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TONGUE IMAGE CLASSIFICATION FOR DIABETES DETECTION USING VARIOUS KERNELS OF SVM AND NON-NEGATIVE MATRIX FACTORIZATION

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Abstract:

Diabetes people who also take antibiotics to combat different infections are particularly vulnerable to fungal mouth and tongue infection. The fungus prospers in the saliva of uncontrolled diabetes to high glucose levels. An efficient method for Tongue image classification using Non-Negative Matrix Factorization (NNMF) and various Support Vector Machine (SVM) kernels are presented in this study. The input tongue images are given to NNMF for feature extraction and stored in feature database. Finally, SVM kernels like linear, polynomial, quadratic and Radial Basis Function (RBF) are used for prediction. The system produces the classification accuracy of 92% by using NNMF and different SVM kernels.

Keywords: Tongue images, Non-negative matrix factorization, Support vector machine, kernels, Diabetes detection

Introduction:

Tongue statistical analysis function extraction and diagnostics in [1]. Based on a wide database conveying over 9000 language images from a colorimetric digital camera specially built non-contact imaging system, a single class SVM algorithm is used to describe the color gamut in the colour scheme. An assessment tool of the consistency of tongue images in Chinese traditional medicine [2]. In the form of a 17-dimensional feature vector for the evaluation of language content, geometric features, texture features or spectral entropy features, are extracted respectively based on the spatial spectral entropy-dependent quality index for tongue images.

Analysis of a visual language image using the ColorChecker language in medical applications [3]. This ColorChecker acts as a color guide and can be used to standardize the captured digital tongue images in color calibration algorithms. At first, a statistical tongue

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color gamut based on a broad tongue image dataset is created. Different amounts of color patches are calculated by experimenting on the ColorChecker tongue. Creation of a language learning program for mobile phones [4]. While a range of methods have over the years been developed for the collection, retrieval and analysis of photographs, most have limitations in reliability, precision, cost and usability.

Color decomposition and thresholding of language image segmentation [5]. In order to define the region of gap between the tongue body root and the upper lip, a picture threshold on the RGB color model is then carried out. Finally, the initial tongue region is optimized with the aid of morphological operations in the above-mentioned field by eliminating fake object regions like the upper lip to achieve the final result. segmentation of the language picture by clusters and thresholds [6-7]. Eventually, by extracting fake tongue body regions, including the high lip, with the aid of the gap region, the tongues are removed from the initial object region.

A non-negative matrix factorization for tongue image classification using various kernels of SVM is described. Section 2 describes the methods and materials used for tongue image classification. Section 3 describes the experimental result and discussion. The last section concludes the tongue image classification.

2 Methods and materials:

The Support Vector Machine is a supervised classification learning algorithm, but can also be used for regression. The key concept is to find a hyperplane that can be used to identify new data points based on the classified data (training data). The hyperplane is a straight line in two measurements.

In general, the learning algorithm aims to learn the universal features (what differentiates between classes) in a class and the classification is based on the representative features learned (so classification is based on differences between classes). In the same direction the SVM functions. The most related examples are found within groups. These are the vectors of support.SVM, by comparison, searches for apples somewhat close to lemons such as yellow and elliptical apples. This is a vector of support. A lemon like an apple would be the other support vector (green and rounded). In SVM, kernel functions play a major role. Their duty is to take data as input and convert them in whatever form they need. They are important in SVM since they help to decide certain important items.

We will look at different kinds of kernels in this article. We'll also see how the kernel operates and why a kernel function is required. This would be an interesting article since it provides you an understanding of what kernel function in some programmes can be used. In previous papers, we discussed SVM in the area of machine learning and SVM implementations. Read them first, if you haven't read the papers.

Initially, the input tongue images are given to NNMF for feature extraction. Then different kernels in SVM like linear, polynomial, quadratic and RBF for prediction. The work flow of proposed system is shown in figure 1.

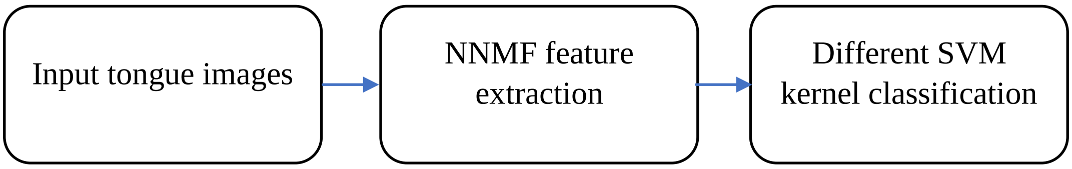

Figure 1 Workflow of proposed system

2.1 NNMF feature extraction:

NNMF is a category of multivariate algorithms and linear algebra with a factor of matrix V in (usually) two matrices W and H, the property of which is the absence of all three matrixes. This negative effect promotes inspection of the resulting matrices. Non-negativity is often fundamental to the study of data in applications such as audio spectrograms processing or muscular activity [8]. As the problem is not necessarily resolvable precisely, it is normally numerically approximated.

2.3 SVM kernels classification

SVM algorithms use a set of kernel defined math functions. The kernel's job is to input data and convert it into the appropriate form. Different SVM algorithms are using different kernel functional forms [9-10]. There can be various kinds of functions. The function of kernel is to take data as input and transform it into the required form.

3 Results and Discussion:

The performance of tongue image classification is measured in terms of accuracy, sensitivity and specificity. Table 1 shows the performance of tongue image classification system using NNMF and SVM kernels.

R	**NMFF computation time (seconds)**	**Classification accuracy (%)**
14	5.12	75
28	7.59	81
42	5.02	86
56	5.33	89
70	5.05	92

From table 1 it is observed that the overall classification accuracy is 942% obtained by the SVM-RBF kernel by using NNMF factor R value is 70 and its computation time is 5.05.

4 Conclusion

An efficient method for tongue image classification using NNMF and different SVM kernels is described in this study. Initially, the NNMF is given for feature extraction with the P-factor values and computation time. At last, different SVM kernels like linear, RBF, quadratic and polynomial kernels are used for prediction. The system yields the overall classification accuracy of 92% by using NNMF and different SVM kernels.

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