of amazon, from one amongst the most well-known shopper physical science outlets, best buy. This cross-check will assist Maine confirm out the professionals and problem BestBuy's remarks gismo.

III. PROPOSED SYSTEM

As the industrial web website of this form of utterly surpassed through in on-line platform folks are commerce merchandise through a definite e-

exchange information processing system. And since of this reviewing merchandise ahead than buying is additionally a common state of affairs. In addition currently daily, customers are additional willing nearer to the critiques to shop for a product. Therefore learning the knowledge from those client evaluations to create the records further dynamic could be a crucial discipline latest instance. during this age of growing tool mastering generally, primarily based algorithms learning plenty of reviews to apprehend a product is as Associate in Nursing opportune time consumption whereby we tend to are able to polarize a examine on an explicit class to know its quality most of the consumers all over within the world. The aim of this paper is to categorize the terrific and poor feedbacks of the purchasers over exclusive merchandise and assemble a supervised analyzing version to polarize an enormous quantity of opinions. a have a study on amazon last year situated over half of one mile of on-line clients' trust critiques as Associate in Nursing awful heap as personal pointers.

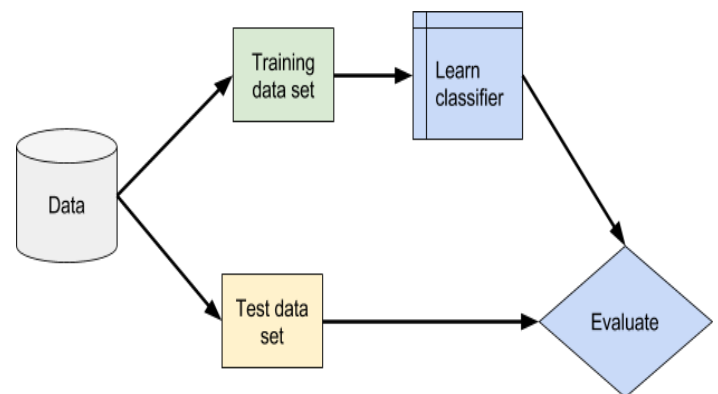


Fig. 2: Structure of Sentiment Analysis

Any on line object with lots of abundance of excessive glorious evaluations offers a good observation of the legitimacy of the item. Conversely, books, or each totally different on-line item, while not opinions locations practicality potentialities during a kingdom of distrust. Pretty very, further critiques look further convincing. Folks charge the consent and experience of others and therefore the analysis on the material is that the glorious thanks to apprehending others have a sway

on the merchandise. Reviews, collected from clients' tales regarding precise merchandise or subjects, straightforwardly have sway on future patron purchase picks. Additionally, terrible reviews usually reason sales loss. For those data the remarks of purchasers and polarizing as a result over an enormous quantity of records the aim. There are a couple of comparable works completed over the amazon dataset. In this opinion mining over a little set of datasets of amazon product evaluations to recognize the polarized attitudes nearer to the products.

In our version, we tend to use each guide and spirited analyzing technique to label our datasets. In the spirited gaining data of manner, one among sort classifiers are accustomed supply accuracy till attaining a nice degree. Once obtaining a notable end result we tend to take those categorized datasets and processed it. From the processed dataset we tend to extracted capabilities that are then categorized through means of distinct classifiers. We tend to use a mixture of types of techniques to extract skills: the bag of phrases technique and tf-idf & chi sq. technique for improving accuracy.

So far, lots of the analysis papers associated with product opinions, sentiment analysis or opinion mining has been performed presently. In the work Elli, Maria and Yi-fan extracted sentiment from the critiques and have a glance at the quit outcome to accumulate a poster leader model. They need claimed that incontestable gismo had been sturdy comfortable to give the excessive accuracy. The use of industrialization analytics created their alternative further appropriate. They what is more worked on detection emotions from analysis, gender-based on the names, what is more detection faux opinions. The commonly used artificial language changed into python and r. them in the main used multinomial naïve Bayesian (mnb) and assist vector machine (SVM) as their primary classifiers.

IV. SENTIMENT ANALYSIS

In paper the author accomplished existing supervised algorithms [14][15][16][17][18] to expect opinions rating on a given numerical scale victimization superior matter content. They have used maintain out move validation the usage of seventieth facts as education records and half-hour info as trying out facts. In this paper, the author used awesome classifiers to work out the exactitude and do not forget values. The author in paper enforced and extended the trendy design within the neighborhood of flavored language process and sentiment analysis to information from amazon analysis datasets. Naïve Bayesian and need list classifiers were accustomed tag a given examine as high quality or awful. They need got selected books and kindle part compare from amazon. The author in aimed to assemble a system that visualizes the critiques sentiment within the form of charts. They need to use records scraping from amazon universal resource locator to induce the knowledge and preprocessed it.

A simple venture in sentiment analysis is classifying the polarity of a given matter content at the file, sentence, or feature/aspect degree—whether the expressed opinion in an exceedingly report, a sentence or Associate in Nursing entity characteristic/issue is positive, bad, or impartial. Advanced, "past polarity" sentiment sort looks, as an example, emotional states as well as "angry", "unhappy", and "glad".

Precursors to sentimental analysis accommodate the verbalizer, that provided tips within the direction of quantifying designs in matter content and, separately, mental studies that tested a personality's mental kingdom based mostly completely on analysis in their verbal behavior. Finally, the strategy delineated in an exceedingly patent by means of volcanic and Fogel, regarded specifically at sentiment and recognized person words and terms in text with appreciate to specific emotional scales. A current system based mostly completely on their work, referred to as impact check, provides synonyms that will be accustomed

to grow or decrease the amount of induced feeling in every scale.

Many different resulting efforts are a lot of less progressive, employing a trifling polar read of sentiment, from advantageous to poor, besides work via Turnery, and pang United Nations agency enforced distinct methods for detective work the polarity of product evaluations and film reviews severally. This painting is on the report degree. one will also classify a file's polarity on a multi-manner scale, that was tried via pang and Snyder amongst others: pang and lee extended the straightforward endeavor of classifying a movie assessment as either fantastic or negative to predict genius rankings on each a 3- or a four-celebrity scale, whereas Snyder dead Associate in Nursing in-depth analysis of eating place opinions, predicting scores for various aspects of the given cafeteria, consisting of the food and scheme.

Opinion mining and sentiment analysis square measure crucial for determinant opinions on makers and services or understanding consumers' mind-set. Given the relentless cascade of information on the World Wide Web, inside the ultimate decade, the sphere of automatically extracting critiques has emerged, isn't any longer viable to preserve up with the drift of recent facts via manual ways. There is also an enormous body of labor on opinion mining for English, not for Italian, via automatic manner. Globally, 2 techniques are used: supervised system-gaining data of and unsupervised strategies, that use a lexicon with words scored for polarity values consisting of impartial, advantageous or dangerous. Supervised techniques need a coaching set of texts with manually assigned polarity values and, from those examples, they examine the options (e.g. phrases) that correlate with the fee. Chaovalit and Chou evaluated commonplace implementations for each ways on film evaluations and complete that supervised techniques perform with concerning 85 nada accuracy, whereas unsupervised strategies do some 77 nada. Supervised ways have the

disadvantage that they need extraordinary education knowledge for every quite file, for each domain and each language. Unsupervised systems square measure bigger strong across extraordinary styles of texts and domains and, once the lexical and linguistics assets square measure developed, will be deployed additional simply. Sentiment analysis is discourse mining of matter content that identifies and extracts subjective records in offer artifact and supporting business to apprehend the social sentiment of their whole, product or service at a similar time as chase online conversations. However, analysis of social media streams is generally strained to only primary sentiment analysis and be counted based mostly completely metrics. That's almost like simply scratching the surface and missing out on those high-value insights that square measure waiting to be determined. Therefore what ought to Associate in nursing emblem do to seize that low placing fruit?

With the newest advances in deep mastering, the capability of algorithms to look at matter content has progressed significantly. The innovative use of advanced AI techniques may be a strong device for doing in-intensity analysis. We have a tendency to believe its miles necessary to reason incoming patron conversation regarding Associate in nursing emblem supported the subsequent strains: Key aspects of Associate in Nursing emblem's product and supplier that customers care regarding. Customers' underlying intentions and reactions relating to those parts. These primary principles while employed in the mixture, find yourself a very important tool for analyzing many thousands of emblem conversations with human-level accuracy. Among the publish, we have a tendency to take the instance of uber and exhibit however this works. Read on!

Textual content classifier — the fundamental constructing blocks

Sentiment analysis

Sentiment analysis is that the most commonplace text sort tool that Associate in Nursingalyses an incoming message and tells whether or not or not the underlying sentiment is top quality, dangerous or impartial. You'll input a sentence of your preference and gauge the underlying sentiment by means of wiggling with the demo here.

Intent analysis

Rationale analysis steps up the game through finding out the person's goal within the back of a message Associate in Nursingd working out whether or not or not it relates an opinion, news, advertising, complaint, suggestion, appreciation or question.

NAÏVE BAYSED CLASSIFIER

Naive Bayes is used as the classifier. They over that naive Bayes offers higher result for word stage than divorced word and multiword. The principle cons of this paper are, they used the best naive Bayes classifier set of rules from that we are able to not get a comfortable result. In paper it's used less arduous algorithms therefore it's straightforward to know. The system offers exaggerated accuracy on SVM so it cannot design nicely on a huge dataset. They used assist vector tool (SVM), provision regression, selection Treemethod.

In paper TF and IDF is employed here as an additional take a look at. It's able to anticipate rating by means of victimization bag of phrases. However, classifiers used here are simplest few. They used root recommend sq. blunders, regression toward the mean version. So, those are some associated works the same higher than, we tend to try to create our design additional inexperienced via manner of preferring pleasant thoughts from them and applied those along. In our device, we tend to a used a huge amount of datasets therefore it gave green Stop outcome and that we might want to require higher selection. Moreover, we've got used spirited reading techniques to label datasets that might dramatically accelerate several tools analyzing obligations. Our

machine what is more consists of varied sorts of feature extraction techniques. To the satisfactory of our data, our projected methodology gave higher accuracy than the present studies works.

A human analysis issue is needed in sentiment analysis, as automatic systems are not capable to analyze ancient tendencies of the character commenter, or the platform and square measure frequently classified incorrectly of their expressed sentiment. Automation affects close to twenty third of remarks that square measure properly classified via masses. But, humans frequently disagree, and it's argued that the inter-human agreement presents a prime sure that automatic sentiment classifiers will ultimately reach. Occasionally, the form of sentiments and topics is fairly sophisticated. Additionally, the matter of sentiment analysis is non-monotonic in admire to condemn extension and forestall-phrase substitution (examine they might not let my canine aaaaazbe this lodge vs I would not let my canine board this resort). To address this problem a number of the rule-based and reasoning-based strategies were distributed to sentiment analysis, like defeasible common sense programming. Also, there square measure a number of tree traversal laws enforced to grammar dissect tree to extract the interestingness of sentiment within the open space golf stroke.

V. CONTEXTUAL LINGUISTICS SEEK (CSS)

Now that's whereby things get genuinely exciting. To derive unjust insights, it's important to know what issue of the brand is easier discussing close to. as Associate in Nursinging instance: amazon may need to segregate messages that associated with late deliveries, request issues, promoting connected queries, product opinions, etc. however, Starbucks may need to classify messages supported whether or not they relate to employees behavior, new java flavors, hygiene feedback, on-line orders, search name, and region then forth. However will one do that?

We introduce a wise clever search rule referred to as discourse linguistics search. The mannerisms works is that it takes thousands of messages and as coming into and filters all of the messages that closely suit the given idea. The picture shown below demonstrates, however, CSS represents a chief improvement over existing techniques used by the trade. A conventional technique for filtering all fee associated messages is to try to do a keyword look for on charge and completely different rigorously associated phrases like (pricing, charge, \$, paid). This method, however, isn't powerful as its miles virtually unfeasible to contemplate all the relevant key phrases and their editions that represent a selected thought. CSS on the opposite hand simply takes the decision of the thought (rate) as input and filters all of the contextually comparable even wherever the plain variants of the thought keyword aren't noted. For the curious masses, we might like to gift a glimpse of however this works. Associate in nursing air technique is employed to convert every word into a specific purpose within the hyperspace and therefore the distance between these factors accustomed understand messages wherever the context is comparable to the thought we're exploring. An image of the means this seems beneath the hood may be visible below:

Despite the actual fact that in most applied math classification strategies, the impartial category is neglected underneath the belief that impartial texts lie on the point of the boundary of the binary classifier, various researchers recommend that, as in each polarity downside, 3 categories got to be recognized. Moreover, it can be confirmed that specific categorified, as well as the goop entropy. Associate in Nursingd, will fancy the introduction of an impartial class and enhance the overall accuracy of the class. There square measure in essence 2 ways that for running with a neutral magnificence. either, the rule issue through 1st distinguishing the neutral language, filtering it out when that assessing the comfort in phrases of advantageous and dangerous

sentiments, or it builds a triangular category in one step.[12] this second technique frequently includes estimating an opening distribution overall categories (e.g. naive Bayes classifiers as distributed by the nltk). whether or not or not and therefore the thanks to use Associate in Nursinging impartial magnificence depends on the character of the statistics: if the facts are literally clustered into neutral, terrible and high-quality language, it is smart to separate out the neutral language out and a spotlight at the polarity among tremendous and dangerous sentiments. If, in analysis, the facts square measure in most cases impartial with tiny deviations nearer to top quality and dangerous have an impact on, this technique may build it more durable to easily distinguish between the 2 poles.

Objectivity identification

This mission is often delineated as classifying a given matter content (typically a sentence) into one amongst 2 instructions: goal or subjective. This downside will from time to time be additional powerful than polarity sort. the perspicacity of phrases and phrases might, in addition, depend on their context and a goal report in addition, |may contain subjective sentences (e.g., a news story quoting people's critiques). Moreover, as noted by means people, results square measure, for the most part, addicted to the definition of perspicacity used whereas expanding upon texts. However, Pang showed that pushing aside objective sentences from a file before classifying its polarity helped improve overall performance.

Function/aspect-based completely

It refers to deciding the evaluations or sentiments expressed on distinct functions or parts of entities, e.g., of a cellular smartphone, a digital camera, or a bank. A characteristic or issue is Associate in Nursinging characteristic or element of Associate in Nursinging entity, e.g., the show of a cell phone, the carrier for Associate in Nursinging cafeteria, or the picture pleasant of a digicam. the advantage of feature-based completely sentiment analysis is that

the chance to seize nuances close to objects of interest. Extraordinary options will generate distinctive sentiment responses, as an example, a resort might have a handy neighborhood, but mediocre food. This hassle entails various sub-issues, e.g., working out applicable entities, extracting their features/aspects, Associate in Nursingd deciding whether or not or not an opinion expressed on each characteristic/aspect is good, terrible or neutral. The automatic identification of capabilities be achieved with grammar strategies, with material modeling, or with deep mastering. Bigger careful discussions close to this stage of sentiment analysis may be found in Liu's work.

Methods and capabilities

Existing ways to sentiment analysis may be classified into three elementary classes: expertise-based techniques, applied math techniques, and hybrid ways. Understanding-primarily techniques classify matter content by means of classes based completely at the presence of unambiguous effect phrases beside happy, unhappy, afraid, and bored. a couple of understanding bases no longer best list obvious impact phrases, however conjointly assign absolute words a possible "affinity" to express feelings. applied math strategies leverage factors from device mastering as well as latent linguistics analysis, aid vector machines, "bag of phrases", "point wise mutual facts" for linguistics orientation, and deep mastering. Additional refined strategies try to discover the holder of sentiment (i.e., the person who maintains that effective country) and therefore the target (i.e., the entity close to that the have an impact on is felt). To mine the opinion in context and find the operate regarding that the speaker has opined, the grammatical relationships of words square measure used. Grammatical dependency members of the family square measure obtained by deep parsing of the matter content. hybrid strategies leverage every device finding out and factors from ability illustration beside ontologies and linguistics networks as the way to uncover linguistics that square measure expressed in an exceedingly delicate

manner, e.g., through the analysis of concepts that don't expressly carry applicable information, however, which could be implicitly associated withzaq different standards that do, therefore.

Open offer package program instrumentality additionally to the type of loose and paid sentiment analysis tools established device about to recognize, info, and flavoring language process methods to alter sentiment analysis on Brobdingnag Ian collections of texts, which has internet pages, on-line info, internet discussion corporations, on-line reviews, web blogs, and social media. information-based completely systems, then again, use publically to be had sources, to extract the linguistics and emotive facts related to linguistic communication concepts. Sentiment analysis can also be accomplished on visible content, i.e., pictures and motion footage (see multimodal sentiment analysis). One of the primary strategies during this direction is sent bank creating use of Associate in nursing adjective-noun combine illustration of visual content. Similarly, the many majorities of sentiment category strategies rely upon the bag-of-words model that disregards context, descriptive linguistics or perhaps order. Approaches that analyze the sentiment-based completely on however phrases compose that means of longer phrases have shown higher-conclusion, however they incur an additional annotation overhead.

VI. CONCLUSION

This paper describes a sentiment analysis take a glance at finished on over one thousand Fb posts regarding newscasts, evaluating the sentiment for rai - the Italian public broadcasting service - nearer to the rising and further dynamic personal company la7. It maps sentiment analysis on social media with observations and measurable statistics. Its effects accurately mirror the reality as outlined through the Observatories di Pavia and audited, lightness the importance of Facebook as a platform for online advertising. Observation social media activities could be a good way to live clients' loyalty and interests, keeping tune up their sentiment within the

direction of makers or merchandise. this incorporates a examine has been accomplished through an ability mining convenience employed by many security sector-related authorities establishments and corporations in the Italian Republic to limit records overload in osintsas and web mining. the linguistic and linguistics procedures enforced on this method allow the analysis, the analysis, the classification of very sensible volumes of heterogeneous files, aiding writing analysts to chop through the statistics labyrinth, analysts to require account of quality of public views, distribution mechanically a sentiment polarity, unexpectedly gaining access to any or all of the capability texts of interest.

REFERENCES

1. Sankey Gupta. "Credit card Fraud Detection and False Alarms Reduction using Support Vector Machines".
2. Er. Monika, "Fraud Prediction for credit card using classification method". *International Journal of Engineering and Technology*, (2016); 7(3) 1087-1090.
3. Wee-Yong Lim, "Conditional Weighted Transaction Aggregation for Credit Card Fraud Detection". HAL ID: hal-01393754.
4. Pravin Kshirsagar and Sudhir G. Akojwar(2016), "Prediction of Neurological Disorders using Optimized Neural Network" *International conference on Signal Processing, Communication, Power and Embedded System (SCOPE5)*, Oct. 2016 .
5. Salvatore G. Stolf "Distributed Data Mining in credit card fraud detection". *Blue Eyes Intelligence Engineering Retrieval Number: F10440476S4/19©BEIESP & Sciences Publication*.
6. R.Dheepa, N.Dhanapal. "Behavior Based Credit Card Fraud Detection using Support Vector Machines". ISSN: 2229-6956 (Online).
7. Thakre, N. (2019). Innovation in the Study of Gun Detection in Bank to Prevent Weapon Attacks of Surveillance. *Test Engineering and Management*, 81(March-April 2019), 05–08. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/download/6/5/>
8. Williams, M. (2019). Management Model: Employee Database model for Spatio-Temporal Relationship. *Test Engineering and Management*, 81(March-April 2019), 09–16. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/13/12>
9. Zirmite, R., & Vaidya, R. (2019). The Study of Gesture Recognition by using Gesture Algorithm and Image Processing. *Test Engineering and Management*, 81(March-April 2019), 01–04. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/5/4>
10. Banerjee, S. (2019). A Dynamic Business Model for IT Industries. *Test Engineering and Management*, 81(January-February 2019), 01–06. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/3/2>
11. Krishnam, R. K. (2019). A Study on Tools and Techniques for Business Models. *Test Engineering and Management*, 81(January-February 2019), 07–12. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/4/3>
12. Lee, J. (2019). Study of Migration and Mobility in the Age of Disruption with Socio-Economic Changes. *Test Engineering and Management*, 81(May-June 2019), 01–04. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/7/6>
13. Alasa, L. (2019). The Role of Internet of Things in Healthcare System with Security and Sensor Networks. *Test Engineering and Management*, 81(May-June 2019), 05–08. Retrieved from <http://testmagazine.biz/index.php/testmagazine/article/view/8/7>
14. Pravin Kshirsagar and Sudhir Akojwar (2016), "Hybrid Heuristic Optimization for Benchmark Datasets" *International Journal of Computer Applications* (0975 – 8887), Volume 146 – No.7, July 2016.
15. Pravin Kshirsagar Sudhir Akojwar(2015). "Classification & Detection of Neurological Disorders using ICA & AR as Feature Extractor", *International Journal Series in Engineering Science (IJSES)*, Volume 1, Issue 1, 2015.
16. Pravin Kshirsagar and Sudhir Akojwar(2015),

- “Classification and Prediction of Epilepsy using FFBPNN with PSO”, IEEE International Conference on Communication Networks, 2015.
17. Pravin Kshirsagar and Sudhir Akojwar (2016) “Classification of Human Emotions using EEG Signals” International Journal of Computer Applications (0975 – 8887) Volume 146 – No.7, July 2016.
 18. Pravin Kshirsagar and Sudhir Akojwar (2017), “Classification of ECG-signals using Artificial Neural Networks”, Researchgate.net
 19. Pravin R Kshirsagar, Sudhir G Akojwar, Nidhi D Bajaj(2018), “A hybridised neural network and optimisation algorithms for prediction and classification of neurological disorders”, Int. J. Biomedical Engineering and Technology, Vol. 28, No. 4, 2018.