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An Advance Approach toward Sentiment Analysis using Swarm Intelligence

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Abstract: Modernization is the key feature for the development of Society. With the timespan people are making growth with trends in technology. Around the decades, there were many technologies which have been stepped up over the industry and made the transformation in the society and have made tremendous development throughout the world. Similarly, In the 21st decades Social media (like Facebook, Twitter, what's app, Instagram & many more) have become one of the emphasized network mediums. Millions of people are using social media to get in touch with people staying far away from them. There are millions of data over it which is non-hierarchical and need to store and use it for feedback and other usage. Not only in Social Media, in the business & marketing sector too, customer feedback plays a crucial role. For maintaining and segregating data in a systematic way, sentiment analysis is being used which makes the task easier and helps to understand the data in a better way. In this paper, we are presenting a sentiment analysis approach using Swarm Intelligence, which could be more beneficial in such tasks to solve the complex problem. The concept is correlated with technology Artificial Intelligence.
Keyword: Sentiment Analysis; Artificial Intelligence; Swarm Intelligence; Feature Selection, image classification.

I. INTRODUCTION

Nowadays, the internet is extremely widespread and is used by over a billion people. The tremendous growth of technology has changed the way people express their views and opinions. Ideas, comments, views, suggestions, feedback pertaining to specific & identifiable issues are shared by the users on the social media platforms, such as Facebook, Twitter etc. This virtual way of interaction has led to people being connected to each other even when they are a million miles away.

The process of defining or finding emotion in data is called sentiment analysis. Sentiment analysis is crucial in various systems such as opinion mining and predicting. Using sentiment analysis gives numerous benefits to the general public. Governments can revise or terminate strategies as indicated by online protests, executives can analyze product recognition and decide on development plans using customer remarks, sociologists can decide the success records of various groups utilizing sentiment mining, and so on [1].

Evolutionary algorithms have succeeded in finding the best solutions to complex problems, where there is a way to measure the quality of solutions [2]. Algorithms such as Nature-Inspired Algorithms, Genetic Algorithms, Simulated Annealing, etc. They have been thoroughly tested in the literature for improved classification. Nature is a rich source of hypothesis that many researchers are inspired by. Today, in almost every field Inspired Algorithms are used to find a well-designed solution to a problem. Nature-Inspired Algorithms can be classified as Swarm Intelligence Algorithms, Bio-Inspired Algorithms and Physics-Chemistry Algorithms. These algorithms that work on the principle of labor distribution and distribution of tasks that produce global patterns, individual agents such as ants, bees, can do a simple job while the cooperation of the whole colony produces a smart character.

During COVID-19 Pandemic, people are working remotely and for the purpose of refreshment they serve social media platforms. In short, it can be considered that the data has increased rapidly and it's required to maintain it properly. With the help of swarm intelligence, sentiment analysis can become easy. Sentiment Analysis has yielded modern eye-catching directives to online media with a wide variety of active applications ranging from business intelligence to politics. The purpose of sentiment analysis is to obtain the user's attitude, feelings or opinion of the type of review or comment provided by them. The opinions given to others helps to make decisions easier.

A. Working of Sentiment Analysis

Workflow that describes the process of sentiment analysis as shown in the figure1. Data is first downloaded and processed to select features that will be used on an ongoing basis. A selected subset of the feature is then sent to a separator that gives us the size of the database. Depending on the polarity accuracy, the accuracy and error rate are calculated. Ideas can be collected from various sources such as Blogs, social networking sites etc.

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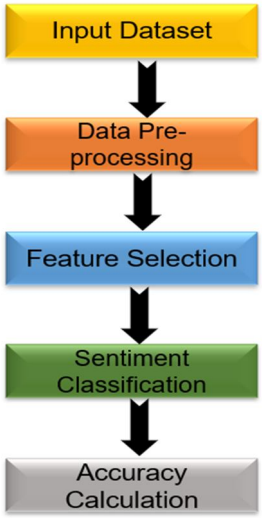

Figure:- 1, Workflow of Sentiment Analysis

Data processing mainly includes data filtering including removal of duplicate words, hashtags, quotes, punctuation marks, expand emotions, increase acronyms and data conversions including word-of-word suspension, override management, blocking and token issuance. The latest methods of feature selection in the field of sentiment analysis from Lexicon-based methods to automated methods. When the feature selection function is over, we have a set of visual and advanced symbols, which become the text input action. Machine learning methods such as Naïve Bayes, Support Vector Machines (SVM), Decision Tree, etc., are used to classify sentiments. Machine learning is a subset of Artificial Intelligence that allows a computer program to automatically learn from a previous task. It works by analyzing data, identifying patterns, and incorporating minimal human interventions [3]. SVM is one of the Machine Learning Algorithm. These machine learning algorithms study the features extracted from the previous step and give the result as positive, neutral or negative. Various methods are used to measure the performance of classifiers such as accuracy, precision, recall and F-measure. Feature selection in sentiment analysis addresses a variety of issues such as large feature space, domain dependence [4], noise attributes, redundancy [5], contextual sensitivity, and limited function in Lexicico-structure [6], among others. The main goal of feature selection is to maximize the performance of the feature by selecting only the most useful and appropriate features and removing unwanted, unnecessary and noisy features and thus reducing the feature vector.

II. SWARM INTELLIGENCE

The swarm is a large homogeneous, simple agent that interacts with their environment, as well as their environment, with no central control to allow a fascinating global character to emerge [7]. Swarm-based algorithms have recently emerged as a naturally inspired family, human-based algorithms capable of producing low, fast, and robust solutions to a number of complex problems [8]. Swarm Intelligence (SI) can therefore be defined as a new branch of Artificial Intelligence used to mimic the behavior of social structures in nature. Swarm intelligence includes a simple collection of interactive agents which interact locally with their associated environment. Agents work in accordance with simple rules of conduct that apply to the location information exchanged between direct and natural agents. Swarm Intelligence algorithms for several performance tasks and research problems [9]. Swarm Intelligence principles have been applied successfully to a variety of problem areas including performance issues, finding appropriate routes, planning, structured design, and image and data analysis [10]. Computer modeling has also been used in a variety of fields, including machine learning [11], bioinformatics and medical informatics, dynamic programs and performance research that has been used financially and commercially as well.

A. Swarm Intelligence Model

Swarm intelligence models are referred to as computational models inspired by natural swarm systems. To date, several swarm intelligence models based on different natural swarm systems have been proposed in the literature, and successfully applied in many real-life applications. Examples of swarm intelligence models are: Ant Colony Optimization [12], Particle Swarm Optimization [13], Artificial Bee Colony [14], Bacterial Foraging [15], Cat Swarm Optimization [16], Artificial Immune System [17], and Glowworm Swarm Optimization [18].

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III. PARTICLE SWARM OPTIMIZATION ALGORITHM

Particle Swarm Optimization (PSO) is planned to be influenced by bird predation behavior. Particle swarm optimization (PSO) is an archetype for optimizing nonlinear functions, started by the conspicuous collective intelligence in several natural systems such as bird flock, bee swarm, among others [19]. For example, several studies confirm that distinct kinds of animals often avoid carnivores more effectively when in a group than individually [20]. PSO starts initializing the population of particles with random position and velocities. Each particle tracks its best position (pbest) according to the evaluation function. In addition, the best position across all particles (gbest) is tracked. The positions of the particles are updated at each step, as well as their velocities based on random variables and predefined parameters [21].

The PSO algorithm is modeled as follows:

$$V_i(t+1) = \omega V_i(t) + c_1 R_1(t)(pbest_i(t) - X_i(t)) + c_2 R_2(t)(gbest(t) - X_i(t)), \quad (1)$$

$$X_i(t+1) = X_i(t) + V_i(t+1), \quad (2)$$

where t is the iteration (generation) number, Vi(t) and Xi(t) represent the velocity and position of the i-th particle, respectively; ω is termed inertia weight, c1 and c2 are the acceleration coefficients, R1(t) and R2(t) are two vectors randomly generated within $[0, 1]^n$; pbesti(t) and gbest(t) are the best solution of the i-th particle found so far, often known as the personal best, and the best solution found by all particles so far, known as the global best, respectively. Kennedy has referred c1R1(t)(pbesti(t) − Xi(t)) and c2R2(t)(gbest(t) − Xi(t)) as the cognitive component and social component, respectively [22].

IV. FEATURE SELECTION IN SWARM INTELLIGENCE

By selecting the lower of the features of a multi-dimensional feature space, is a global concern, in order to optimize the number of reduced functions, and to eliminate the already irrelevant and noisy features and thus improve the classification accuracy and increasing the duration of treatment. Swarm intelligence algorithms are used in such an optimization problem, you are able to measure the quality of the solution. Therefore, the algorithms for the optimal variant of the feature vector for the visual basic functions, which provides a high classification accuracy. The same algorithms in order to improve the quality of the solution by working through several iterations, and the implementation of application-oriented knowledge of the previous iteration to the current value. By reducing the number of features, you can get a more accurate classification than using the full set of features. Features of the sample in the ground are represented by a four-step process, including, among other things, an essential function of the generation, with a prize at the bottom, the last criterion for validation, and the results of the validation. First, the basis has been created for this, the candidate of the base has been wanting to do based on the specific search strategies, the lowest candidate is evaluated and compared with the previous value, which is used in the attributes of the evaluation process.

V. RESULT

AI is transforming many industries [23]. Over the last few years there have been tremendous growth in the field of robotics, automation, artificial intelligence over their application. Comparatively, swarm intelligence has been in a relatively low focus. Swarm intelligence has its roots in the way in which some social insects interact with the nature in a unique and smart way despite having subordinate capabilities [24]. Swarm intelligence algorithms produce results that are superior in terms of sensitivity, the specificity, and accuracy. The use of swarm intelligence in the field of data mining is open, and the development of the area to researchers will significantly improve the system performance of the customers and decision-makers to invest in this area. Improving the results can help the sellers to gain valuable feedback, as customer satisfaction with their products), and is able to release the government agencies' understanding of e-government and e-control. This indicates that feature optimization is the most dynamic area of research, and to improve the performance in sentiment analysis, this area has much potential to be discovered further.

VI. CONCLUSION

In this research work, the importance of sentiment analysis and how necessity it is has been focused. There has been a lot of research ongoing in the field of intelligence and out of that swarm intelligence is considered to be one of the trending research fields in upcoming days. Swarm Intelligence can be considered to be a segment of Artificial Intelligence. PSO algorithm can be concluded as the most efficient in sentiment analysis. This paper has been focused on an approach for sentiment analysis using swarm intelligence.

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VII. CONFLICT OF INTEREST

Miss Riddhi Mandal and Mr. Prateek Dutta, the author of the research work entitled "An Advance approach toward Sentiment Analysis using Swarm Intelligence" states that there is no conflict in the proposed work. No living being has been impacted with the research work. This Research work states for the benefit of human beings.

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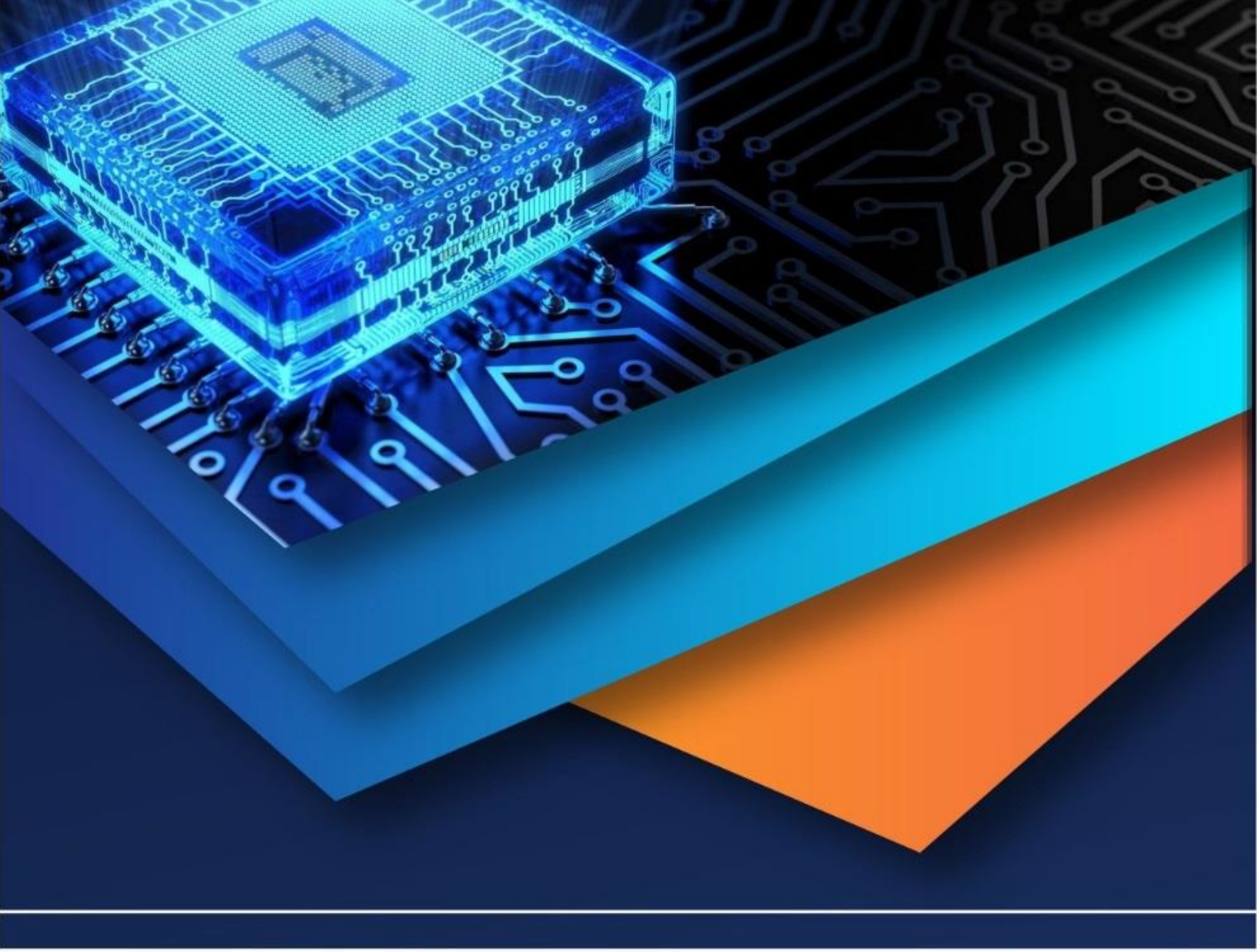

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