



Reputation Management System in Blockchain-based E-commerce

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Project Objectives:

This project aims to create a reputation score system that factors in suspicious user behavior, transaction data, and past reputation to determine the reputation score. This score directly impacts weight given to a buyer's review in computing average product rating, and the value of monetary incentive awarded for leaving this review. As such, users are not only discouraged from malicious behavior (fake and unfair ratings) but also encouraged to leave honest reviews. Smart contracts on the Goerli Ethereum blockchain ensure automated, secure and unbiased reputation calculation.

The Proposed Reputation System:

The reputation score (RS) is a function of:

1. frequency factor (α)
2. deviation factor (β)
3. active factor (γ)

$$RS = \frac{\sum_{i=1}^n RS_i}{n} \quad \text{where } RS_i = \alpha_i \times \beta_i \times \gamma_i$$

$$\alpha = \frac{1}{\lambda^{T_{prev} - T_{incoming}}} \quad \beta = \mu^{|r_{average} - r_{incoming}|} \quad \gamma = \min\left(\frac{N_{user} - N_{MIN}}{N_{MAX} - N_{MIN}}, 1\right)$$

Performance:

By limiting the impact of fake reviews on the average product rating, making the attack prohibitively expensive, and/or making the attack duration prohibitively long, the proposed system has demonstrated the ability to defend against these attacks (non-exhaustive):

Varied high-frequency attacks	Long time gap attacks	Collusion attacks
<p>After 1000 reviews:</p> <p>Reputation Score: Capped at 4/100 Increase in product rating: 2.78</p>	<p>After 1000 reviews:</p> <p>Time taken: 4.33 years Increase in product rating: 77</p>	<p>After 1000 reviews (with new accounts):</p> <p>Estimated cost: S\$7000 Increase in product rating: 2.7</p> <p>After 1000 reviews (with trusted accounts):</p> <p>Estimated cost: S\$90000</p>