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SVM TECHNOLOGY CLASSIFICATION FOR KNOWLEDGE MANAGEMENT AND CRS

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ABSTRACT

The method of support vector machines, also called large margin machines (SVM), is a derivative of computer learning, a solid theoretical basis different from its ancestor of neural networks. The SVM method is known as a very interesting advance in its principle, its implementation and its extension to multiclass problems. Over the past decade, research has focused on adapting the method to particular problems such as novelty detection and clustering as well as improving its performance (optimization and parallelization) and its application. in different domains. such as imaging, sound, banks, biology, management and knowledge management. As a result, several applications have experienced real success with the use of SVMs. In this article, we have highlighted in depth the correlation of SVMs especially on knowledge management as well as the companies implemented Corporate Social Responsibility (CRS). The purpose of the classification is to apply the variables according to the proposed method based on SVM improves the classification accuracy of the classifiers compared to the simple term-based data classification method in order to simplify and facilitate the decision making .

Keywords: *Support Vector Machine , Classification, Technology, Knowledge management and CRS.*

1. INTRODUCTION

Support vector machines, or support vector machines (SVMs), are supervised machine learning models focused on solving mathematical discrimination and regression problems. They were conceptualized . This model was quickly adopted due to its ability to work with high-dimensional data, its theoretical guarantees and the good results achieved in practice. Requiring a small number of parameters, SVMs are appreciated for their ease of use.

Knowledge management is simply the process of identifying, organizing, storing and disseminating information within the same company [1]. The goal is simply to set up a knowledge management system. Thus, this will guarantee access to information for all the teams of a company. Moreover, the importance of knowledge management in SVMs is increasingly reflected in the massive consultation of methods for improving computer science[2]. This consultation promotes the development of guidelines for project selection in an operational form. Indeed, knowledge management gives additional value to the tacit knowledge held by professionals in IT development institutions[3].

Regarding the role of knowledge management and CRS in improving IT performance, we can define performance as a measure of the change in an organization's financial condition or financial results resulting from management decisions and the execution of these decisions by members of the organization. To achieve strategic and operational objectives, knowledge management is an essential lever. Knowledge Management enables teams, networks, organizations and individuals to collectively and systematically create, share and apply knowledge[4]. As revealed by some authoritative authors on the subject, knowledge management pursues two objectives: Increasing the efficiency and effectiveness of operations and fighting competition through innovation. There is therefore no doubt that knowledge appears to companies and organizations as a source of competitive advantage. Speaking of performance, it

can be IT performance, innovation performance, growth performance or operational performance. We also cite among these performance indicators, competitive advantage and value creation. In all these aspects, the role of knowledge in improving performance is somewhat variable. In this context, this research work aims to give a clear vision on SVMs as well as on knowledge management as tools for improving SVMs[5]. The reason to test these different classifiers is their variability in the selection of information variables according to different measures of distance ranging from a simple measure of knowledge management to kernel-based methods. The purpose of the classification is to validate the variables that the proposed method based on SVMs improves the classification accuracy of the classifiers compared to the simple term-based data classification method in order to simplify and facilitate decision-making.

In this context, this paper aims to answer in a direct way the following central question: Will the technological classification of machine vector support have an impact on the profitability of companies using knowledge management and CRS? To answer to this central question, we opted for a broad explanation of the foundations of SVMs, followed by an exploration of the need for knowledge management as well as CRS for producing companies in order to end with an exploration of existing data on two cases. practices, namely the SVM at the knowledge management level, as well as the SVM at the CRS level.

2. CONCEPTS AND LITERATURE REVIEW

2.1 SUPPORT VECTOR MACHINE

The principle of SVMs consists in reducing a classification or discrimination problem to a hyperplane (feature space) in which the data is separated into several classes whose boundary is as far as possible from the data points (or "maximum margin") [6]. Hence the other name given to SVMs: wide-margin separators. The concept of boundary implies that the data is linearly separable [7]. To achieve this, support vector machines use kernels, i.e. mathematical functions to project and separate data in vector space, "support vectors" being the data closest to the border. It is the furthest boundary of all the training points which is optimal, and which therefore presents the best capacity for generalization[8].

SVMs are classifiers that make it possible to deal with nonlinear problems by reformulating them into quadratic optimization problems. Which are much easier to solve. These methods are based on two key ideas: the notion of maximum margin and the notion of kernel function. Without going into too much theoretical detail, the maximum margin is the separation boundary of the data which maximizes the distance between the separation boundary and the closest data (i.e. which maximizes the margin). In a few words also, a kernel function is a kind of alternative to a dot product (which is expensive) in a very high-dimensional space[9].

For a more precise understanding of how this method works, we will translate it mathematically:

Suppose A is a set of n data / class pairs, defined by:

$$A = \{(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)\}$$

Such that: $y_i \in \{-1.1\}$ is the label indicating whether or not an observation belongs to a class, the number n designates the dimension of the database, and XI the I th sample of this base.

In practice, to be able to apply the SVM method correctly, it is first necessary to choose the descriptive parameters well because the selection of these parameters is crucial in the classification of the data[10].

The second step is to find the optimal hyperplane which will divide the training data in half so that all points of the same type are on the same side of the hyperplane because the plane will be divided into two different parts, and each part will have the same type of points[11].

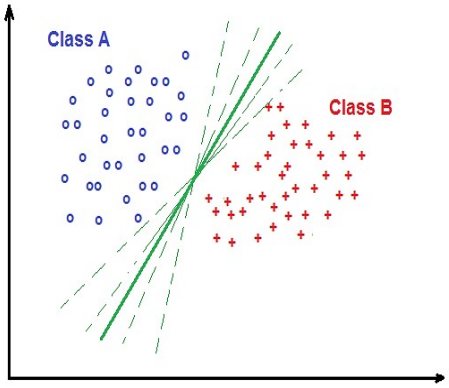

Fig. 1. The Infinity Of The Hyperplane Of Separation.

Then, we seek the optimal hyperplane to separate these two types of points, i.e. we seek to maximize the distances between the points of the learning classes and the hyperplane, this distance is

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called the margin, and the minimum distance points are called support vectors. There are two types of separation methods: linear separation and non-linear separation[12].

2.2 Nonlinear separation or nonlinear SVMs:

In real SVM applications, classes cannot be separated linearly, so we are working with nonlinear SVM to work around this problem, That is to say, by applying a nonlinear transformation to the data to change dimension and easily find a hyperplane classification in this new space[13], and also to give the classifier more freedom to correctly classify the points even if they are initially points on the wrong side of the initial hyperplane (non-separable categories) [14].

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future[15]. This best decision boundary is called a hyperplane. SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine[16].

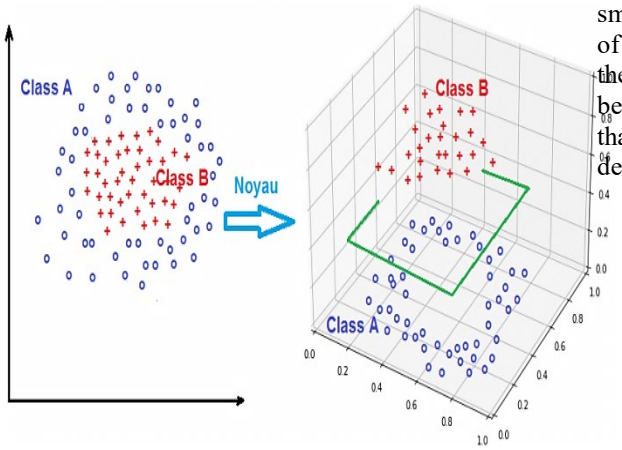

Fig. 2. Example of a nonlinearly separable problem.

The optimization problem is written as follows:

$$\begin{cases} \min \frac{1}{2}\|w\|^2 + C \sum_{i=1}^{n} \varepsilon_i \\ \forall i,\ y_i(w.x_i + b) \geq 1 - \varepsilon_i \end{cases}$$

Where w and b are parameters of the hyperplane, C is the weight given to samples located on the wrong side of the separation boundary (also called regularization constraint), εi are parameters which allow to consider badly classified points.

The optimal solution to this problem is therefore to determine the result of this function necessary for the classification of each sample:

$$f(x) = sign(\sum_{i=1}^{M} \alpha_i y_i K(x_i, x) + b)$$

Where x_i and y_i are respectively the support vectors and their membership classes.

2.3 Linear separation or linear SVMs:

For two-class, separable training data sets, there are lots of possible linear separators. Intuitively, a decision boundary drawn in the middle of the void between data items of the two classes seems better than one which approaches very close to examples of one or both classes[17]. While some learning methods such as the perceptron algorithm find just any linear separator, others, like Naive Bayes, search for the best linear separator according to some criterion. The SVM in particular defines the criterion to be looking for a decision surface that is maximally far away from any data point. This distance from the decision surface to the closest data point determines the margin of the classifier[18]. This method of construction necessarily means that the decision function for an SVM is fully specified by a (usually small) subset of the data which defines the position of the separator[19]. These points are referred to as the support vectors (in a vector space, a point can be thought of as a vector between the origin and that point). Other data points play no part in determining the decision surface that is chosen.

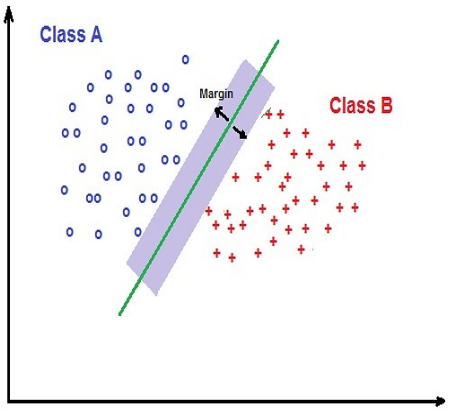

Fig. 3. The Optimal Hyperplane And The Maximum Margin.

Linearly separable cases are the simplest cases of SVM, because they make it easy to find the hyperplane (line) separating the classes, so we are just trying to maximize the classifier margin, to find a good separating hyperplane[20].

The term Support Vector Machine contains a mathematical term Vectors. So, the natural question comes to the mind is What is the significance of this term in the entire algorithm. For any of the machine learning algorithms operations on vectors is one of the fundamental part. In computer science , vector is an object that has two components: magnitude & direction. The magnitude of a vector is more formally called its norm. It is the euclidean distance of the coordinates of the vector from the origin[21].

2.4 Knowledge Management and CRS

Knowledge management is a field of study that has been around for 30 years. It started as an academic theory and has evolved to encompass an essential part of organizational studies. Among the earliest definitions of knowledge management, O'Dell & Grayson 1998 defined knowledge management as "a conscious strategy of getting the right knowledge to the right people at the right time and helping people to share and information in action so as to strive to improve organizational performance" (Girard and Girard, p.2). This definition suggests that knowledge management is a coordinated and deliberate attempt by an organization to use its people resources , process, organizational structure, and technology to add value for reuse and innovation[22] .This process is achieved through the creation, distribution, and application of knowledge that is fed into corporate memory to ensure the adoption of best practices as well as continuous organizational learning (Alina) It should be noted that the concept of conflict management births is different than information management. Indeed, information contains only the potential of knowledge and is not complete knowledge in itself. Rather, knowledge management is the result of a continuous feedback loop achieved by refining the information available and its application. Knowledge management is also self-modifying and dynamic which allows changes based on the course of information acquired over time (Webb) [23]. Based on the meaning and definition of knowledge management, its main purpose is reduced to facilitating a smooth transition of acquired knowledge from individuals to their successors. The process should proceed with minimal memory loss during the transfer process[24]. Resource critical areas are highlighted in knowledge management to mark importance and enable people to build working knowledge from the toolkit to ensure creation of intellectual capital (Dalkir). Thus, knowledge management is a mixture of techniques that provide expertise in a domain. The current study will detail knowledge management in organizations later in the study[25].

Regarding the challenges of integrating knowledge management in the IT sector, Asrar-ul-Haq and Anwar in a study identified that challenges in the integration process can arise in the process of transfer and sharing due to lack of trust between team members and employees of the organization as well as the nature of the technology used[26].

Interpersonal distrust is further increased by the lack of reward in the organization to promote knowledge sharing behavior using technological tools. Additionally, the authors found that organizational culture was also seen as a limiting factor in integrating knowledge management. In companies with a strong individualistic culture and predominance of personal interest[27], the integration of knowledge management is questioned in the sharing phase but also by the technology introduced by the IT department of companies[28].

Fig. 4. Knowledge Managemenr cycle

Knowledge Management in the organization encompasses a comprehensive process of recognition of the processes used in its adoption with the organizational process, and their impact on

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the overall performance of the organization. The traditional knowledge management process begins with the creation, acquisition, refinement, storage, transfer, sharing, and reuse or application of knowledge. The knowledge acquired is implemented in organizational practices of communication, collaboration, problem solving, innovation, individual and collective learning, collective decision-making and intelligence[29]. These assets augmented by the implementation of knowledge are leveraged by the business to create improved organizational performance of improved decisions, organizational processes, relationships with customers, suppliers and partners, and overall organizational behavior .

The strategy for using knowledge material in the organization is to ensure that there is a link between internal and external processes. Thus, managers are aware of resources and can at the same time engage employees in the creation and dissemination process[30]. Strategies ensure ubiquitous access to the knowledge base that is decentralized and quick and easy to reach (Nowacki and Bachnik). There is a free flow of information in the organization to ensure that expertise is available to the entire workforce and, at the same time, knowledge is added at every stage to ensure the creation of scalable artificial intelligence (North and Kumta). This should enable collaboration within the team and enable decision-making in organizations to be based on monitored and controlled learning[31].

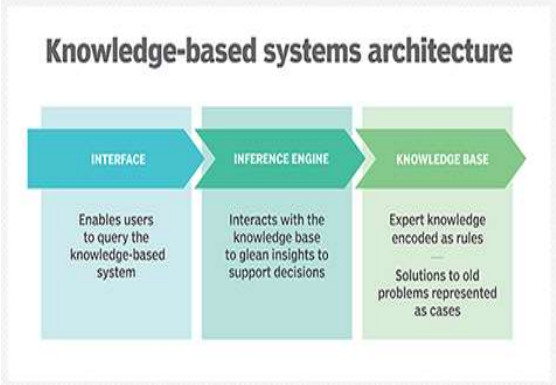

Fig. 5. Knowledge Managemenr systems architecture

The role of knowledge management in organizations is to enable them to achieve greater IT efficiency. This is achieved by reducing the duplication of work in the organization, as knowledge management helps improve IT capabilities, positively impacts the quality of their decision-making and therefore leads to better performance. Sharing knowledge in the organization leads to better practices in sharing documents[32], lessons learned and improving organizational memory, thus leading to better communications and formulating the basis for decision-making strategic.

On the other side Corporate Social Responsibility (CSR) is a concept that organizations act responsibly towards the community where they operate by considering the interest of society and taking various activities and initiatives on the community, environment [33] , shareholders in all aspects of their operations. The European Union defines CSR (OECD, 2001) as "a process which aims to treat the stakeholders of a company or an institution in an ethical or responsible manner". "Ethically or responsibly" means treating key stakeholders in a manner deemed acceptable by international standards. In the globalized world where companies extend their operations across national borders, their activities increasingly escape the regulatory reach of individual states and their regulations. Therefore, in order to hold multinational companies accountable for their activities, corporate social responsibility is highly imperative. Mallen Baker defines CSR as the way companies manage business processes to produce an overall positive impact on society. In order to maintain good corporate citizenship, organizations follow different CSR strategies in the community where the company is engaged. It is a highly sustainable way of bringing economic development to the company as well as to the local community where the company operates [34]. The broadest framework of corporate social responsibility is the relationship between global organizations, the government of countries and individual citizens. This social contract is an ethical obligation that the community imposes on multinationals for their operations and management. This concept goes beyond the attributes of self-interest and profit maximization and focuses on collective interest and profit maximization[35]. Humanity's greatest challenge has always been a balanced development and in order to secure future generations, the principles of CSR are useful [36]. The principles of CSR are primarily aimed at optimizing the growing appetite of businesses around the world and responding responsibly to the demands of the environment and the community.

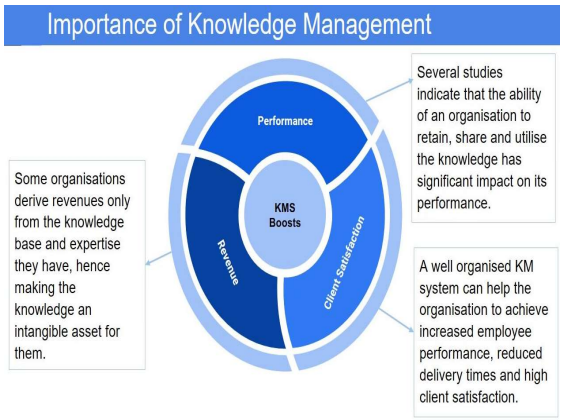

Fig. 6. Importance of Knowledge Management

Knowledge is becoming the core of innovation, knowledge development, knowledge economy, innovation is the main source of inspiration. Knowledge assets and knowledge resources of the competition, have penetrated into natural resources, competition among the means of production, and how the effective management of knowledge has increasingly become a strategic issue to be faced with important practical significance.

The process of integrating knowledge management into technology begins with determining a source to acquire knowledge in the first place. Castrogiovanni et al in a study identified that knowledge in institutions can be acquired from sources such as organizational management, IT, industrial or business environment and adaptive technology. The authors identified that of the four, the adoption of new technologies and human resources are important for knowledge acquisition and management. Once the source has been identified, the knowledge management integration process begins with data collection. The data is then consolidated into information from which we can call on the SVMs. It is then analyzed to derive knowledge from it, as the same data mining and mining is done to make decisions in financial institutions to improve their competitiveness [37].

Khanal and Paudyal in a study suggested that the integration of knowledge management in the institution, is based on three important steps to obtain knowledge, organize it and apply it for the benefit of organizational performance. Integration has a significant impact on market and financial results, organizational efficiency, and employee and customer satisfaction.

Textual databases are useful sources of information and knowledge and if these are well utilised then issues related to future project management and product or service quality improvement may be resolved. A large part of corporate information, approximately 80%, is available in textual data formats. Text Classification techniques are well known for managing on-line sources of digital documents.

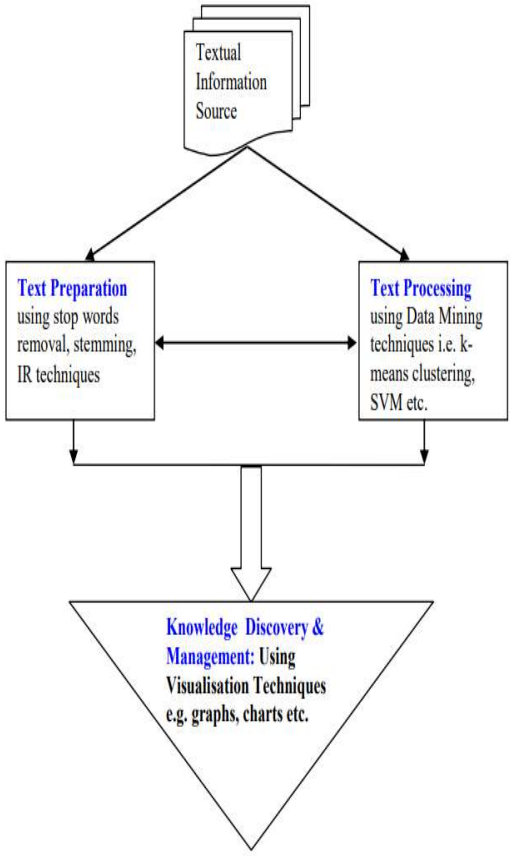

Fig. 7. Textual Data Mining For Industrial Knowledge Management And Text Classification (N. Ur-Rahman Et Al.)

The identification of key issues discussed within textual data and their classification into two different classes could help decision makers or knowledge workers to manage their future activities better[38].

Identification of useful information from textual databases through the application of

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different data mining techniques has long been widely used in various application domains. However there are less reported applications in industrial contexts which implies that industrial databases have not been fully utilized to explore information and transform it into useful knowledge sources. A few instances of text mining and classification techniques have been reported in the engineering domain. For example, the application of classification techniques has been explored to classify manufacturing quality defects and service shop data sets.

Text classification is an important approach to handling textual data or information in the overall process of knowledge discovery from textual databases. It has been a most promising area of research since the inception of the digital text based economy . It is mainly used to classify text documents into predefined categories or classes based upon content and labelled training samples [39]. Text mining techniques have been widely used in various application fields like e-mail filtering, document management, customer needs identification, etc. It can therefore be concluded that the use of this technology can help to access information and manage it for better use in future applications.

3. RESULTS AND DISCUSSION OF THE IMPLEMENTATION OF SVMS USING KNOWLEDGE MANAGEMENT AND CRS

The need for an efficient and centralized enterprise data management framework has been one of the primary goals for institutions over the past few years.

From the principles of SVM and the growing requirements of companies using knowledge management tools in terms of detailed reports and specifications of the technology used, we have attempted in this research work to plan a strategy of Effective data governance is no longer an option.

To simplify the understanding and analysis of all the variables in our study, we have focused in this paper on the data available relating to a limited number of variables, mainly: Retail , Food Services US sales and UK cow's milk production.

The analysis of databases studied in this article is part of the process of extracting knowledge from ECD data or (KDD: Knowledge Discovery from Data). This growing field is often called data mining.

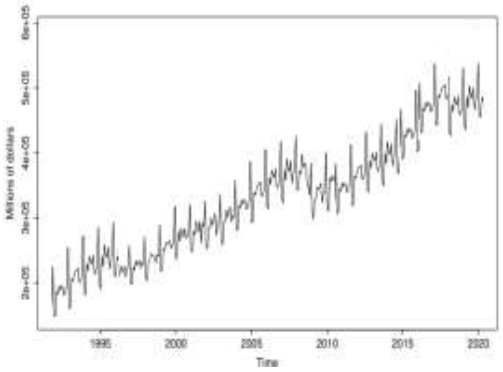

Fig. 8. Observations of sales to retail and food service in the United States

An improvement in the same article consists in the use of transductive SVMs instead of classical SVMs to measure the separation of the two classes. Transductive SVMs make it possible to take into account during learning, not only training examples with their classes, but also test examples but without their classes. In this context, the results show food and beverage sales in the US restaurant industry from 2000 to 2017. In 2015, food and beverage sales in the US restaurant industry, we observe that retail sales in the United States increased in March but they were mainly inflated by the increase in the prices of gasoline and foodstuffs, showed the figures in the figure.

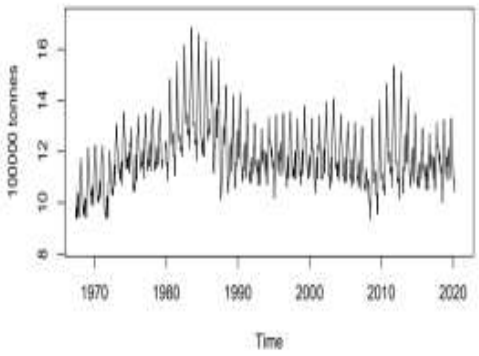

Fig. 9. Cow Milk Production In The UK Companies.

Classification is a very important task in data mining, and it consumes a lot of research for

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its optimization. Supervised classification is one of the most widely used techniques in database analysis. It makes it possible to learn decision models that make it possible to predict. The United Kingdom is the 3rd largest milk producer in the EU (after France and Germany). After having been a forerunner in the development of dairy production, the United Kingdom has gone through an air pocket: in free fall since 2014, the production of organic milk is on the rise again with the export market as its ease. The prospect of Brexit encourages players to set up international private partnerships in order to ensure the development of the sector in an uncertain context for the country's agricultural policy.

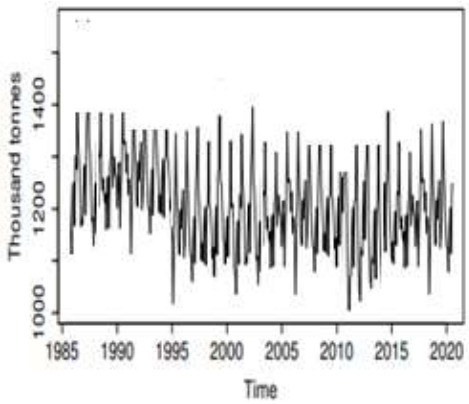

Fig. 10. Observations Of Cow's Milk Production In The UK

Domestic demand is indeed growing, driven by consumers who are increasingly aware of their diet following numerous food scandals. Buyers are thus more and more defined towards healthy products, of national origin and respectful of animal welfare. In addition, the organic label represents an additional key benefit in many other ranges of health food products, such as products without high protein content and dairy substitutes for example. Supermarkets thus continue to expand their organic product offer, including discounters who see it as an opportunity to attract more affluent consumers, improve their image and move organic products to a wider consumer base.

Here are the confusion matrices we found for each app:

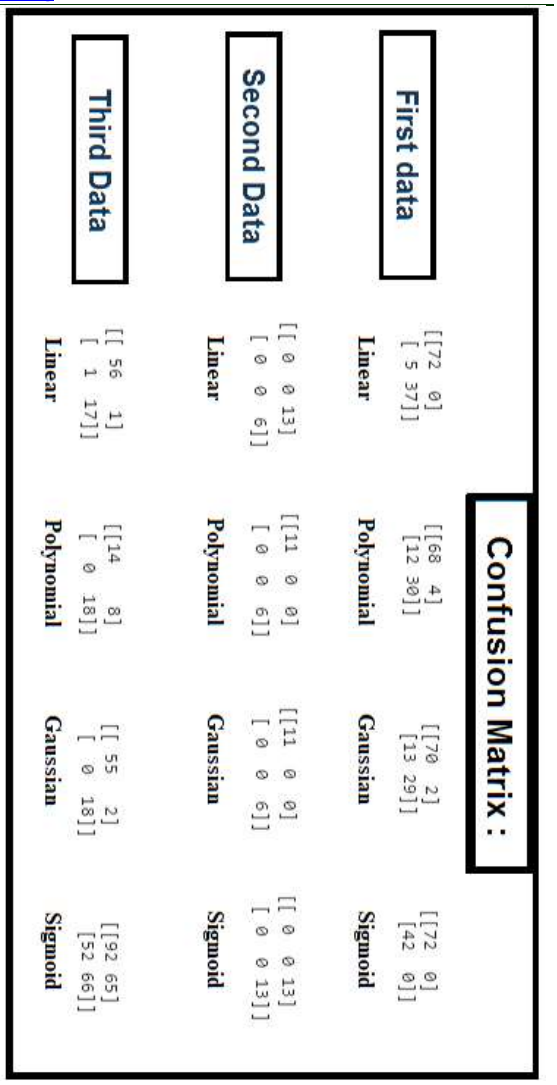

Fig. 11. The Matrix Of Confusion.

Regarding the confusion matrices, we also noticed that the best confusion matrix we got was when we used the linear kernel function in the second data, where all the data was arranged in the right place more especially for the case of the implementation of SVMs for Knowledge management for the case of sales to retail and food service in the United States on the one hand, on the other hand for the case of Cow milk production in the UK companies using the model ideal of corporate social responsibility. we also noticed that the function misclassifies the data because it classifies all this data in one category, for the second data as well as for the third data, which also shows that it cannot be used to classify these types of data .

4. DISCUSSION

Database management systems (DBMS) currently applied, in addition to the database engine, a data mining engine. From what we have seen in this section, SVMs can produce actionable predictive insights and create integrated enterprise-level business intelligence applications applying knowledge management as in the case of companies heavily involved in corporate social responsibility. 'business 'business . The built-in data mining function are works in our case in a very efficient way, all users can spot trends and hidden insights in their data, especially in the case of Cow milk production in the UK companies using CRS, as well as sales to retail and food service in the United States using knowledge management. Developers of SVM-related applications can quickly automate the research and distribution of business news, trends, and business intelligence results throughout their organization.

We find that the parameters we used always give the correct results from the 3 types of data available. This parameter allows information to be controlled in order to simplify decision-making by using the most powerful knowledge management tools. In this research work, we presented a new method related to SVM and attempts to implement it in knowledge management for multiclasses using the SVM method. Unlike conventional methods, our method extends the principle of the single-class SVM method. This contributes in a direct way to improving the results of SVM users in companies using knowleedge management as for CRS institutions.

5. CONCLUSION

In this article, we started with the analysis and understanding of the problem posed and the determination of the objectives in order to set up SVMs in a context of knowledge management in order to allow better improvement. Then, we collected the data necessary and available for the resolution of the problem, to begin a phase of preparation of these data for the analysis more particularly for very specific cases of companies using knowledge management as well as for other companies involved in corporate social responsibility. Once the data has been prepared, the analysis stage allows the information to be extracted. The evaluation stage makes it possible to judge the relevance of the information extracted, which has been presented in the form of numbers (8 to 11). In each of the phases of the process, we generated a figure using SVM tools, the databases represent storage media for data consumed or information extracted. The manipulation and analysis of these databases play a crucial role in the performance of the information optimization process. this has allowed the contribution to the simplification of the use of data to be able to help the companies concerned to make decisions using SVMs whether in knowledge management or in the case of CRS, more particularly, among the of learning, the SVMs allowed us to produce the required data and thus to validate our results. They have been able to rank first among multilevel analysis tools and several types of analysis is simplification of data usage via SVM classification technology.

6. LIMITATIONS OF THE STUDY

The study identified the contribution of SVMs in CSR activities as well as in companies using knowledge management by taking into consideration a single practical case for each case this presents the first limit of our research work but this is essential to the rarity information to broaden the search. The paper also attempted to cover an appropriate range of SVM practice through two use cases. Some limitations and shortcomings should also be mentioned. The objective was to encourage companies in industrial sectors to use SVMs to correctly predict their results in order to make the necessary decisions, but the article focused only on a single sector of activity. in a single country for the case of knowledge management, and a single well-determined case in a single country in the second case, in a future article we will try to find more data in order to broaden the search.

7. PERSPECTIVES AND FUTURE DIRECTIONS

SVMs, in full evolution, still have difficulties for the manipulation of databases in their different levels of analysis. On the one hand, the large amount of data stored in these databases has become unbearable by most analysis algorithms, and on the other hand, the symbolic data stored in these databases poses a problem.

difficulties for many of these algorithms. In this context, we will try in an upcoming article to see the correlation between SVM and BIg data in order to find a magic formula aimed at improving the current situation.

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