

# Crowdrebate: An Effective Platform to Getting more Rebate for Customers

Nian Chen <sup>†</sup>, Weijie Sun <sup>†</sup>, Wangze Ni <sup>†</sup>, Zhao Chen <sup>†</sup>, Jiale Gu <sup>†</sup>, Peng Cheng <sup>\*</sup>, Lei Chen <sup>†</sup>, Xuemin Lin <sup>#,\*</sup>

<sup>†</sup>The Hong Kong University of Science and Technology, Hong Kong, China

{nchenaf, zchenah}@connect.ust.hk, {wsunan, wniab, leichen}@cse.ust.hk, jialgu@ust.hk

<sup>\*</sup>East China Normal University, Shanghai, China

pcheng@sei.ecnu.edu.cn

<sup>#</sup>The University of New South Wales, Australia

lxue@cse.unsw.edu.au

**Abstract**—In this demo, we will present the Crowdrebate platform, which collects requests from users, group requests into a set of orders to get more rebates, and relay products to different receivers in an order. We introduce the sketch of system architecture and demonstrate scenarios via several case analysis.

## I. INTRODUCTION

With the flourishing development of e-commerce platforms, online shopping has become part of people’s lives. In order to further stimulate online consumption, e-commerce platforms arrange various promotion campaigns on special days, such as Black Friday [1] in Western countries and Double Eleven in China [2]. Due to the fact that online promotions are too numerous, people can not get promotion information for the first time, some intermediate platforms have emerged in the market, such as Groupon [3] and Dealmoon [4]. These platforms help users sort out the hot deals of various e-commerce platforms, saving the user’s shopping time.

However, sometimes even users know those promotion, they found that their purchase fails to meet the spending threshold to use a coupon or to enjoy the delivery service. In this situation, users will intentionally ask their friends or look for other person on the social networks to place one order together in order to meet the threshold. Because all the e-commerce platforms support only one shipping address for one order, when multiple users place an order together, one of the users will inevitably receive all the products first and then distribute them to others respectively. These complex processes are unreliable and time-consuming for consumers.

What is even more damaging to consumers’ motivation to shopping is that e-commerce promotion activities have become increasingly complicated in recent years. For example, during the 2020 Taobao Double eleven, the platform prolonged the promotional period. This change might aim at bringing more benefits and convenience to consumers, but indeed imposes extra workloads to them, since multiple complex coupons rules change on a daily basis. As a matter of fact, consumers complains that it takes much time to decipher the coupon rules in order to enjoy the event’s maximum benefit [5] [6].

Under these circumstances, our demo-Crowdrebate firmly grasps consumer’s pain point. Crowdrebate collects users’

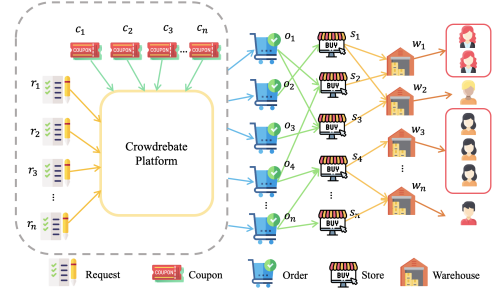


Fig. 1: The operation process of crowdrebate

purchasing requests and group their requests into orders to maximize total benefit. Meanwhile, we give the exposure of online retailers’ promotions so that more users would participate in promotions. To summarize, not only do we dedicate ourselves to help users get more benefits, we also devote ourselves to help e-commerce platforms fill more orders, increase platforms’ revenue, and ultimately achieve a bilateral win-win situation.

Our platform operates as follows 1. Users can post their requirements on our platform. Each requirement corresponds to the e-commerce platform they would like to order from, such as the specific stores, specific products, and prices, as well as the expected period of placing order. Based on the received requests, we will make an order association and match the coupons we crawled from the e-commerce platform to maximize each order’s rebate. Owing to the fact that we place the orders for consumers, the products will first be sent to our warehouses from the online stores, and then we will distribute the products to the according users.

Thus, our demo has three core components:

- Users can publish their needs, our platform collects the demands and crawls online coupons to make patchwork combinations;
- Users can view the latest coupons of e-commerce platforms and the popular products that users would like to buy on the platforms;
- Users can view their historical data analysis, such as our service charges and the amount of money we help users

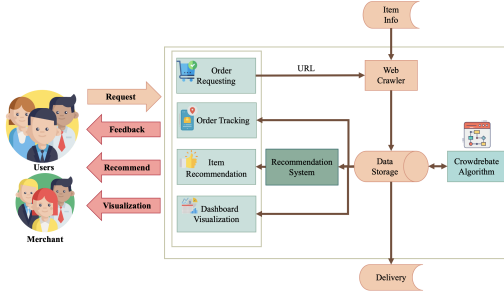


Fig. 2: The architecture of crowdrebate

to save. Furthermore, we can also provide an API to our partner platforms so that they can see the coupon data (such as the regional distribution of users, favorite stores and products, etc.) of the coupons used on our platform.

## II. SYSTEM ARCHITECTURE

### A. set up new request

As shown in figure 2 depicts the architecture of Crowdrebate platform. The user interface module runs on the client side, enabling both general users and merchant users to get corresponding services. The other three modules, crowdrebate algorithm, process automation and recommendation system, run on the server host and provide support for the core functionalities in Crowdrebate. We introduce the technical details of these modules in the rest part of this section.

### B. User Interface

There are two types of users interact with the user interface module, “general users” and “merchant users”. General users, who seek for group buying to meet the threshold of rebates, can request and track their orders with the interface while getting personalized recommendation. Merchant users from online shopping platforms, can benefit from the data dashboard to gain a better understanding of user portraits. This module consists of the following four functions.

1) *Order Requesting*: Users with needs for group shopping can post their requirement on Crowdrebate with this order requesting function. The input for this function consists of two parts, product information and customer information. The former one includes the shopping platform, product link and promotion type which help the web crawlers to target the certain item and its promotions. The key part of customer information are expected time slots and delivery address that have an impact on the rounds and delivery costs for the crowdrebate algorithm to run.

2) *Order Tracking*: The order tracking function enables users to manage all historical orders. No matter whether one’s item is waiting in the pool, being processed to place a order, or already on delivery, users can track realtime status for his order. Crowdrebate platform utilizes the web crawler, crowdrebate algorithm and order scripts to automate the process of group ordering, and updates data timely for users to track.

3) *Item Recommendation*: The item recommendation functions shows users products that best fit personal demands. Crowdrebate have top coupons and recommended products on the home page, where all users share the same information of top coupons while the recommended products are personalized. Both features are fed with datas from Crowdrebate.

4) *Dashboard Visualization*: Crowdrebate opens API and provides visualized data dashboard to cooperating online shopping platform. With the visualized dashboard, merchant users have access to internal datas depicting user portraits, product sales and coupon popularity.

### C. Crowdrebate Algorithm

Crowdrebate algorithm can place orders for users’ best interests, and works as one of the most crucial components in our platform. Considering combination for coupons and delivery costs, Crowdrebate proposed two algorithms to adapt different scenarios.

**“The Order-First Algorithm.”** In most cases, coupons with strict thresholds usually guarantee tempting rebates that should way cover the delivery costs. Under such a scenario, we propose the order-first algorithm to place orders. Generally speaking, this algorithm greedily packs orders for a maximal amount of total rebates while ignoring delivery costs. For each coupon  $c_i$ , we traverse requests  $o_j$  in the pool that is eligible and calculate the differential rebate amount when compared to placing an order separately, and the request with the largest amount will be integrated into one order until for any request the differential rebate amount fails to increase. However, the amount of coupons used in a newly merged order may exceed the upper limit since their amounts are calculated separately before the merger. We introduce \*Dif procedure\* to tackle extra coupons. After packing requests, we need to place the order and assign one single address as the delivery destination. While this algorithm doesn’t take delivery into account before, now it assigns a warehouse to the order to minimize the cost of delivery.

**“The Warehouse-First Algorithm.”** The order-first algorithm performs well in most cases, however, it still suffers from two drawbacks. The first one is due to its lack of consideration for delivery costs, and once the delivery cost gets much higher this algorithm performs poorly. The second defect results from the time complexity introduced by the error correction “Dif procedure”, which can be fatal when handling peak shopping festival traffic. As a result, a more efficient approach, the warehouse-first algorithm, is proposed to tackle the large scale data and non-negligible delivery costs. Instead of directly combining requests for higher rebates, we first group those requests sharing the same warehouse  $w_j$ . Only then will we merge requests within the same warehouse for higher rebates. The preprocessing procedure divides the integral data set into smaller groups to constrain the batch size and running time, and grouping by delivery destination guarantees relatively small delivery costs. Basically the warehouse-first algorithm is more efficient, and can produce a better result for higher

delivery costs while the order-first algorithm stands out when rebates are profitable enough to cover delivery costs.

#### D. Process Automation

Crowdrebate uses the process automation module to complete the whole procedure from picking items to pay for orders in our server. Basically the module is composed of two sub-modules, the web crawler retrieving the information of products and coupons, and the order bot to automatically place an order.

**“The Web Crawler.”** Currently, two types of information will be crawled respectively, products and coupons. For the product information, this module retrieves the data passively. Before the user can post a request, a URL linked to the product must be provided to activate the web crawler. With the pasted URL, the spiderbot crawls the associated coupons along with the product information, and will specifically return options like size or color for the user to choose. In addition, we actually crawl all the meta data of this product for further recommendation function. For the coupon information, this module actively seeks for data. We take the initiative to crawl information from coupon websites like Etao, Alimama to enrich our available coupon pools.

**“The Order Bot.”** The Crowdrebate algorithm runs in rounds periodically and produces final grouped orders each round. Therefore we develop the order bot to automatically handle those orders. Since some exclusive coupons in different orders may violate each other, we introduce multiple accounts to place those exclusive orders which also enables us to run the scripts in parallel.

#### E. Recommendation System

The recommendation system module is one of the key features of Crowdrebate. Considering the online shopping scenario, there won't be a huge change for items on sale, and the similarity of items is relatively stable to the user's interest, so we adapt the item-based collaborative filtering (ItemCF) to recommend similar products. The recommendation system is built upon meta data from the web crawler and users' historical requests and ratings. Since users on Crowdrebate pursue higher rebates, we improved the ItemCF to rank on rebate amount instead of similarities to better meet their demands.

### III. DEMONSTRATION OVERVIEW

In this section, we describe different kinds of scenarios that users commonly encountered in the Crowdrebate platform.

**As a regular user** of the platform, he/she can do the following actions on the platform:

#### A. set up new request

When the user completes the registration on our platform and clicks on the **Set up new request** button 3(a), he will enter the page which guides him to fill in the following information 3(b). At first, the user needs to select the e-commerce platform he wishes to order from. In order to

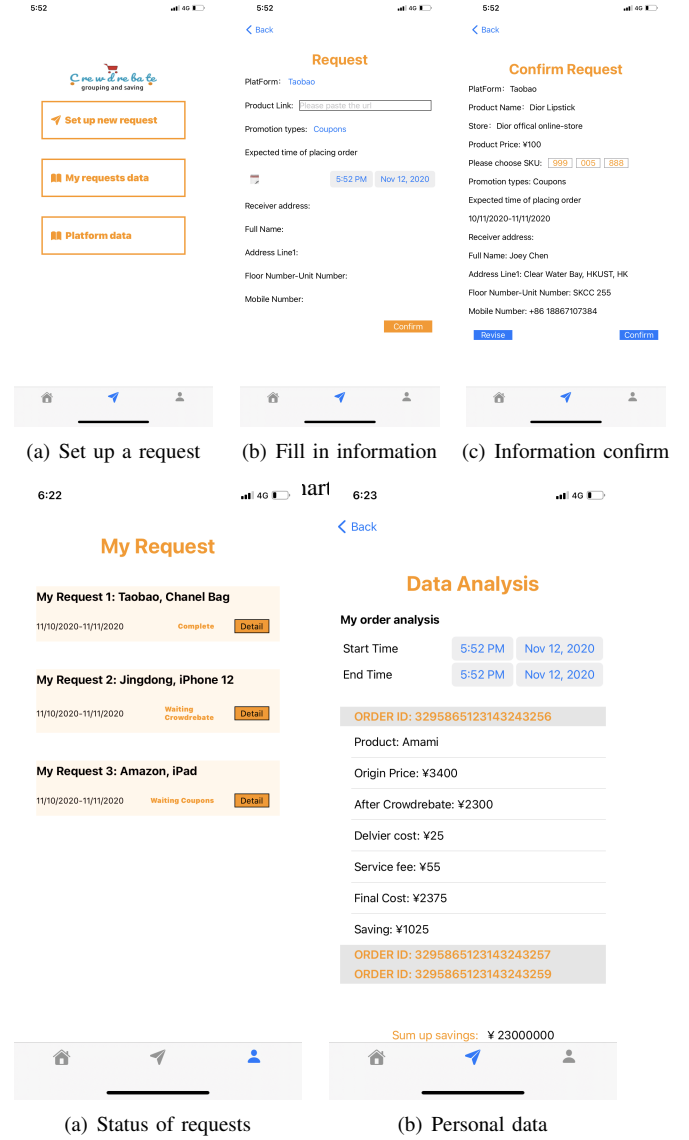


Fig. 4: View status of requests and personal data”.

simplify the user's task and to prevent the platform from placing the wrong order of product, the user will need to copy the URL link of the product he wants to buy, and the platform will automatically crawl the product information such as price, store, promotions, etc. If there is more than one Stock Keeping Unit SKU for the product, we will also crawl to all the SKU information and ask the user to make a choice. Next, the user needs to select the type of promotions he wants to participate in, such as whether to enjoy the coupons or to receive more free samples, and the time slot she/he wants the platform to place the order. Finally, the user fills in the delivery address. After confirming the final information twice 3(c), the platform will start to complete the request at the time specified by the user.

#### B. My requests and data analysis

On the personal page 4(a), the user can check all the requests he/ she made on our platform and the status of each request, such as whether the order has been placed, and

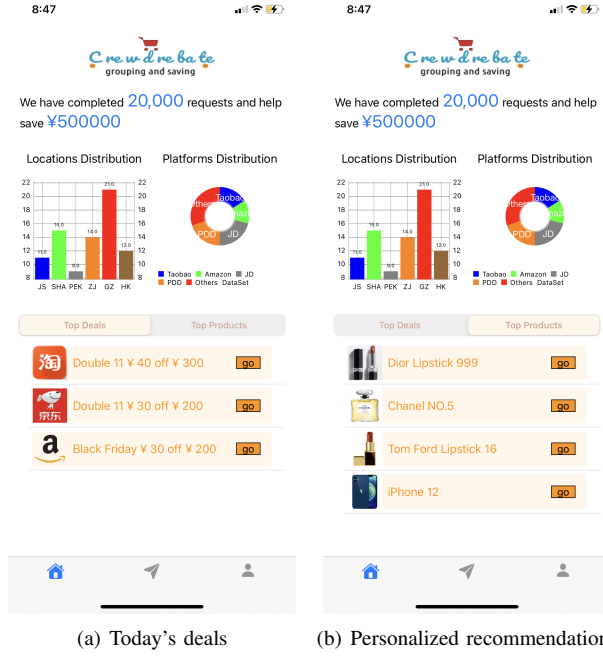


Fig. 5: View Today's deals and personalized recommendations.

whether the product has been sent to the warehouse, etc.

Note that, in order to offer the uses more channels to analyze the purchases on our platform, user can also see specific data for each request in the **My request data** page 4(b), like the original price, the price after the platform placed an order for them, the shipping cost and the platform's service charge, and the saving after deducting various costs. The user can choose to see the sum of the data over a period of time is also worth mentioning.

#### C. Top deals and personalized recommendations

When user are not sure about recent promotions of e-commerce platforms, she/he can use the home page to see our daily updates of platforms' top deals to save time 5(a). When user have no clear shopping target, the platform will make personalized recommendations based on the previous purchase data 5(b).

#### D. Dashboard of data

As **teammates** of the Crowdbate platform or **Our cooperation partners**, in addition to the basic operations mentioned above, they can also carry out the following functions:

Without being interfered with the user privacy, our platform staffs can enter the third button **Platform data** 3(a), where they will be able to see a dashboard of data related to the whole platform, such as how many orders we have received, how many coupons we have used, how much money we have helped users to save, the distribution of our users by regions, and the distribution of platforms they like to launch request 6(a).

As for our cooperation partners of e-commerce platforms, they can see a dashboard of data related to their platforms. For example, as Taobao cooperators, they can see how many of the requests initiated by our platform users are from Taobao,

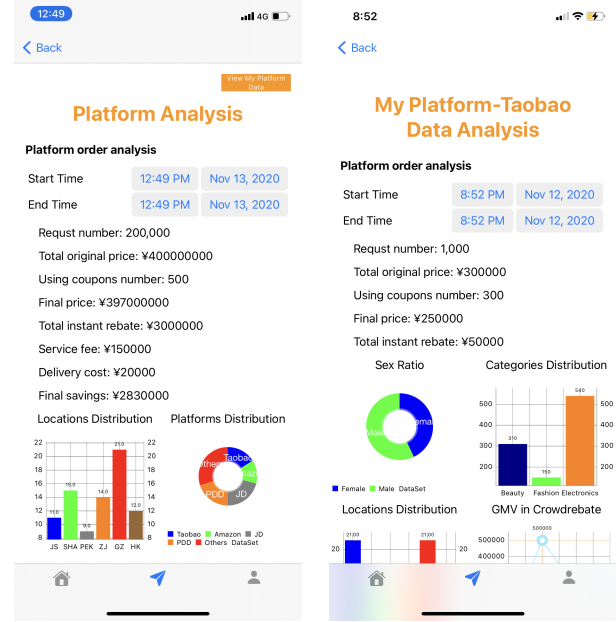


Fig. 6: Dashboard of data.

the distribution of categories they like to buy, the ratio of sex, etc 6(b). This dashboard of data will help our partners to gain a more practical understanding of user preferences, design coupons, and reach a win-win collaboration mechanism.

#### IV. CONCLUSION

In this demo, we will present the Crowdbate platform, which collects requests from users, group requests into a set of orders to get more rebates, and relay products to different receivers in an order. We introduce the sketch of system architecture and demonstrate scenarios via several case analysis.

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