Incremental learning for Fast Discrimination of complex compound base on SVM and convex hull vectors

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Abstract:using new samples to improve the accurate of classification for complex compound such as apple essence is a key aspect for rapidly and accurate determination in online detection.In this paper,a novel methodology is proposed,which involves two crucial aspects in the context of the use of online data in classification for complex compound:i)the method of the complex compound resolution for online data by incremental learning algorithm based on Hull vector;and ii)the selection of the most appropriate spectroscopy,taking into account both 识别风险和代价、分辨率等.Both Raman and ion mobility spectrometry (IMS) had the advantages of easy operation and quick analysis.It was shown that the identification accuracy rate of the Raman spectroscopy for nine kinds of apple essences was 98.35%,which is higher then that of the IMS.The results from this study demonstrated that the Raman spectroscopy combined with incremental learning algorithm can be used as a reliable,stable and fast new method to discriminate among complex compound.

Key words:Apple Essences;Incremental Learning;Convex hull;SVM;discrimination

1 I. Introduction

1.1 discrimination of complex compound

1.2 Incremental Learning Base on SVM

公式 1

$$\min_{w,b,\xi} \quad \frac{1}{2}||w||^2 + C\sum_{i=1}^{N}\xi_i^p \tag{1}$$

$$s.t. \;\; y_i(w^T x_i + b) \geq 1 - \xi_i,$$

$$\xi_i \geq 0 \;, \forall \; i \in \{1, \cdots, N\}$$

需要对齐的长公式可以用 split 环境，它本身不能单独使用，因此也称作次环境，必须包含在 equation 或其它数学环境内。split 环境用 \\ 和 & 来分行和设置对齐位置。

$$\min_{w,b,\xi} \quad \frac{1}{2}||w||^2 + C\sum_{i=1}^{N}\xi_i^p$$
$$s.t. y_i(w^T x_i + b) \geq 1 - \xi_i, \tag{1}$$
$$\xi_i \geq 0 \ , \forall \ i \in \{1, \cdots, N\}$$

To simplify matters,the quadratic program is typically expressed in its dual form

$$\max_a \sum_{i=1}^{m} \alpha_i - \frac{1}{2}\sum_{i=1}^{m}\sum_{j=1}^{m} \alpha_i\alpha_j y_i y_j \phi(x_i)^T \phi(x_j) \tag{2}$$

2 II.Experiments and Materials

中文测试

$$(a+b)^3 \qquad = (a+b)(a+b)^2 \tag{2}$$
$$= (a+b)(a^2+2ab+b^2) \tag{3}$$
$$= a^3+3a^2b+3ab^2+b^3 \tag{4}$$

$$label10(a+b)^3 = (a+b)(a+b)^2 \tag{5}$$
$$= (a+b)(a^2+2ab+b^2) \tag{6}$$
$$= a^3+3a^2b+3ab^2+b^3 \tag{7}$$

$$x^2+y^2 = 1 \tag{8}$$
$$x = \sqrt{1-y^2} \tag{9}$$

This example has two column-pairs.

$$\text{Compare } x^2+y^2 = 1 \qquad x^3+y^3 = 1 \tag{10}$$
$$x = \sqrt{1-y^2} \qquad x = \sqrt[3]{1-y^3} \tag{11}$$

This example has three column-pairs.

$$x = y \qquad X = Y \qquad a = b+c \tag{12}$$
$$x' = y' \qquad X' = Y' \qquad a' = b \tag{13}$$
$$x+x' = y+y' \qquad X+X' = Y+Y' \qquad a'b = c'b \tag{14}$$

This example has two column-pairs.

$$\text{Compare } x^2+y^2 = 1 \qquad x^3+y^3 = 1 \tag{15}$$
$$x = \sqrt{1-y^2} \qquad x = \sqrt[3]{1-y^3} \tag{16}$$

This example has three column-pairs.

$$x = y \qquad X = Y \qquad a = b + c \tag{17}$$
$$x' = y' \qquad X' = Y' \qquad a' = b \tag{18}$$
$$x + x' = y + y' \qquad X + X' = Y + Y' \qquad a'b = c'b \tag{19}$$

This example has two column-pairs.

$$\text{Compare } x^2 + y^2 = 1 \qquad x^3 + y^3 = 1 \tag{20}$$
$$x = \sqrt{1 - y^2} \qquad x = \sqrt[3]{1 - y^3} \tag{21}$$

This example has three column-pairs.

$$x = y \qquad X = Y \qquad a = b + c \tag{22}$$
$$x' = y' \qquad X' = Y' \qquad a' = b \tag{23}$$
$$x + x' = y + y' \qquad X + X' = Y + Y' \qquad a'b = c'b \tag{24}$$

$$x = y \qquad \text{by hypothesis} \tag{25}$$
$$x' = y' \qquad \text{by definition} \tag{26}$$
$$x + x' = y + y' \qquad \text{by Axiom 1} \tag{27}$$

$$\begin{aligned} x^2 + y^2 &= 1 \\ x &= \sqrt{1 - y^2} \\ \text{and also } y &= \sqrt{1 - x^2} \end{aligned} \qquad \begin{gathered} (a + b)^2 = a^2 + 2ab + b^2 \\ (a + b) \cdot (a - b) = a^2 - b^2 \end{gathered} \tag{28}$$

$$\begin{aligned} x^2 + y^2 &= 1 \\ x &= \sqrt{1 - y^2} \\ \text{and also } y &= \sqrt{1 - x^2} \end{aligned} \qquad \begin{gathered} (a + b)^2 = a^2 + 2ab + b^2 \\ (a + b) \cdot (a - b) = a^2 - b^2 \end{gathered} \tag{29}$$

$$\left.\begin{aligned} B' &= -\partial \times E \\ E' &= \partial \times B - 4\pi j \end{aligned}\right\} \quad \text{Maxwell's equations}$$

$$\begin{matrix} V_j = v_j & X_i = x_i - q_i x_j & = u_j + \sum_{i \neq j} q_i \\ V_i = v_i - q_i v_j & X_j = x_j & U_i = u_i \end{matrix} \tag{30}$$

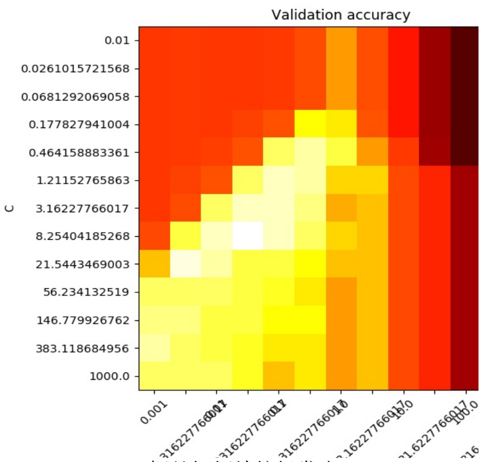
$$A_1 = N_0(\lambda; \Omega') - \phi(\lambda; \Omega') \tag{31}$$
$$A_2 = \phi(\lambda; \Omega')\phi(\lambda; \Omega) \tag{32}$$

and finally

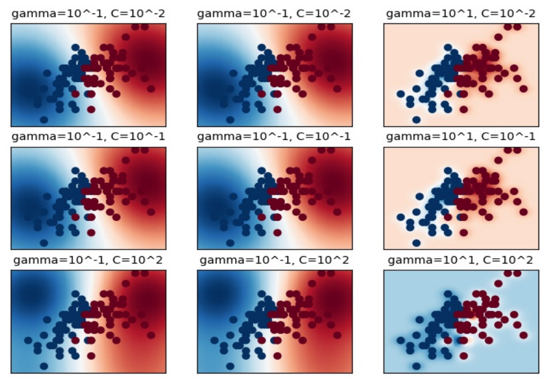
$$A_3 = \mathcal{N}(\lambda; \omega) \tag{33}$$

3 III. Data Analysis

4 IV. Result and Discussion

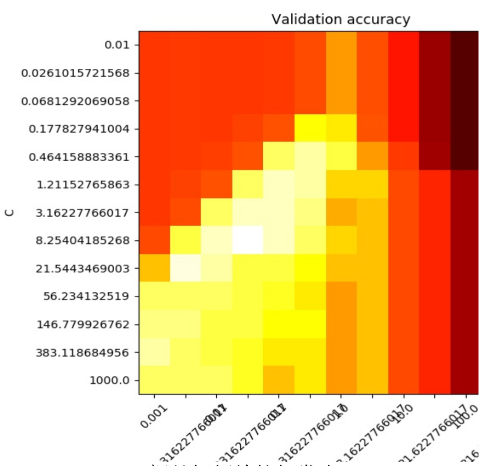


(a) 螺丝钉解放垃圾发电



(b) scatter plot

Figure 1: 并排图



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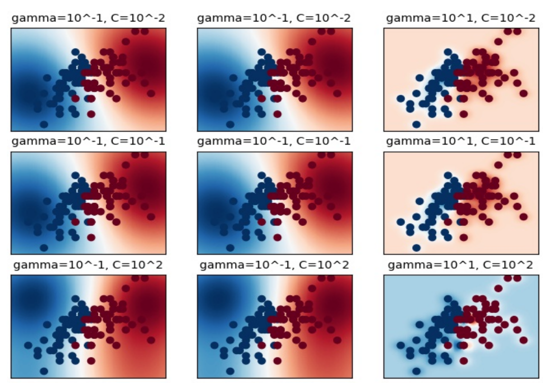

(b) scatter plot

Figure 2: 并排图

5 V. Conclusion

6 References

References

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