The Design of APP Content Guiding System Based on Deep Learning Algorithm

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Abstract. This paper presents a deep learning algorithm based evaluation system of the relationship between user’s mind and behavior. The system is achieved by categorizing the mutual interactions between user and APP product which inherently reflect the relationship between user’s mind and behavior. The numerical annotations of the mutual interactions, combined with numerous feedbacks from users when interacting with APP, allow machines to learn and master the evaluation system, in order to achieve a customer-satisfactory content guidance.

1. The current APP content guidance system
The content guidance system in APP can provide users with more efficient use experience, and hence results in a clear path to generate business value. The guidance system is especially important for the APPs which possess multiple user’s roles, variant marketing scenarios, and complex information. A good content should appear right on the time when users need it, either early or late appearance can spoil users’ experience. However, the traditional content guidance system is unable to grasp information based on the relationship between user0s’ mind and behavior, therefore cannot provide the on-time and on-demand content for users. On the other hand, the emerging of deep learning algorithm results in a revolutionary change of content guidance system, the interaction between user and APPs started to transit from graphical user interaction (GUI) to natural user interaction (NUI). This change enables machines to interpret users’ mind from their behavior, then to master the relationship between users’ behavior and their mind, and ultimately to create the possibility to provide users with accurate and on-time user interaction.

2. Deep learning algorithm and APP content guiding system
When playing with APPs, users’ preference about the content are inevitably reflected on their interacting behaviors with the APPs. This fact can lead us the way in the search of users’ mind by understanding their behaviors, namely “Behavior - Mind“ evaluation system. Firstly, we start with categorizing the interacting behaviors of users with APPs, and then filter the emotional behaviors from non-emotional ones. By utilizing the deep learning algorithms, we are able to predict users’ mind based on their emotional behaviors, and hence to design the guidance content based on users’ mind to better meet their needs. Specifically, the intelligent content guidance system presented in this paper offsets from the traditional content guidance system by realizing the NUI between users and APPs by virtue of introducing the “Behavior - Mind” evaluation system.
3. Content guiding system based on deep learning algorithm

The content guidance in APP products provides users with more effective using experience, as well as benefits merchants with a clearer path to revenue by intentionally guiding customers to conduct commercial activities. Accordingly, the effectiveness of a content guidance system determines its acceptance by users and commercials. This is especially true for APP products with multiple users’ roles and variant information. As aforementioned, an effective guidance system should appear to users when needed, either early or late appearance can spoil users’ experience. Deep learning algorithms is able to help answer the questions: what information does user need? When does user need this information? By utilizing the deep learning algorithm, we firstly make machines analyze users’ behavioral data. With sufficient amount of self learning, the machine is expected to be able to predict users’ behavior based on the real time usage data from users. Ultimately, prompt content guidance will be provided to users by machine. Instilled with the on-demand and on-time features, the new content guidance system is expected to have significantly larger acceptance by both uses and merchants due to its unparalleled effectiveness compared to the traditional content guidance system.

Figure 1. The relationship between behavior and mind

3.1. Evaluation system of “Behavior - Mind” relationship

User’s mind, referred to cognitive reception, which can directly or indirectly affect the user's behavior. Therefore, by analyzing the user's interaction behavior, the user's mind behind the behavior can be discovered, which is an important step of the intelligent content guiding system.

3.1.1. Classification of interaction behavior. User's behavior, referred to user's actual operation with APP products, can be categorized into passive behavior, neutral behavior and positive behavior. For example, ‘share’, ‘like’ and ‘save’ can be viewed as positive behaviors, whereas ‘delete’, ‘cancel’ and ‘block’ can be viewed as negative behaviors. In addition, neutral behaviors include the ones such as ‘browse’, ‘search’ and ‘halt’, etc. The extent of behavior, for example, the time length before like or the time length before cancel one service, usually serves as a good indicator to understand user’s mind in addition to behavior itself. For example, if a user cancel a service after just 1 min of trial, then the user should have higher chance of feeling against with the content provided by the service. In other words, extent of behavior is able to amplify the indication of user’s mind, and should be used in together with behavior to increase the accuracy of prediction. The common online behaviors are listed below, and minor delta is expected between different types of APP products.

3.1.2. Relationship between behavior and mind. Behavior and extent of behavior altogether can be used to predict user’s mind. Further, user’s mind can be simply divided into positive mind and negative mind. Specifically, ‘prone to buy’, ‘interested in the content’ are viewed as positive mind, whereas ‘confused’ and ‘lost’ are viewed as negative mind. In general, positive mind directs to positive behavior, and vice versa. For example, if a user save some product from one online store for later view, the user is believed to be interested in that product; if a user spends merely a transient moment on some video, then the user...
is expected to be not interested in the content of the video. As far as neutral behavior, it needs to be evaluated in specific scenarios where different behaviors can result from the same mind. In this case, significant amount of behavioral analysis should be performed in order to intelligently provide the accurate content guidance regardless of the delta between different scenarios.

3.2. “Behavior-Mind” deep learning algorithm analysis model

The behavior-mind deep learning algorithm works as follows. Firstly, we numerically annotate user’s behavior and the extent of behavior in order to better interpret user’s behavior. Then the deep learning help machine interpret the connections between user’s mind and user’s behavior and the extent of behavior. The self learning of machine is achieved through significant amount of corrections by comparing the predicted user mind (or predicted future behavior) to actual user’s future behavior. In this way, machine learns to provide accurate real-time correspondence to users regardless of environmental or operational complexities.
4. Research summary
A deep learning based content guidance system was illustrated in this paper. An algorithm to pass through from user’s behavior and extent of behavior to user’s mind is illustrated. A Behavior-Mind evaluation system is achieved by annotating user’s behaviors, interpreting user’s behavior (and extent) to user’s mind, and learning the relationships between user’s behavior and mind in order to predict user’s behavior under complex circumstances. The content guidance system based on the algorithm can elevate users’ experience with APP products, and also provide new directions in the application of deep learning on APP products.

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