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INFERRING MERCHANT REVIEW SCORES FROM PAYMENT DATA

ABSTRACT

Users complete payment transactions with various merchants using a wallet application or similar payment application maintained by an account management computing system. The account management computing system creates a predictive model or trains a machine learnt regression function or classifier model to predict the merchant review score based on the payment information received from the user device. A merchant is identified to derive a merchant review score and the account management computing system identifies the business type of the identified merchant. Payment data that corresponds to completed payment transaction between various users and the identified merchant are identified. Each part of the payment data that can be used by the predictive model to infer a merchant review score is a signal that is identified from the payment data.

During its analysis of the first signal, the account management computing system determines the number of times the user has visited the identified merchant. The number of repeat visits to the identified merchant can be normalized based on a similar merchant type. During its analysis of the second signal, the account management computing system determines the difference between the preauthorized payment amount and the final payment amount for the user’s payment transaction with the identified merchant. This analysis will yield a calculated gratuity amount. The gratuity amount can be normalized based on a user’s typical gratuity amount for a similar merchant type or based on geographic locations. The predictive model is applied to the identified signals to infer a merchant review score. The account management computing system outputs the merchant review score for the identified merchant.

SUGGESTED KEYWORDS

Merchant Review Score, Business Review Score, Inferring Review Score

BACKGROUND

Consumers actively seek out and read consumer reviews of merchants to aid in their decision which merchant to engage for business. However, despite the large number of consumers that read the reviews, very few actually leave reviews for the merchants they visit. This is especially true of merchant review systems that focus on local merchants. Often this lack of consumers leaving merchant reviews leads to a biased merchant review score or no
review score at all. Additionally, given that most consumers have never submitted any merchant reviews or provided any signal about which merchants they enjoy, it is very difficult for a merchant review system to offer useful recommendations for new places the consumer might enjoy in the future.

Therefore, it is desirable to automatically infer merchant ratings from consumer behavior. Inferring merchant ratings from consumer behavior can provide more accurate merchant review data and improved merchant recommendations for the consumer.

DETAILED DESCRIPTION

Payment data can comprise useful signals to determine whether a user would likely provide positive, negative, or neutral feedback for a merchant. For example, examination of payment data can provide useful information regarding whether a user has re-visited a merchant. With certain types of merchants, for example hair salons and coffee shops, repeat customers are expected. A user that frequently re-visit a merchant location where repeat customers are expected would likely provide positive feedback. However, a user that stops visiting a merchant location where repeat customers are expected would likely provide negative feedback.

Examination of payment data can also provide user information regarding a gratuity amount. With certain types of merchants, for example, restaurants, taxis, spas, and hair salons, leaving a gratuity is expected. A user that provides a larger than expected gratuity would likely provide positive feedback. However, a user that leaves a smaller than expected gratuity would likely provide negative feedback.

To gather this payment data, users complete payment transactions with various merchants using a wallet application or similar payment application on each user computing device. The wallet application is maintained by the account management computing system, so that the account management computing system receives a record for each payment transaction completed. For example, the account management computing system may function as the issuer system or other intermediary system that coordinates and facilitates each payment transaction that occurs using a wallet application on a user computing device. In another example, the account management computing system maintains a financial account that is used to complete the payment transaction. In another example, the account management computing system maintains user accounts that provide the account management computing system anonymous access to the payment data. Multiple users complete multiple payment transactions with multiple different merchants to provide a rich
sampling of payment data. In one example, the account management computing system continues to obtain the payment data as more and more payment transactions are completed. In an example, the payment data analyzed by the account management computing system is anonymous without indicating a user identity associated with the payment data.

The account management computing system creates a predictive model or trains a machine learnt regression function or classifier model to predict the merchant review score based on the payment information received from the user device. The predictive model may be an artificial neural network or other form of adaptive system model that analyzes data and relationships to find patterns in the data. The predictive model may also be a Gaussian Mixture Model, decision tree, Markov Decision Process, or other mathematical framework for modeling decision making. The account management computing system may create two or more different predictive models. For example, the account management computing system can create a different model for each type of merchant business (for example, separating hair salons from restaurants). In another example, the account management computing system can create a different model for each type of signal identified from the payment data (for example, separate models for providing merchant review scores based on repeat visits and based on gratuity amount).

In yet another example, the account management computing system can create a model or set of rules by analyzing the repeat visit and/or gratuity amount associated with a user’s visit to a merchant and the user’s corresponding merchant review left for the merchant. In this example, the account management computing system can identify those users that have left a review for a merchant. The account management computing system can then identify whether the user is a repeat customer of the merchant and/or the user’s gratuity amount for each visit. These determinations can be used to create or train the predictive model. Alternatively, any combination of number or types of models can be used.

A merchant is identified to derive a merchant review score. For example, the account management computing system identifies a merchant that has less than a threshold number of merchant review scores. In another example, the account management system identifies a merchant frequently visited by multiple different users. The account management computing system identifies the business type of the identified merchant. For example, the account management computing system identifies that the merchant is a hair salon, taxi service, restaurant, spa, or other merchant type. The identified merchant type can be used to determine the type of signals to identify from the payment data and/or the predictive model to apply to the identified signals.
The account management computing system identifies payment data that corresponds to the identified merchant. For example, the account management computing system identified Merchant Z, a local hair salon, to provide a merchant review score. The account management computing system identifies each payment transaction that occurred between a user and Merchant Z. Because Merchant Z is a hair salon, which is a business type that expects repeat customers, the same user may have visited and completed a payment transaction with Merchant Z multiple times. The account management computing system can identify the payment data for each of the payment transactions between the user and Merchant Z. In this example, the payment data comprises a number of times the user has revisited Merchant Z. Because Merchant Z is a hair salon, which is also a business type that expects a gratuity, the payment data also comprises a gratuity left by the user at the completion of each visit. In another example, the account management computing system repeats this process to identify payment data for payment transaction between multiple different users and Merchant Z.

Signals are identified from the payment data. Each part of the payment data that can be used by the predictive model to infer a merchant review score is a signal. Continuing with the previous example, because Merchant Z is a hair salon, which is a business type that expects repeat customers, a first signal is previous visits. Additionally, because Merchant Z is a hair salon, which is also a business type that expects a gratuity, a second signal is a gratuity amount.

During its analysis of the first signal, the account management computing system determines the number of times the user has visited the identified merchant. Continuing with the previous example, the identified merchant is Merchant Z, a hair salon. The account management computing system determines that User X has completed three payment transactions with Merchant Z, the last payment transaction completed on week ago. Based on these payment details, the account management computing system can infer that User X is a repeat customer of Merchant Z. In another example, User Y has complete one payment transaction with Merchant Z, the last payment transaction completed one year ago. Because Merchant Z is a hair salon and repeat visits are expected, the account management computing system can infer that User Y is not a repeat customer of Merchant Z.

During its analysis of the second signal, the account management computing system determines the difference between the preauthorized payment amount and the final payment amount for the user’s payment transaction with the identified merchant. This analysis will yield a calculated gratuity amount. Continuing with the previous example, the identified
Merchant is Merchant Z, a hair salon. At each of User X’s three visits the preauthorized payment amount is $200. The final payment amount is $240. The calculated gratuity amount is thus $40, which is 20 percent.

The gratuity amount can be normalized based on a user’s typical gratuity amount for a similar merchant type or based on geographic locations. For example, Merchant A is a high-end restaurant. The calculated gratuity from User X’s payment transaction with Merchant A is 25 percent. However, Merchant R is a casual dining family restaurant. The calculated gratuity from User X’s payment transaction with Merchant R is 18 percent. Each calculated gratuity can be normalized based on User X’s typical gratuity amount for a similar type of restaurant.

The predictive model is applied to the identified signals to infer a merchant review score. For example, the predictive model infers that User X’s three completed payment transactions with Merchant Z corresponds to a merchant review score of four out of five stars. In another example, the predictive model infers that User X’s payment transaction with Merchant A resulting in a 25 percent gratuity corresponds to a merchant review score of five out of five stars. In yet another example, the predictive model infers that User Y’s complete one payment transaction with Merchant Z one year ago corresponds to a merchant review score of two out of five stars.

The account management computing system outputs the merchant review score for the identified merchant. For example, each generated merchant review score can be displayed on a web site or mapping application. In another example, the generated merchant review scores can be combined, weighted, or normalized. In yet another example, multiple merchant review scores based on different signals can be displayed (for example, 75 percent of customers returned to Merchant X for repeat visits).

**EXAMPLE SYSTEM ARCHITECTURES**

Figure 1 is a block diagram depicting a system to infer merchant review scores from payment data. As depicted in Figure 1, the system comprises network computing devices that are configured to communicate with one another via one or more networks or via any suitable communication technology.

Each network comprises a wired or wireless telecommunication mechanism by which the network computing devices can communicate and exchange data. For example, each network can be implemented as, or may be a part of, a storage area network (SAN), personal area network (PAN), a metropolitan area network (MAN), a local area network (LAN), a
wide area network (WAN), a wireless local area network (WLAN), a virtual private network (VPN), an intranet, an Internet, a mobile telephone network, a card network, Bluetooth, Bluetooth Low Energy (BLE), near field communication network (NFC), any form of standardized radio frequency, infrared, sound (for example, audible sounds, melodies, and ultrasound), other short range communication channel, or any combination thereof, or any other appropriate architecture or system that facilitates the communication of signals, data, and/or messages. Throughout this discussion, it should be understood that the terms “data” and “information” are used interchangeably herein to refer to text, images, audio, video, or any other form of information that can exist in a computer-based environment. The communication technology utilized by the devices may be alternative communication technology.

Each user computing device may be a personal computer, mobile device (for example, notebook, computer, tablet computer, netbook computer, personal digital assistant (PDA), video game device, GPS locator device, cellular telephone, Smartphone or other mobile device), television, wearable computing devices (for example, watches, rings, or glasses), or other appropriate technology that includes or is coupled to a web server, or other suitable application for performing a payment transaction. The user can use the user computing device to perform a payment transaction and communicate the payment details to an account management computing system via an application. The application is a program, function, routine, applet or similar entity that exists on and performs its operations on the user computing device. For example, the application may be a shopping application, merchant system application, an Internet browser, a digital wallet application, or other suitable application operating on the user computing device. The user may install the application and/or make a feature selection on the user computing device to authorize or perform the techniques described herein.

Each user computing device communicates payment data to the account management computing system. The account management computing system comprises an account unit that stores the received payment data and a review score unit. The account management computing system creates a predictive model or trains a machine learnt regression function or classifier model to predict the merchant review score based on the payment information received from the user device. The predictive model may be an artificial neural network or other form of adaptive system model that analyzes data and relationships to find patterns in the data. The predictive model may also be a Gaussian Mixture Model, decision tree, Markov Decision Process, or other mathematical framework for modeling decision making.
The review score unit retrieves the stored payment data and applies the predictive model to infer a merchant review score.

Figure 2 is a block flow diagram depicting a method to infer merchant review scores from payment data.

Figure 3 is a block flow diagram depicting a method to identify signals from payment data.
Method for inferring merchant review scores from payment data

User completes payment transactions with merchant using wallet application managed by account management computing system

Record payment data for completed payment transaction

Create machine learnt regression function / classifier to derive merchant review score from payment data

Identify merchant to derive merchant review score

Identify merchant business type

Identify payment data for payment transactions completed with identified merchant

Identify signals from payment data

Apply machine learnt regression function / classifier to identified signals to infer review score for identified merchant

Display review score for identified merchant

Figure 2
Method for identifying signals from payment data

No

Merchant business type expects repeat visits

Yes

Determine number of times user X has completed a payment transaction with the identified merchant

No

Merchant business type expects gratuity

Yes

Determine difference between user X preauthorized payment amount and final payment amount

Normalize determined gratuity amount

Apply machine learnt regression function / classifier to identified signals to infer review score for identified merchant

Figure 3