COMMUNICATIONS SERVER APPARATUS, METHOD AND COMMUNICATIONS SYSTEM FOR PROVIDING A RECOMMENDATION OF OFFERINGS BY MERCHANTS TO A USER

Technical Field

The invention relates generally to the field of communications. One aspect of the invention relates to a communications server apparatus for providing a recommendation of offerings by merchants to a user. Other aspects of the invention relate to a method for providing a recommendation of offerings by merchants to a user, and a communications system for providing a recommendation of offerings by merchants to a user.

One aspect of the invention has particular, but not exclusive, application for recommending offerings (e.g., products and/or services) offered by merchants on an online e-commerce platform to users interacting with the platform. The offerings may be ordered or arranged in a manner that is determined according to the monetization rates associated with the corresponding merchants providing the offerings, where the monetization rates may be determined using a plurality of parameters involving the merchants, the users and the administrator of the online platform. As a result, a more balanced recommendation of offerings may be provided to the users, taking into consideration contributions by each merchant to the platform and to the user, thereby allowing opportunities for merchants to improve their profiles on the platform and for users to have better access to a variety of merchants as well as offerings at more competitive costs.

Background

In many online platforms that recommend products or services to users, the goal is typically to maximize the platform's immediate revenue by serving the ones that are most likely to be selected by the user to order and have large order values. The core

of any recommendation platform is a ranking score that is computed for each offering at runtime. The ranked list of offerings served to the user is based on the ranking score. Specifically, the higher the ranking score an offering has, the more visible it will be to the user. Typically the ranking score is defined as the expected immediate revenue to the platform, and the platform will serve the offering with the highest ranking score at the most visible position. This will lead to higher short term revenue to the platform in general.

Due to the way the ranking algorithm works, it is common to have well-known merchants dominate the top recommendations due to their brand recognition, which leads to a higher conversion rate. As a result, many smaller and less well known merchants do not get enough visibility on such platforms to sustain their businesses. Over time, those merchants may feel that the platform is not performing for them and leave, or simply go out of business. This is a reputation bias in the ranking algorithm. Such a vicious cycle results in an ecosystem where only a small number of well-known or high-value merchants dominate, users having fewer choices, and the platform will decline with suboptimal user experience.

Another source of bias that tends to work against smaller merchants is the basket size bias. When the recommendation platform earns revenue in the form of a percentage of the sales, or simply considers bigger purchases are generally better for users and merchants, the recommendation platform will favour merchants with large average basket sizes. In some industries such as food and beverages, merchants with smaller average basket sizes also tend to be smaller ones. As a result, merchants with less expensive offerings tend to have less visibility than they deserve, and users have fewer choices.

Many recommendation platforms try to solve this bias problem by allowing merchants to advertise on their platform, which gives them prime real estate on the recommendation list. However, advertising by itself may not be enough or the best

way for some merchants to attract certain customer segments, as their prices are not attractive enough for those segments. In those cases, merchants will offer discounts to those customer segments. However, since the platform does not profit from the discount, usually it does not take that into account in the recommendation decision, and those merchants will not be able to get the visibility they need to achieve the sales goal. In fact, offering discounts can hurt their visibility if the platform is optimizing for commission revenue, which is usually a percentage of the final gross merchandise value. The current regime operated in most recommendation platforms disincentivize merchants from offering discounts, even if that is what they need to do to acquire customers. This is a bias in the recommendation ranking algorithm due to "promotion blindness."

The three biases (Reputation Bias, Basket Size Bias, and Promotion Blindness) that exist in many recommendation platforms result in an unfair playing field and a monolithic culture in the ecosystem. Users and merchants will suffer, and wither in many cases, in the long run.

Summary

Aspects of the invention are as set out in the independent claims. Some optional features are defined in the dependent claims.

Implementation of the techniques disclosed herein may provide significant technical advantages. Techniques disclosed herein take into account a number of contributions by each merchant to both the online platform hosting offerings for sale to users, and to the users, for providing recommendation of offerings to the users. By such implementation, the merchants can enhance their profiles and visibility to the users and, at the same time, the users can have easier access to a more diverse group of merchants, thus, providing a more variety of choices to the users. This improves efficiency in resource allocation and use of bandwidth and processing load

as compared to known approaches which result in visibility of only a small group of merchants (e.g., only well-known merchants with considerable brand recognition and that can provide high revenue to the platform), where the users would likely need to put in a higher number of requests for products or services due to the limited choices offered to them in order to widen their options, which leads to inefficient usage of resources as such higher number (and sometimes duplicated) requests lead to increased data processing, bandwidth utilization, and memory usage, thus, causing increased data network traffic and delays leading to negative user experience.

Further, by taking into consideration discount contributions by merchants to the users when determining recommendation of offerings to users, users can have relatively higher visibility of offerings with more competitive prices. Similar to the above, this helps to improve efficiency in usage of resources, bandwidth and processing load, as the techniques disclosed herein may alleviate or minimise the need for users to keep submitting new requests or scrolling through a relatively long list of offerings with the hope of finding merchants that offer prices that are acceptable to the users, where such a situation likely results in increased data processing and bandwidth utilization, for example.

In at least some implementations, the techniques disclosed herein may provide for filtering of offerings through use of one or more defined thresholds so as not to serve such offerings, which may be considered less relevant to the user's request, during recommendation to users. Otherwise, the users would have to scroll through a relatively long list of offerings, made worse by the presence of irrelevant offerings that are also served to the users, thus resulting in increased bandwidth utilisation, data network traffic and processing load.

In an exemplary implementation, the functionality of the techniques disclosed herein may be implemented in software running on a handheld communications device,

such as a mobile phone. The software which implements the functionality of the techniques disclosed herein may be contained in an “app” – a computer program, or computer program product – which the user has downloaded from an online store. When running on the, for example, user’s mobile telephone, the hardware features of the mobile telephone may be used to implement the functionality described below, such as using the mobile telephone’s transceiver components to establish the secure communications channel for providing a recommendation of offerings by merchants to a user.

Brief Description of the Drawings

The invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

FIG. 1 is a schematic block diagram illustrating an exemplary communications system involving a communications server apparatus.

FIG. 2A shows a schematic block diagram illustrating a communications server apparatus for providing a recommendation of offerings by merchants to a user.

FIG. 2B shows a schematic block diagram illustrating a data record.

FIG. 2C shows a schematic block diagram illustrating architecture components of the communications server apparatus of FIG. 2A.

FIG. 2D shows a flow chart illustrating a method for providing a recommendation of offerings by merchants to a user.

FIG. 3 shows a schematic of a system diagram and workflow, according to various embodiments.

Detailed Description

Various embodiments may relate to techniques, including methods, for improving content variety through recommendation ranking.

The present techniques aim to address the three biases (Reputation Bias, Basket Size Bias, and Promotion Blindness) identified in known recommendation ranking algorithm. Techniques disclosed herein may improve the variety of merchants participating in a recommendation platform (being or part of an online market or e-commerce platform) by ranking the products and/or services based on their expected monetization rate, which is defined as the proportion of gross order value that the merchant contributes to the platform directly or indirectly if that product or service is shown at the most prominent place (usually at the top) of the list of recommendations. Put in another way, the expected monetization rate associated with a merchant's product or service offering is defined as a proportion of expected gross order value that the merchant contributes to the platform directly or indirectly if that product or service is shown to the user. In other words, the expected monetization rate is how much the merchant is expected to pay the platform as a portion of the order value if an order or sale happened as a result of showing the merchant's offering to the user. A gross order value is the amount of money that goes to the merchant from the order. As a non-limiting example, for a food delivery order, the gross order value includes the cost of food, as well as charges collected by the merchant such as tips and tax. The gross order value does not include food delivery charges and/or platform fees that go to the platform directly.

By ranking products and/or services offered by merchants with high (or relatively higher) monetization rate, the (online market or e-commerce) platform may aid in levelling the playing field between the more well-known merchants and those with less name recognition, between the large-ticket sellers (or merchants) and small-ticket ones, as well as incentivizing merchants to offer discounts to attract end customers (or consumers or users). As a result, the recommendation algorithm or techniques disclosed herein may favour merchants who may contribute a bigger portion of their gross sale to the platform, thus, benefiting the platform in the long run by creating a more diverse and vibrant ecosystem and a loyal merchant base.

Referring first to FIG. 1, a communications system 100 is illustrated, which may be applicable in various embodiments. The communications system 100 may be for providing a recommendation of offerings by merchants to a user.

The communications system 100 includes a communications server apparatus 102, a first user (or client) communications device 104 and a second user (or client) communications device 106. These devices 102, 104, 106 are connected in or to the communications network 108 (for example, the Internet) through respective communications links 110, 112, 114 implementing, for example, internet communications protocols. The communications devices 104, 106 may be able to communicate through other communications networks, such as public switched telephone networks (PSTN networks), including mobile cellular communications networks, but these are omitted from FIG. 1 for the sake of clarity. It should be appreciated that there may be one or more other communications devices similar to the devices 104, 106.

The communications server apparatus 102 may be a single server as illustrated schematically in FIG. 1, or have the functionality performed by the communications server apparatus 102 distributed across multiple server components. In the example of FIG. 1, the communications server apparatus 102 may include a number of individual components including, but not limited to, one or more microprocessors (μP) 116, a memory 118 (e.g., a volatile memory such as a RAM (random access memory)) for the loading of executable instructions 120, the executable instructions 120 defining the functionality the server apparatus 102 carries out under control of the processor 116. The communications server apparatus 102 may also include an input/output (I/O) module (which may be or include a transmitter module and/or a receiver module) 122 allowing the server apparatus 102 to communicate over the communications network 108. User interface (UI) 124 is provided for user control and may include, for example, one or more computing peripheral devices such as display monitors, computer keyboards and the like. The communications

server apparatus 102 may also include a database (DB) 126, the purpose of which will become readily apparent from the following discussion.

The communications server apparatus 102 may be for providing a recommendation of offerings by merchants to a user.

The user communications device 104 may include a number of individual components including, but not limited to, one or more microprocessors (μP) 128, a memory 130 (e.g., a volatile memory such as a RAM) for the loading of executable instructions 132, the executable instructions 132 defining the functionality the user communications device 104 carries out under control of the processor 128. User communications device 104 also includes an input/output (I/O) module (which may be or include a transmitter module and/or a receiver module) 134 allowing the user communications device 104 to communicate over the communications network 108. A user interface (UI) 136 is provided for user control. If the user communications device 104 is, say, a smart phone or tablet device, the user interface 136 may have a touch panel display as is prevalent in many smart phone and other handheld devices. Alternatively, if the user communications device 104 is, say, a desktop or laptop computer, the user interface may have, for example, one or more computing peripheral devices such as display monitors, computer keyboards and the like. User communications device 104 may also include satnav components 137, which allow user communications device 104 to conduct a measurement or at least approximate the geolocation of user communications device 104 by receiving, for example, timing signals from global navigation satellite system (GNSS) satellites through GNSS network using communications channels, as is known.

The user communications device 106 may be, for example, a smart phone or tablet device with the same or a similar hardware architecture to that of the user communications device 104. User communications device 106, has, amongst other things, user interface 136a in the form of a touchscreen display and satnav

components 138. User communications device 106 may be able to communicate with cellular network base stations through cellular telecommunications network using communications channels. User communications device 106 may be able to approximate its geolocation by receiving timing signals from the cellular network base stations through cellular telecommunications network as is known. Of course, user communications device 104 may also be able to approximate its geolocation by receiving timing signals from the cellular network base stations and user communications device 106 may be able to approximate its geolocation by receiving timing signals from the GNSS satellites, but these arrangements are omitted from Figure 1 for the sake of simplicity.

The user communications device 104 and/or the user communications device 106 may be for accessing or interacting with an online platform hosting offerings for sale, where users may request for recommendation for a product or service.

FIG. 2A shows a schematic block diagram illustrating a communications server apparatus 202 for providing a recommendation of offerings by merchants to a user, while FIG. 2B shows a schematic block diagram illustrating a data record 240 that may be generated by the communications server apparatus 202.

The communications server apparatus 202 includes a processor 216 and a memory 218, where the communications server apparatus 202 is configured, under control of the processor 216 to execute instructions in the memory 218 to, in response to receiving request data having a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale, generate, in one or more data records 240, for each offering by a merchant relevant to the product or service, first data 241 indicative of a commission contribution by the merchant to an administrator of the online platform, second data 242 indicative of an advertisement contribution by the merchant to the administrator, third data 243 indicative of a discount contribution by the merchant to the user, fourth

data 244 indicative of a gross order value associated with the merchant, and fifth data 245 indicative of a monetization rate associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value, generate, in the one or more data records 240, ranking data 248 indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants, and transmit, for receipt by at least one user communications device of the user, data indicative of the offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform. The processor 216 and the memory 218 may be coupled to each other (as represented by the line 217), e.g., physically coupled and/or electrically coupled.

In other words, there may be provided a communications server apparatus 202 for recommending offerings (e.g., products and/or services) that are provided or offered by merchants to users. A user may interact with an online (e-commerce) platform hosting the offerings for sale, where the online platform may be communicatively coupled to the communications server apparatus 202. The user may request for a product or service on the online platform. In response to receiving (user) request data including a data field indicative of the product or service requested by the user via the online platform, the communications server apparatus 202 may, in one or more data records 240 and for each offering by a (corresponding) merchant that is relevant to the requested product or service, generate a plurality of data. The plurality of data include first data 241 indicative of a (expected) commission contribution by the merchant to an administrator (or host) of the online platform, second data 242 indicative of an (expected) advertisement contribution by the merchant to the administrator (e.g., an individual or a company or a business entity), third data 243 indicative of a (expected) discount contribution by the merchant to the user, fourth data 244 indicative of a (expected) gross order value associated with the merchant, and fifth data 245 indicative of a (expected) monetization rate

associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value. Therefore, the monetization rate may be defined as monetization rate = [(commission contribution + advertisement contribution + discount contribution) / gross order value]. Each of the commission contribution, the advertisement contribution, the discount contribution, the gross order value, and the monetization rate may be defined in terms of a numerical value.

The communications server apparatus 202 may further generate, in the one or more data records 240, ranking data 248 indicative of a ranking of the merchants (who provide the offerings relevant to the product or service) determined based on the monetization rates associated with the merchants. In this way, the merchants may be ranked relative to each other based on the monetization rates associated with the merchants.

The communications server apparatus 202 may further transmit, for receipt by at least one user communications device of the user, data indicative of the offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform. The order may be a sequential order from the highest monetization rate to the lowest monetization rate. In other words, the offerings may be presented in a recommendation list, where the offerings may be arranged in the order in decreasing monetization rate, starting from an offering by a merchant with the highest associated monetization rate.

The communications server apparatus may arrange the offerings in the order of the merchants in accordance with the ranking data prior to transmission for receipt by the at least one user communications device.

The communications server apparatus may further transmit, for receipt by the at least one user communications device, the ranking data 248.

The commission contribution is zero if there is no commission contribution by the merchant to an administrator, e.g., the merchant has not offered any commission to the administrator for sales made through the platform.

The advertisement contribution is zero if there is no advertisement contribution by the merchant to the administrator, e.g., as a result of at least one of the following: (i) the merchant is not running any advertising campaign on the platform, (ii) the offering by the merchant that is relevant to the product or service is not part of or eligible under an advertising campaign run by the merchant on the platform, (iii) the user is not an eligible user for the advertising campaign, or (iv) the merchant has not offered any payment to the administrator for users clicking on an advertisement run by the merchant as part of the advertising campaign.

The discount contribution is zero if there is no discount contribution by the merchant to the user, e.g., as a result of at least one of the following: (i) the merchant is not running any promotion (or discount) campaign on the platform, (ii) the offering by the merchant that is relevant to the product or service is not part of or eligible under a promotion campaign run by the merchant on the platform, or (iii) the user is not an eligible user for the promotion campaign.

In the context of various embodiments, the (expected) monetization rate is defined as a proportion of the (expected) gross order value that the merchant contributes to the platform directly or indirectly if the offering is shown to the user. In other words, the (expected) monetization rate is how much the merchant may be expected to pay or contribute to the platform as a portion of the order value if an order happened as a result of showing the merchant's offering to the user. As such, the monetization

rate is indicative of a payment by the merchant to the administrator as a proportion of the gross order value.

In the context of various embodiments, the term "gross order value" refers to the amount of money that goes to the merchant from an order or sale, which may include the cost of the offering, tax and tips, but exclude delivery charges or platform fees. As such, the gross order value is indicative of a payment receivable by the merchant from an order or sale made via the online platform.

In the context of various embodiments, the one or more data records 240 may include one or more contribution data fields, one or more order value data fields, one or more rate data fields, and one or more ranking data fields. The communications server apparatus 202 may generate, for or in the one or more contribution data fields, the first data 241, the second data 242 and the third data 243. The communications server apparatus 202 may generate, for or in the one or more order value data fields, the fourth data 244. The communications server apparatus 202 may generate, for or in the one or more rate data fields, the fifth data 245. The communications server apparatus 202 may generate, for or in the one or more ranking data fields, the ranking data 248.

In the context of various embodiments, the one or more data records 240 may be associated with or accessible by the communications server apparatus 202. The one or more data records 240 may be modified or updated by the communications server apparatus 202. The one or more data records 240 may be stored at the communications server apparatus 202, e.g., in the memory 218.

For generating the first data 241, the communications server apparatus 202 may be configured to generate data indicative of a commission rate offered by the merchant to the administrator, and determine the commission contribution as a function of the gross order value and the commission rate. The commission contribution may be

determined by the formula: commission contribution = gross order value × commission rate. The commission rate may refer to a percentage or an absolute amount offered by the merchant to the administrator, for example, of a sale made by the merchant through the online platform.

For generating the second data 242 and the fourth data 244, the communications server apparatus 202 may be configured to generate data indicative of an estimated click through rate (CTR) (i.e., CTR estimate) for an offering that is recommended as a top offering (i.e., top offering in the order determined in accordance with the ranking data). The term "click through rate" refers to the probability that users will click on a merchant result when it is presented at the top of the recommendation list, i.e., probability of users clicking on an offering that is the top recommendation where the corresponding merchant has the highest associated monetization rate.

If the estimated click through rate (CTR estimate) is below a (first) defined threshold, the communications server apparatus 202 may be configured to filter the offering from being recommended to the user. Therefore, such offering is not recommended to the user.

For generating the second data 242, the communications server apparatus 202 may be further configured to generate data indicative of an ad cost per click (ad CPC), and determine the advertisement contribution as a function of the estimated click through rate (CTR estimate) and the ad cost per click (ad CPC). The advertisement contribution may be determined by the formula: advertisement contribution = estimated click through rate × ad cost per click. The term "ad cost per click" refers to the amount that a merchant has offered to pay, to the administrator, for each click by users of an advertisement run by or associated with the merchant.

For generating the fourth data 244, the communications server apparatus 202 may be further configured to generate data indicative of an estimate of the gross order

value (i.e., gross order value estimate) and data indicative of an estimated conversion rate (CVR) (i.e., CVR estimate) for conversion into sale of an offering that is recommended as a top offering (i.e., top offering in the order determined in accordance with the ranking data), and determine the gross order value as a function of the estimate of the gross order value, the estimated click through rate (CTR estimate) and the estimated conversion rate (CVR estimate). The gross order value may be determined by the formula: gross order value = estimate of the gross order value $\times$ estimated click through rate $\times$ estimated conversion rate. The term "conversion rate" refers to the probability that users will place an order after clicking on a merchant result when it is presented at the top of the recommendation list, i.e., probability of users placing an order after clicking on an offering that is the top recommendation where the corresponding merchant has the highest associated monetization rate.

If the estimated conversion rate (CVR estimate) is below a (second) defined threshold, the communications server apparatus 202 may be configured to filter the offering from being recommended to the user. Therefore, such offering is not recommended to the user.

For generating the third data 243, the communications server apparatus 202 may be configured to generate data indicative of a discount rate offered by the merchant to the user, and determine the discount contribution as a function of the gross order value and the discount rate. The discount contribution may be determined by the formula: discount contribution = gross order value $\times$ discount rate. The discount rate may refer to a percentage or an absolute amount offered by the merchant to the user.

The communications server apparatus 202 may be further configured to generate training data based on historical data of user interaction with the online platform (e.g., data associated with past activities or actions by various users on the platform),

and train at least one machine learning model based on the training data for determining the commission contribution, the advertisement contribution and the discount contribution. Each machine learning model may include or may be a linear regression model or a deep learning model. The at least one trained machine learning model may be used to determine the estimated click through rate (CTR estimate), the estimated conversion rate (CVR estimate), and the estimate of the gross order value. In various embodiments, three separate machine learning models may be provided and trained, one each to determine the CTR estimate, the CVR estimate, and the estimate of the gross order value.

In the context of various embodiments, a user communications device may include, but not limited to, a smart phone, tablet, handheld/portable communications device, desktop or laptop computer, terminal computer, etc.

FIG. 2C shows a schematic block diagram illustrating architecture component of the communications server apparatus 202. That is, the communications server apparatus 202 may further include a data generating module 250 to generate the first data 241, the second data 242, the third data 243, the fourth data 244, the fifth data 245, and the ranking data 248 (see FIG. 2B), and a transmitting module 252 to transmit data indicative of the offerings to be recommended to the user.

In the context of various embodiments, the communications server apparatus 202 may be a single server, or have the functionality performed by the communications server apparatus 202 distributed across multiple server components.

FIG. 2D shows a flow chart 260 illustrating a method for providing a recommendation of offerings by merchants to a user.

In response to receiving request data having a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale, in

one or more data records and for each offering by a merchant relevant to the product or service, at 261, first data indicative of a commission contribution by the merchant to an administrator of the online platform are generated, at 262, second data indicative of an advertisement contribution by the merchant to the administrator are generated, at 263, third data indicative of a discount contribution by the merchant to the user are generated, at 264, fourth data indicative of a gross order value associated with the merchant are generated, and, at 265, fifth data indicative of a monetization rate associated with the merchant are generated, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value.

At 266, ranking data indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants are generated in the one or more data records.

At 267, data indicative of the offerings to be recommended to the user are transmitted, for receipt by at least one user communications device of the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform.

For generating the first data, data indicative of a commission rate offered by the merchant to the administrator may be generated, and the commission contribution may be determined as a function of the gross order value and the commission rate. The commission contribution may be determined by the formula: commission contribution = gross order value $\times$ commission rate.

For generating the second data and the fourth data, data indicative of an estimated click through rate (CTR estimate) for an offering that is recommended as a top offering may be generated.

In various embodiments, if the estimated click through rate is below a defined threshold, the offering may be filtered from being recommended to the user.

For generating the second data, data indicative of an ad cost per click (ad CPC) may be generated, and the advertisement contribution may be determined as a function of the estimated click through rate and the ad cost per click. The advertisement contribution may be determined by the formula: advertisement contribution = estimated click through rate $\times$ ad cost per click.

For generating the fourth data, data indicative of an estimate of the gross order value (gross order value estimate) and data indicative of an estimated conversion rate (CVR estimate) for conversion into sale of an offering that is recommended as a top offering may be generated, and the gross order value may be determined as a function of the estimate of the gross order value, the estimated click through rate and the estimated conversion rate. The gross order value may be determined by the formula: gross order value = estimate of the gross order value $\times$ estimated click through rate $\times$ estimated conversion rate.

In various embodiments, if the estimated conversion rate is below a defined threshold, the offering may be filtered from being recommended to the user.

For generating the third data, data indicative of a discount rate offered by the merchant to the user may be generated, and the discount contribution may be determined as a function of the gross order value and the discount rate. The discount contribution may be determined by the formula: discount contribution = gross order value $\times$ discount rate.

In the context of various embodiments, training data may be generated based on historical data of user interaction with the online platform, and at least one machine

learning model may be trained based on the training data for determining the commission contribution, the advertisement contribution and the discount contribution.

It should be appreciated that descriptions in the context of the communications server apparatus 202 may correspondingly be applicable in relation to the method as described in the context of the flow chart 260, and vice versa.

The method as described in the context of the flow chart 260 may be performed in a communications server apparatus (e.g., 202; FIGS. 2A and 2C) for providing a recommendation of offerings by merchants to a user, under control of a processor of the communications server apparatus.

In the context of various embodiments, an “App” or an “application” may be installed or resident on a user communications device and may include processor-executable instructions for execution on the device. As a non-limiting example, a user may access or interact with the online platform via an App. Further, a user may request for a product or service on the online platform via the App.

There may also be provided a computer program product having instructions for implementing the method for providing a recommendation of offerings by merchants to a user as described herein.

There may also be provided a computer program having instructions for implementing the method for providing a recommendation of offerings by merchants to a user as described herein.

There may further be provided a non-transitory storage medium storing instructions, which, when executed by a processor, cause the processor to perform the method

for providing a recommendation of offerings by merchants to a user as described herein.

Various embodiments may further provide a communications system for providing a recommendation of offerings by merchants to a user, having a communications server apparatus, at least one user communications device and communications network equipment operable for the communications server apparatus and the at least one user communications device to establish communication with each other therethrough, wherein the at least one user communications device includes a first processor and a first memory, the at least one user communications device being configured, under control of the first processor, to execute first instructions in the first memory to transmit, for receipt by the communications server apparatus for processing, request data having a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale, and wherein the communications server apparatus includes a second processor and a second memory, the communications server apparatus being configured, under control of the second processor, to execute second instructions in the second memory to, in response to receiving data indicative of the request data, generate, in one or more data records, for each offering by a merchant relevant to the product or service, first data indicative of a commission contribution by the merchant to an administrator of the online platform, second data indicative of an advertisement contribution by the merchant to the administrator, third data indicative of a discount contribution by the merchant to the user, fourth data indicative of a gross order value associated with the merchant, and fifth data indicative of a monetization rate associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value, generate, in the one or more data records, ranking data indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants, and transmit, for receipt by the at least one user communications device of the user, data indicative of the

offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform.

Various embodiments or techniques will now be further described in detail.

Techniques disclosed herein involve using a ranking function equivalent to the monetization rate of eligible merchants to improve diversity of the results presented to the users or consumers. Such ranking function may reduce the reputation and basket size biases as the merchant's absolute conversion rate and basket size are not as important as the willingness to share a bigger portion of their gross revenue with the platform, e.g., an online market or e-commerce platform. Smaller and less well known merchants can compete by offering to do one or more of the following: paying higher commission rates, purchasing advertisements, and offering discounts to customers, which are reflected in the ranking decision as well.

Merchants can contribute to the platform in three ways:

1. Pay commission to the platform as a percentage of each sale or a fixed amount for each sale.
2. Buy advertisement from the platform to increase the visibility of the merchant on the platform.
3. Offer discounts to users on the platform.

The expected monetization rate of each offering is defined as:

$$expected\ monetization\ rate = \frac{expected\ commission + expected\ ad\ revenue + expected\ discount\ value}{expected\ gross\ order\ value}$$ Equation (1).

An "offering" refers to a product or service offered by merchants. Each merchant may have multiple offerings (e.g., multiple products and/or services), and the techniques or algorithm disclosed herein may evaluate each offering separately.

At the serving time, the platform computes the expected monetization rate of each eligible offering that can be served to the user. The serving time refers to the time when a request for recommendation to be served to the user is made. The platform has to make a decision on which offering(s) to recommend to the user. The offering with the highest expected monetization rate is shown at the most prominent position, the one with the second highest expected monetization rate is placed at the next most prominent position, and so on.

Some variables that are employed for implementing the algorithm or technique include:

- Click Through Rate (CTR) - the probability that users will click on the merchant result when it is presented at the top of the recommendation list;
- Conversion Rate (CVR) - the probability that users will place an order after clicking on the merchant result if it is presented at the top of the recommendation list; and
- Ad Cost Per Click (CPC) - the amount that the merchant offered to pay per click when their result serves as an ad on the platform to the user.

It should be appreciated that the CTR and/or the CVR may refer to a respective probability corresponding to the merchant result when it is presented only at the top of the recommendation list.

In order to estimate the expected monetization rate (see Equation (1)) at the serving time, the expected commission, the expected ad revenue, the expected discount value, and the expected gross order value are computed. These estimates are determined as follows:

$$\begin{matrix} expected \\ gross\ order\ value \end{matrix} = \begin{matrix} gross\ order \\ value\ estimate \end{matrix} \times CTR\ estimate \times CVR\ estimate \quad \text{Equation (2),}$$

$$\underset{commission}{expected} = \underset{gross\ order\ value}{expected} \times commission\ rate \quad \text{Equation (3),}$$

$$expected\ ad\ revenue = CTR\ estimate \times ad\ CPC \quad \text{Equation (4),}$$

$$\underset{discount\ value}{expected} = \underset{gross\ order\ value}{expected} \times discount\ rate \quad \text{Equation (5).}$$

The recommendation platform of various embodiments, being or part of the online market or e-commerce platform, includes components or features to estimate the following quantities or parameters for each merchant offering at the serving time to support the above calculations:

- Gross order value estimate;
- Click Through Rate (CTR) estimate; and
- Conversion Rate (CVR) estimate.

Such components may be in the form of one or more machine learning (ML) models that may be trained using historical data of how users interact with different results on the e-commerce platform. In various embodiments, three separate ML models may be employed, one each for gross order value estimate, CTR estimate and CVR estimate. Each of the three ML models may be trained offline using historical data, which include features used as input to the model such as user's past activities on the platform (e.g., CTR, number of visits per day, etc.), and observed outcome – the gross order value estimation model uses the gross order value; the CTR estimation model considers or use whether a click occurred after a certain offering is presented to the user; and the CVR model considers or use whether an order occurred after a certain offering is presented to the user. The ML models can be in different forms such as a linear regression or deep learning model. The choice depends on the amount of data available and the complexity of the relationship. The training data used are collected by previous recommendations shown to different users on the

platform. The corresponding ML model can be used to predict the likelihood of an outcome such as a click or order based on the feature input at serving time.

The gross order value estimate provides an estimate of the gross value (prices) of the products/services made by a user in one order or sale. The product/service offering recommended to the user can be (only) part of the final order placed by the user. It should be appreciated that the final order may exclude the product recommended, but the order may still be attributed to the recommendation served to the user as it draws the user down the conversion funnel.

The non-limiting example below, as shown in TABLE 1 and TABLE 2, illustrates how ranking by the expected monetization rate disclosed herein may allow merchants to gain better visibility on the e-commerce platform by contributing, for example, through advertising on the platform and/or offering discounts to users. The numbers in TABLE 1 and TABLE 2 are provided as non-limiting examples, where one or more of the numbers involved may be rounded numbers. As shown in TABLE 1, Merchants 1 and 2 have higher click-through rates (CTR), higher conversion rates (CVR), and higher average (gross) order values than Merchants 3 and 4. If the ranking score is defined as the expected commission like most known recommendation platforms, Merchants 1 and 2 will be ranked on top, as shown in TABLE 2.

In the example shown, Merchant 3 is running an advertising campaign on the platform and offers to pay $0.10 per click on its ad. Merchant 4 is offering a 20% discount to users on its orders. When the merchants are ranked by monetization rate, as shown in TABLE 2, Merchants 3 and 4 end up being ranked above Merchants 1 and 2, despite their lower conversion rates and lower gross order values. The increased visibility may help Merchants 3 and 4 to get more orders or sales, and may aid in diversifying the set of merchants on the e-commerce platform. As a result, consumers or users have more choices and may be more satisfied in the long run.

TABLE 1: Settings and performance estimates of 4 hypothetical merchants on a recommendation platform.

Merchant	commission rate	discount rate	ad CPC	CTR estimate	CVR estimate	Gross order value estimate
1	20%	0%	$0.00	20%	20%	$10.20
2	15%	0%	$0.00	10%	20%	$12.50
3	20%	0%	$0.10	9%	9%	$7.80
4	20%	20%	$0.00	8%	8%	$5.90

TABLE 2: Ranking scores and the intermediate calculations, and the final ranking based on two ranking methods.

Merchant	expected gross order value	expected commission	expected ad revenue	expected discount value	Total merchant contribution	expected monetization rate	Ranking based on expected commission	Ranking based on expected monetization rate
1	$0.408	$0.082	$0.000	$0.000	$0.082	0.200	1	**3**
2	$0.250	$0.038	$0.000	$0.000	$0.038	0.150	2	**4**
3	$0.063	$0.013	$0.009	$0.000	$0.022	0.342	3	**2**
4	$0.038	$0.008	$0.000	$0.008	$0.015	0.400	4	**1**

In various embodiments, the recommendation list is ordered according to the ranking based on the expected monetization rate. When the list of recommendation relevant to the product or service requested by a user is presented to the user, the user will see a list of the products or services that are the same as, or similar to, or relevant to the requested product or service (i.e., a list of offerings relating to the requested product or service), sorted by merchants who offer the products or services according to the ranking determined by the merchants' expected monetization rates. In other words, the ranked list of recommendation shows the

order of merchants (ranked according to their expected monetization rates) that offer or sell the requested product or service. It should be appreciated that the request by or from a user or consumer may be for a generic product such as “chicken”, and each offering may be more specific such as “chicken rice”, “fried chicken”, “chicken soup”, etc. Therefore, the ranked list of recommendation may contain products and/or services that may be relevant or similar to or associated with the product or service included with the request made by the user.

FIG. 3 shows a schematic of a system diagram and workflow 370, according to various embodiments. Users or consumers 371 may use a "User App" 372 that may be installed or resident on a communications device of the respective user 371 and may include processor-executable instructions for execution on the communications device for interacting with and/or accessing the online e-commerce or recommendation platform. Merchants 373 may use a "Merchant App" 374 that may be installed or resident on a communications device of the respective merchant 373 and may include processor-executable instructions for execution on the communications device for interacting with and/or accessing the online e-commerce or recommendation platform. It should be appreciated that, in various embodiments, the user app 372 and the merchant app 374 may be the same app, where select or different functionalities or options within the app may be available to different groups or people, depending on whether they are consumers 371 or merchants 373, which may be identifiable, for example, by input or data submitted during the registration process for the app 372, 374.

Merchant experience

Merchants 373 can use the merchant app 374 to set up, for example, as part of the "Merchant Service" 388, promotion and advertising campaigns, as well as managing their commission rates, if the platform allows for such options. Some of the actions that may be performed by merchants 373 may include, but not limited, to the

following. Further, it should be appreciated that not all of the actions described below may be required or available.

(i) Setting up promotion campaigns (e.g., discount promotions).

- A merchant 373 can login to the merchant app 374.
- The merchant 373 creates a promotion campaign.
- The merchant 373 configures campaign parameters including, but not limited to:
  - Start and end dates for the promotion campaign;
  - Eligible users 371 to receive the promotion (e.g., which may be all users 371 or certain groups or categories of users 371 whom the promotion is directed to or made available to);
  - Eligible offerings or items (e.g., products and/or services) of the merchant 373 where discounts may be offered;
  - Discounts offered on eligible items to the eligible users 371. This may involve setting the discounts offered, for example, as a percentage of the item price, a fixed amount off the item price, discount for bundle buy of 2 or more items, etc.).

(ii) Setting up advertising campaigns.

- A merchant 373 can login to the merchant app 374.
- The merchant 373 creates an advertising campaign.
- The merchant 373 configures campaign parameters including, but not limited to:
  - Start and end dates for the advertising campaign;
  - Eligible users 371 to see the advertisement (e.g., which may be all users 371 or certain groups or categories of users 371 whom the advertisement is directed to or made available to);
  - Offerings or Items (e.g., products and/or services) of the merchant 373 that are available to be promoted through the advertisement;

- Cost per click for the advertisement.

(iii) Setting and changing commission rates.

- A merchant 373 can login to the merchant app 374.
- The merchant 373 sets a commission rate.
- The merchant 373 changes the commission rate within an allowed range.

Merchant attributes (e.g., location, offerings, hours, etc.), and the campaigns created by the merchants 373 may be stored in a datalake (eg., a centralized repository for storing data) 390. The commission rates may also be stored in the datalake 390.

Recommendation workflow

During an online session when users 371 open or initiate the user app 372 to get recommendations about a product or service, the e-commerce or recommendation platform may, as a non-limiting example, follow the workflow described below with reference to the system 370 shown schematically in FIG. 3, to generate the ranked list of recommendations based on the monetization rate.

- In response to an input or request by a user 371 for recommendation made via a corresponding user app 372, the user app 372 sends one or more requests for recommendations to the Recommendation Service 375.
- The Recommendation Service 375 retrieves candidate offerings (e.g., products and/or services relevant to the user request) from the Offer store 382, as well as promotion and advertising campaign information from the Campaign store 384. Then, the Recommendation Service 375 sends the set of candidate offerings, along with the promotion and advertisement information about them, to the Ranking Engine 376.
- The Ranking Engine 376 evaluates each candidate offering by performing the following functions:
  - Estimate gross order value (e.g., using a machine learning (ML) model 398) via the Order Value Estimation Service 380a.

- Estimate CTR (e.g., using a machine learning (ML) model 398) via the CTR Estimation Service 380b.
- Estimate CVR (e.g., using a machine learning (ML) model 398) via the CVR Estimation Service 380c.
- Filter out low quality candidates.
- Compute expected commission.
- Compute expected ad revenue.
- Compute expected discount value.
- Compute expected gross order value.
- Compute expected monetization rate.
- Rank candidate offerings by expected monetization rate.
- Return the ranked list of offerings to the Recommendation Service 375.

- The Recommendation Service 375 returns or communicates the ranked list of offerings back to the user (or client) app 372 for serving to the user 371 who requested for recommendation.

The expected gross order value may be computed by the Order Value Estimation Service 380a.

The Ranking and Pricing Service 378 may be employed to carry out one or more of the following: (i) filter out low quality candidates, (ii) compute expected commission, (iii) compute expected ad revenue, (iv) compute expected discount value, (v) compute expected monetization rate, and (vi) rank candidate offerings by expected monetization rate.

For filtering low quality candidates, thresholds on CTR and CVR estimates may be set on the platform, where candidates with estimated CTR and CVR below such thresholds may be filtered as such candidate are expected to be irrelevant to the user and may cause bad experience.

Referring to FIG. 3, the Online Feature Reducer 386, the Online Feature Store 387, the Offline Feature Reducer 392 and the Offline Feature Store 394 are machine learning components.

The Online Feature Reducer 386 processes (all) the data that are available at the serving time, including both data collected in advance such as campaign data, as well as data only available at the serving time such as user location, and turn them into features that can be used by the various estimation services 380a, 380b, 380c to generate estimates.

The Online Feature Store 387 is a storage device to hold feature data that is generated by the Online Feature Reducer 386 to facilitate consumption of such feature data by the various estimation services 380a, 380b, 380c.

The Offline Feature Reducer 392 is similar to the Online Feature Reducer 386 except that it processes data that are collected before the serving time.

The Offline Feature Store 394 is similar to the Online Feature Store 387 except that it is used to store feature data generated by the Offline Feature Store 394. The feature data from the Offline Feature Store 394 may be provided to the Model Training module 396 for training the models 398.

It will be appreciated that the invention has been described by way of example only. Various modifications may be made to the techniques described herein without departing from the spirit and scope of the appended claims. The disclosed techniques comprise techniques which may be provided in a stand-alone manner, or in combination with one another. Therefore, features described with respect to one technique may also be presented in combination with another technique.

Claims

1. A communications server apparatus for providing a recommendation of offerings by merchants to a user, comprising a processor and a memory, the communications server apparatus being configured, under control of the processor to execute instructions in the memory to:

in response to receiving request data comprising a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale,

generate, in one or more data records, for each offering by a merchant relevant to the product or service,

first data indicative of a commission contribution by the merchant to an administrator of the online platform;

second data indicative of an advertisement contribution by the merchant to the administrator;

third data indicative of a discount contribution by the merchant to the user;

fourth data indicative of a gross order value associated with the merchant; and

fifth data indicative of a monetization rate associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value;

generate, in the one or more data records, ranking data indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants; and

transmit, for receipt by at least one user communications device of the user, data indicative of the offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform.

2. The communications server apparatus as claimed in claim 1, wherein, for generating the first data, the communications server apparatus is configured to:

generate data indicative of a commission rate offered by the merchant to the administrator; and

determine the commission contribution as a function of the gross order value and the commission rate.

3. The communications server apparatus as claimed in claim 2, wherein the commission contribution is determined by the formula:

commission contribution = gross order value $\times$ commission rate.

4. The communications server apparatus as claimed in any one of claims 1 to 3, wherein, for generating the second data and the fourth data, the communications server apparatus is configured to generate data indicative of an estimated click through rate for an offering that is recommended as a top offering.

5. The communications server apparatus as claimed in claim 4, wherein, if the estimated click through rate is below a defined threshold, the communications server apparatus is configured to filter the offering from being recommended to the user.

6. The communications server apparatus as claimed in claim 4 or 5, wherein, for generating the second data, the communications server apparatus is further configured to:

generate data indicative of an ad cost per click; and

determine the advertisement contribution as a function of the estimated click through rate and the ad cost per click.

7. The communications server apparatus as claimed in claim 6, wherein the advertisement contribution is determined by the formula:

advertisement contribution = estimated click through rate × ad cost per click.

8. The communications server apparatus as claimed in any one of claims 4 to 7, wherein, for generating the fourth data, the communications server apparatus is further configured to:

generate data indicative of an estimate of the gross order value and data indicative of an estimated conversion rate for conversion into sale of an offering that is recommended as a top offering; and

determine the gross order value as a function of the estimate of the gross order value, the estimated click through rate and the estimated conversion rate.

9. The communications server apparatus as claimed in claim 8, wherein, if the estimated conversion rate is below a defined threshold, the communications server apparatus is configured to filter the offering from being recommended to the user.

10. The communications server apparatus as claimed in any one of claims 4 to 9, wherein the gross order value is determined by the formula:

gross order value = estimate of the gross order value × estimated click through rate × estimated conversion rate.

11. The communications server apparatus as claimed in any one of claims 1 to 10, wherein, for generating the third data, the communications server apparatus is configured to:

generate data indicative of a discount rate offered by the merchant to the user; and

determine the discount contribution as a function of the gross order value and the discount rate.

12. The communications server apparatus as claimed in claim 11, wherein the discount contribution is determined by the formula:

discount contribution = gross order value $\times$ discount rate.

13. The communications server apparatus as claimed in any one of claims 1 to 12, wherein the communications server apparatus is further configured to:

generate training data based on historical data of user interaction with the online platform; and

train at least one machine learning model based on the training data for determining the commission contribution, the advertisement contribution and the discount contribution.

14. A method for providing a recommendation of offerings by merchants to a user, the method comprising:

in response to receiving request data comprising a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale,

generating, in one or more data records, for each offering by a merchant relevant to the product or service,

first data indicative of a commission contribution by the merchant to an administrator of the online platform;

second data indicative of an advertisement contribution by the merchant to the administrator;

third data indicative of a discount contribution by the merchant to the user;

fourth data indicative of a gross order value associated with the merchant; and

fifth data indicative of a monetization rate associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of

the commission contribution, the advertisement contribution, and the discount contribution to the gross order value;

generating, in the one or more data records, ranking data indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants; and

transmitting, for receipt by at least one user communications device of the user, data indicative of the offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform.

15. The method as claimed in claim 14, wherein generating the first data comprises:

generating data indicative of a commission rate offered by the merchant to the administrator; and

determining the commission contribution as a function of the gross order value and the commission rate.

16. The method as claimed in claim 15, wherein the commission contribution is determined by the formula:

commission contribution = gross order value $\times$ commission rate.

17. The method as claimed in any one of claims 14 to 16, wherein, for generating the second data and the fourth data, the method comprises generating data indicative of an estimated click through rate for an offering that is recommended as a top offering.

18. The method as claimed in claim 17, wherein, if the estimated click through rate is below a defined threshold, the method further comprises filtering the offering from being recommended to the user.

19. The method as claimed in claim 17 or 18, wherein generating the second data comprises:

generating data indicative of an ad cost per click; and

determining the advertisement contribution as a function of the estimated click through rate and the ad cost per click.

20. The method as claimed in claim 19, wherein the advertisement contribution is determined by the formula:

advertisement contribution = estimated click through rate $\times$ ad cost per click.

21. The method as claimed in any one of claims 17 to 20, wherein generating the fourth data comprises:

generating data indicative of an estimate of the gross order value and data indicative of an estimated conversion rate for conversion into sale of an offering that is recommended as a top offering; and

determining the gross order value as a function of the estimate of the gross order value, the estimated click through rate and the estimated conversion rate.

22. The method as claimed in claim 21, wherein, if the estimated conversion rate is below a defined threshold, the method further comprises filtering the offering from being recommended to the user.

23. The method as claimed in any one of claims 17 to 22, wherein the gross order value is determined by the formula:

gross order value = estimate of the gross order value $\times$ estimated click through rate $\times$ estimated conversion rate.

24. The method as claimed in any one of claims 14 to 23, wherein generating the third data comprises:

generating data indicative of a discount rate offered by the merchant to the user; and

determining the discount contribution as a function of the gross order value and the discount rate.

25. The method as claimed in claim 24, wherein the discount contribution is determined by the formula:

$$\text{discount contribution} = \text{gross order value} \times \text{discount rate}.$$

26. The method as claimed in any one of claims 14 to 25, further comprising:

generating training data based on historical data of user interaction with the online platform; and

training at least one machine learning model based on the training data for determining the commission contribution, the advertisement contribution and the discount contribution.

27. A computer program or a computer program product comprising instructions for implementing the method as claimed in any one of claims 14 to 26.

28. A non-transitory storage medium storing instructions, which when executed by a processor cause the processor to perform the method as claimed in any one of claims 14 to 26.

29. A communications system for providing a recommendation of offerings by merchants to a user, comprising a communications server apparatus, at least one user communications device and communications network equipment operable for the communications server apparatus and the at least one user communications device to establish communication with each other therethrough,

wherein the at least one user communications device comprises a first processor and a first memory, the at least one user communications device being

configured, under control of the first processor, to execute first instructions stored in the first memory to transmit, for receipt by the communications server apparatus for processing, request data comprising a data field indicative of a product or service requested by the user via an online platform hosting the offerings for sale; and

wherein the communications server apparatus comprises a second processor and a second memory, the communications server apparatus being configured, under control of the second processor, to execute second instructions stored in the second memory to:

in response to receiving data indicative of the request data, generate, in one or more data records, for each offering by a merchant relevant to the product or service,

first data indicative of a commission contribution by the merchant to an administrator of the online platform;

second data indicative of an advertisement contribution by the merchant to the administrator;

third data indicative of a discount contribution by the merchant to the user;

fourth data indicative of a gross order value associated with the merchant; and

fifth data indicative of a monetization rate associated with the merchant, wherein the monetization rate is determined as a ratio of a sum of the commission contribution, the advertisement contribution, and the discount contribution to the gross order value;

generate, in the one or more data records, ranking data indicative of a ranking of the merchants determined based on the monetization rates associated with the merchants; and

transmit, for receipt by the at least one user communications device of the user, data indicative of the offerings to be recommended to the user, the offerings being arranged in an order of the merchants in accordance with the ranking data for selection by the user on the online platform.