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Similarity search of graph database based on Fuzzy Logic Support vector machine (PSO-SVM) algorithm and computer application

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Abstract. **Support vector machine (SVM) has excellent learning performance, has become a popular research method in the field of machine learning, and has been successfully applied in many fields. In recent years, more and more modeling methods have been put forward by relevant scholars to solve problems such as classification identification, risk prediction, and effectiveness evaluation. This article briefly introduces the support vector machine (SVM), and expounds the algorithm of support vector machine in graph database similarity search and computer application for readers' reference.**

Keywords: Support Vector Machine, Graph Database, Computer Application, Artificial Intelligence (Ai)

I. INTRODUCTION

The algorithm research of support vector machine is just in the initial stage, we need to continue to study. In the era of rapid development of the Internet, although people may not understand the existence of support vector machine, but it has been in the service of human beings, for people to produce, life to create better conditions, has been widely used in various fields.

II. FUZZY LOGIC SUPPORT VECTOR MACHINE

A. Generation and development of fuzzy logic support vector machines

With the development of The Times, artificial intelligence, cloud computing and support vector machine have all appeared in our life. Support vector machine, referred to as SVM, is a kind of data-based machine learning. It is different from SLT, but it is a machine learning method based on the risk minimization principle in SLT, which can improve the learning machine's ability and reduce data errors. And the support vector machine is a convex quadratic programming problem, just like the linear programming problem, he can find an extreme value which is the optimal solution. And its accuracy compared with the traditional machine learning algorithm, even better. SVM is the most practical part of machine learning[1-3]. Its main content has been completed many years ago, and it is now in the stage of continuous improvement. It has great advantages in solving small samples, nonlinear and high-dimensional pattern recognition, and can also complement and interact with other forms of machine learning machines. Moreover, support vector machine has a good theoretical foundation, so it also shows different talents in application, and has been widely used, such as pattern recognition, voice recognition, remote sensing technology, software modeling, and image recognition and other aspects have shown a good ability. But it also has disadvantages, such as slow training speed of support vector machine, poor noise resistance, very complex algorithm, difficult to implement large-scale training and so on. SVM has been applied more and more widely, so I also believe that it will be better developed and more widely used in the continuous efforts and development of human beings.

B. Optimization Theory

The optimal theory is a theoretical basis of support vector machines (SVM), which includes two programming problems, the primal problem and the dual problem, and the construction algorithm between the two problems. The description of the optimal theory includes optimality conditions, Wolfe duality theory, Lagrange duality and its classification[4-6].

KKT condition: its basic idea is to convert inequality constraints into equality constraints by adding relaxation variables, artificial variables, etc. Convex programming, a general constraint problem contains equality and inequality constraints, and solves the objective function. There are three cases in the feasible region: if there is a local solution to the problem, then the local solution is also the global solution of the problem; The set of the whole solution combination of the problem is convex; If the problem has a local solution, then the objective function is strictly convex on the feasible region, and the local solution is the unique global solution of the problem. Constraint programming, considering the feasible region of the problem, in which P + Q constraint functions are continuously differentiable, two kinds of constraint conditions will be derived: P + Q constraint functions are all linear functions; Gradient linearly independent condition: Gradient vector set is linearly independent.

Lagrange duality: Lagrange duality is a dual problem considering optimization. Its idea is to define the payment

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function, so that the minimum or maximum problem in question is also the solution to the optimization problem. In this case, the maximum or minimum problem is the dual optimal solution of the optimization problem. Is a dual problem considering optimization, its idea is to define the payment function, so that the minimum or maximum problem in question is also the solution of the optimization problem, then the maximum or minimum problem is the dual optimal solution of the optimization problem. When we consider a differentiable convex problem, if the original problem has a solution, then its duality also has a solution. If the original problem and the dual problem have solutions respectively, then the necessary and sufficient condition for the two solutions to be the optimal solution is that the two solutions are equal (FIG. 1 is the dual image of Lagrange).

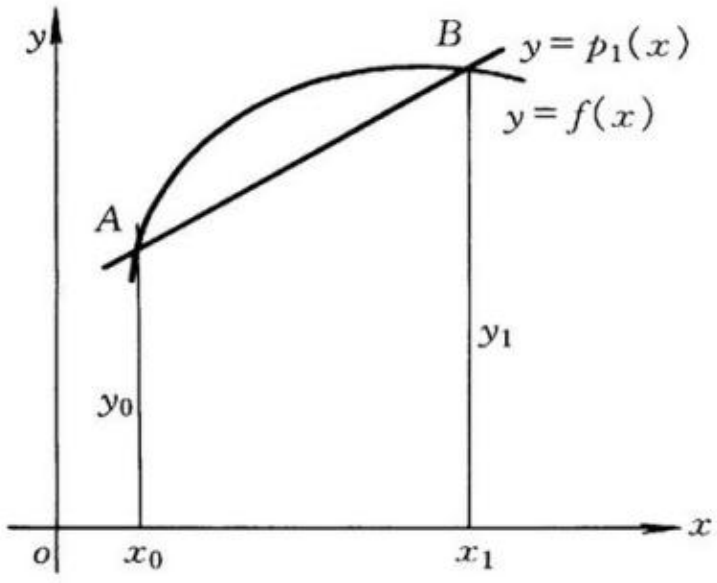

Fig 1. Dual image of Lagrange.

Wolfe duality: Consider continuous differentiable convex problems. If any of its constraints are true, then the original problem has, then the Wolfe duality also has a solution. If the original problem and the dual problem have solutions respectively, then the necessary and sufficient condition for the two solutions to be optimal is that the two solutions are equal (FIG. 2 is the dual image of Wolfe).

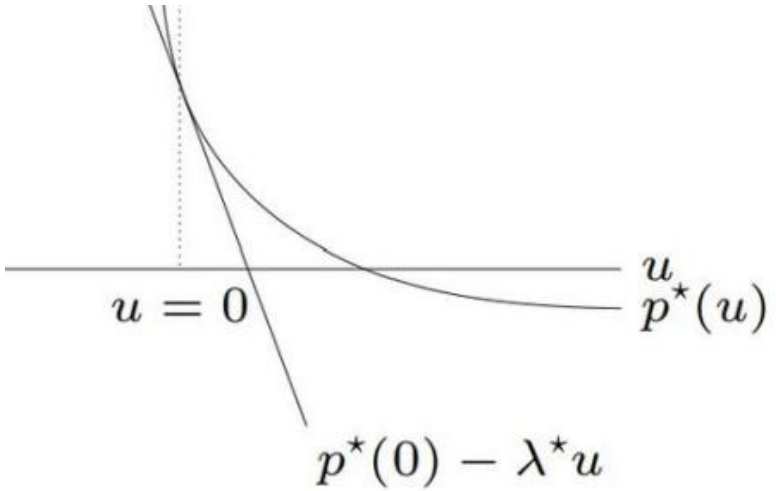

Fig 2. Wolfe dual image.

In general, KKT condition, Lagrange duality and Wolfe duality are uniform for the study of convex problems.

C. Study of learning algorithm

Because SVM has defects, in order to solve these problems and study quadratic convex programming problems, an algorithm to optimize large scale convex quadratic linear problems is proposed to solve the limited problems of support vector machines. Support vector machines use nonlinear change to map the original sample space to a higher dimensional space, and then find the linear classification plane in the higher dimensional space to solve the optimal. In fact, in support vector machines, no matter the linear problem or the nonlinear problem or the high-dimensional problem, it is to solve the quadratic programming convex problem, which is the algorithm principle of support vector machines. When the data is not very large, we can directly solve it through the optimization principal algorithm, but when the data is relatively large, the limitation of this method becomes obvious and cannot be used. We need to create new algorithms for these problems. So after this, many scholars began to study and put forward a variety of special algorithms, including sequence minimum optimization algorithm, deformation algorithm based on standard SVM, fuzzy support vector machine algorithm, etc.

Sequence minimum optimization algorithm: in essence, the working set scale is reduced to 2, and the result is the increase of iteration. Therefore, the time of this algorithm is spent on iteration, seeking for the fastest in iteration. And this idea can be applied to other algorithms. Therefore, the sequential minimum optimization algorithm still has a great space for further development.

Deformation algorithm based on standard SVT: on the one hand, including scholars of sor, LSVM and sav algorithm, they use quadratic loss function, or on the objective function and partial set-top secondary disturbance, the purpose of this algorithm is to make the original problem of convex quadratic programming problem becomes larger, let the optimality of the dual programming simple, eventually to better the convergence of the algorithm faster. On the other hand, it is the study of least-squares support vector machine, and puts forward the term of pre-optimal conjugate gradient. If the training sample size is very large, it is necessary to use least-squares support vector machine to solve linear equations. By decomposing high-order matrix into low-order matrix, the idea of decomposition algorithm is fully utilized.

Fuzzy support vector machine algorithm: Fuzzy information is always there, but also cannot be ignored. However, if there is ambiguous information or noise in THE SVM, then the SVM function will be greatly reduced, or even little. So, we must solve these kinds of problems. In fuzzy information processing, the design of membership function is the core part of the whole fuzzy SVM algorithm. If the membership functions are different, the final processing results of the algorithm are also different, and the degree of resistance to the implementation of the algorithm is also different. Therefore, it is required that the membership function accurately reflects the uncertainty existing in the training samples, so that we can make a more correct and objective choice.

III. Graph Database Similarity Search and Computer Application of Fuzzy Logic Support Vector Machine Algorithm

How to extract effective image content features for image retrieval and storage has always been the direction of researchers' unremitting efforts. So far, many researches mainly focus on the extraction of low-level visual features such as color, texture, and shape, which have achieved certain results in their respective fields. At present, the application of support vector machine to image retrieval is also expected to achieve better retrieval results with fewer image samples. With the help of the powerful learning ability of support vector machine, the relationship between low-level visual features and high-level semantic concepts is studied, to transform the low-level visual features of high-dimensional images into low-dimensional image features with semantic information. The combination of machine learning method and image feature extraction can, on the one hand, learn the potential semantics of images and reduce the "semantic gap"; on the other hand, it can also reduce the system's dependence on the interaction with users in the relevant feedback stage, that is, reduce the burden of users and improve the system's availability. In addition, this approach may reduce the dimension of image feature vectors when it is used to convert low-level visual features into middle or high-level semantic features. Based on the good performance of support vector machine, the classification problem and regression problem can be transformed into the planning problem, which makes the classification more effective and can effectively overcome the uncertainty of structure and ownership of traditional classification society such as neural network. But his calculations have also increased considerably.

IV. Conclusion

To sum up, various algorithms of support vector machine have been widely used in image retrieval, but there are still many shortcomings in real-time performance. This paper only conducts experimental research on some aspects of support vector machine. In

the future work, other intelligent methods can be combined with the introduction of neural network, data mining and other available technologies in the disciplines, which can effectively solve the difficult problems in image retrieval and at the same time play a great help to our research work.

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