Problem Chosen	2022 MCM/ICM Summary Sheet	Team Control Number
Fuck		**22111000**

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How to fuck effectively

Contents

1 Problem Statement

In order to indicate the origin of the toll way problems, the following background is worth mentioning.

The problem is stated here.

2 Assumptions and Justifications

2.1 Assumptions

2.2 Symbols and Definitions

Table 1: Symbols and Definitions.

Notations	Description
η	1
ξ	
P	
r	
x	
X	
N	
n	

2.3 Symbols and Definitions

3 Mathematical Models

3.1 Basic Model

$$\sum_{t} \tag{1}$$

According to Equation (1)

Notations	Description
a	Persuasion of comments
$s(X \to Y)$	Degree of support between X and Y, indicating how often the rules can be used for analysis
$c(X \to Y)$	Confidence between X and Y, indicating the frequency of transactions in Y containing X
X	Promotion/The 'verified purchase' is 'N'
$\overline{X}$	No promotion or The 'verified purchase' is 'Y'
Y	Poor feedback
$\overline{Y}$	Favourable feedback
Z	Poor evaluation support rate
$\overline{Z}$	Favourable support rate
f_V	Amount of platform commentators
$f_{\overline{V}}$	Amount of common customers
a_V	Support rate of comments written by writers
$a_{\overline{V}}$	Support rate of comments written by non writers
a_T	Overall weighted support rate
$Q_\mu(v)$	Amount of comments, dependent variable in multiple linear regression
μ_i	Regression coefficient of multiple linear regression, $\{i = 0, 1, 2, 3\}$
v_i	Independent variable of multiple linear regression, $\{i = 0, 1, 2, 3\}$
v_1	Amount of no promotions in monthly reviews
v_2	Number of disapproval of poor feedback and approval of favorable feedback in each month
v_3	Frequency of good keywords in each month
ξ	Random error term of multiple linear regression
r^2	Sample determination coefficient discrimination coefficient
SSR	Regression sum of squares
SST	Sum of squares of total variation
T	Weighted mean value of star rating in the train set
$\widetilde{T}$	Weighted mean value of star rating in the testing set
std	Standard deviation of the result in training set and testing set
D	Future value of products
φ	Weighted star rating
δ	The rate of positive keywords in reviews

$$\begin{cases} \frac{dS_2}{dt} = -R_0 \cdot S_2(I_1 + I_2) \\ \frac{dI_2}{dt} = R_0 \cdot S_2(I_1 + I_2) - \frac{I_2}{r} \\ \frac{dS_1}{dt} = \rho \left[1 - \frac{S_1 + (1+v/r)I_1}{K_1}\right] - R_0 \cdot S_1(I_1 + I_2) - v \cdot S_1 \\ \frac{dI_1}{dt} = R_0 \cdot S_1(I_1 + I_2) - \frac{I_1}{r+v} \end{cases} \tag{2}$$

3.2 Improved Model

Additional assumptions for the model improvement

Algorithm 1: Competitive selection

Input: the set of data patterns $\mathbb{X}$
Output: the set of prototype seeds $\mathbb{S}^*$

Compute the Euclidean distance $dist\,(\mathbf{x}_m, \mathbf{x}_n)$
Compute the density $D(\mathbf{x}_m) \geq \gamma$
Select eligible $\mathbf{x}_m$ for the candidate seed set $\mathbb{C}^0 \leftarrow \{\mathbf{x}_m \mid C(\mathbf{x}_m, \gamma) = 1\}$
Initialize $\mathbb{C}^* \leftarrow \mathbb{C}^0$
while $\mathbb{C}^* \neq \phi$ **do**
    Initialize $\mathbb{S}^j \leftarrow \mathbb{S}^*$
    Select the winning seed from the candidate set $\mathbf{x}_s^j \leftarrow \arg\max D(\mathbf{x}_m)$, $\mathbf{x}_m \in \mathbb{C}^j$
    Update $\mathbb{S}^* \leftarrow \mathbb{S}^j \cup \{\mathbf{x}_s^j\}$
    Update $j \leftarrow j + 1$
end
return $\mathbb{S}^*$

4 Results and Solutions

Result analysis

Discussions

5 Model Evaluation and Sensitivity Analysis

5.1 Model Evaluation

Figure 1: Figure illustration.

5.2 Sensitivity Analysis

6 Strength and Weakness

6.1 Strength

The models have the following strengths:

- Advantage 1
- Advantage 2

6.2 Weakness

The models have the following weaknesses:

- Weakness 1
- Weakness 2

7 Conclusions

References

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[4] N. Hu, P. Pavlou, and J. Zhang, "Overcoming the J-shaped distribution of products reviews," *Communications of the ACM*, vol. 52, pp. 144-147, 2009.

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[7] E. W. Frees, *Regression Modeling with Actuarial and Financial Applications*, Cambridge, UK: Cambridge University Press, 2009. ISBN: 978-0521135962

Letter

Write the letter here.

Appendix: Programs and Codes

If you do not want to provide program codes, delete this appendix section.

```
import numpy as np
import matplotlib.pyplot as plt

x = np.array([-3.0, -2.9, -2.8, -2.7, -2.5, -2.4, -2.3, -2.2, -2.1, -2])
y = np.sin(x)

plt.figure()
plt.xlabel("x axis")
plt.ylabel("y axis")
plt.plot(x, y, '-^')
plt.xlim(min(x)-0.05, max(x)+0.05)
plt.ylim(min(y)-0.05, max(y)+0.05)
plt.legend(loc='best')
plt.show()
```