REV2: FRAUDULENT USER PREDICTION IN RATING PLATFORMS
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THE FAKE RATINGS PROBLEM

REV2: Fraudulent User Prediction in Rating Platforms
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Hey Srijan!
Hey Tret! How’s your online holiday shopping going?

Fraudulent Users by the rev2 Algorithm?
Very difficult actually! I don’t know which user ratings I can trust and which I can not. It is so easy to give fake ratings and cheat users.

It is indeed. Our REV2 algorithm can help you with this challenge!

That’s awesome! What is REV2?

REV2 ALGORITHM

How do you use this formulation to identify fraudulent users by the REV2 algorithm?

The REV2 algorithm works iteratively: all scores are initialized to their behavior property scores.

Then in each iteration: (1) all goodness scores are updated while keeping all fairness and reliability scores fixed; then (2) all reliability scores are updated; and finally (3) all fairness scores are updated.

This is done until convergence. This is repeated for multiple different hyper-parameter combinations.

The users with lowest average fairness scores are fraudulent.

REV2 PERFORMANCE: UNSUPERVISED AND SUPERVISED

Rev2 consistently performs the best in bad cases and second best in 1/3 cases in unsupervised setting.

In the supervised setting, REV2 outperforms nine algorithms across all datasets.

REV2 FORMULATION

A TOY EXAMPLE

Let me give you a simple example. Here, all users except U2 give high positive scores to P1 and P2, and high negative score to P3. But U2 consistently disagrees with this consensus on several occasions. And so, U2 is an unfair and fraudulent user.

REV2 PROPERTIES

Great! But do you need training labels to run it?

REV2 works in both (unsupervised) and supervised conditions. It can leverage training examples whenever available.

Yes! REV2 is always guaranteed to converge in an upper-bounded number of iterations.

And REV2 has linear-time complexity as well.

REV2 PERFORMANCE: ROBUSTNESS

Nice! How does REV2 perform?

REV2 works great! We compared REV2 with nine state-of-the-art algorithms on five datasets. REV2 performs the best, irrespective of amount of training data.

Here is how REV2 performs on one dataset:

REV2 AT WORK

Flipkart is India’s largest e-commerce platform. We reported the 100 most unfair users in the Flipkart network to their review fraud investigators, and they manually confirmed that 17 users were fraudulent.

Here is how the precision@k changes on Flipkart.

REV2 IS BEING DEPLOYED IN FLIPKART TO DETECT FRAUDULENT USERS!

WHAT IF I HAVE QUESTIONS?

Most definitely! The codes and datasets are all available at http://cs.stanford.edu/~srijan/rev2

FEEL FREE TO REACH ME AT SRIJAN@CS.STANFORD.EDU

THE FAIRNESS, RELIABILITY, AND GOODNESS

Interesting! What are fairness, reliability, and goodness scores?

The fairness and reliability scores indicate how trustworthy a user and rating are, respectively. The goodness of a product indicates the most likely rating a fair user would give it.

Are these scores given?

No, these scores are unknown a priori. But clearly they are mutually inter-dependent. We establish five axioms to relate them for instance. The first one states: Better products get higher ratings.