AMPER(Aim-Measure-Predict-Evaluate-Recommend): The Paradigm of Digital Me

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Abstract

AI services can help people live healthier and richer lives, and such services can be collectively referred to as Digital Me. The purpose of this paper is to research Digital Me service and suggests AMPER (Aim-Measure-Predict-Evaluate-Recommend) approach to implement a general Digital Me algorithm for providing actual services. Digital Me is defined as an AI-based product service system (PSS) that makes it possible to manage the individual's state (health, beauty, memory, knowledge, finance, and happiness, etc.) in real- time. We studied cases of Digital Me service of edutech and healthcare. In order to enable a Digital Me service, it is necessary to measure, predict and evaluate the user's future states, and recommend actions to improve the states. We developed a structure of a purely data-based algorithm that set a user-centric aim (A), measures the user's states (M), predicts the user's future states (P), evaluates and compares the user's performance (E), and recommends desirable action (R). As a result of experimenting with the proposed algorithm structure with EdNet dataset, we verified the AMPER structure for the user-centric aim of improving the user's English score that measures the correct answer to the question solved by the user, predicts the correct answer to the next question using Transformer model, evaluates the user's English ability, and recommends the question that will improve English scores the fastest.

Keywords: Digital Me, Aim, Measure, Predict, Evaluate, Recommend

Introduction

In the recently released SF film *Don't Look Up*, there is a scene concerning an AI service that collects tens of millions of users' state data and predicts health conditions. It even predicts when and how the main character dies, and the main character encounters the predicted actual situation. *AI 2041*, an AI novel and AI manual co-authored by AI experts and SF novelists, deals with similar AI services (Lee & Chen 2021). In addition, even with small changes in a user's behavior, insurance premiums may be raised or lowered, and continuous alarms may make them, for example, quit smoking. These services guide you to take medicine as necessary and remind you to schedule a hospital appointment. The advent of AI services in movies and novels suggests a future that is gradually approaching us. AI services that helps people live healthier and richer lives can be collectively referred to as "Digital Me." Digital Me is defined as an AI-based product service system (PSS) that makes it possible to manage the individual's state (health, beauty, memory, knowledge, finance, happiness, etc.) in real time (Lee 2022). For example, in various healthcare cases, user state data such as pulse, blood pressure, and body temperature are secured. Healthcare services are provided by analyzing the health status of users through AI algorithms. It supports real-time monitoring through intelligent exercise devices and mobile and cloud linkage with health devices and provides healthcare services by securing self-diagnosis health data through repeated health check surveys. There are algorithmic studies on health status analysis that predict health, such as AdaCare (Ma et al. 2021), which

considers the characteristics of behavioral change rates, and ConCare (Ma et al. 2020), which refers to individual learning by clinical function. In addition, there are studies on healthcare services such as treatment recommendation algorithms based on health prediction (Wang et al. 2018). Digital Me services exist not only in healthcare but also in edutech, and the most representative example is Riiid. It is currently operating as a service using various algorithms for predicting and recommending users' English skills.

AMPER(Aim-Measure-Predict-Evaluate-Recommend)

In this work, AMPER is proposed as an algorithmic structure for implementing a digital service, as shown in Figure 1. The Digital Me algorithm can maximize user state improvement by recommending desirable behaviors by deriving R (Recommend) for going to the target state based on user state data. The Digital Me algorithm uses user state data, according to user-centered objective A (Aim), to establish M (Measure) to measure the current state of the user, and only using data to predict the user's future states through P (Predict). After evaluating the user's future states through E (Evaluate), it is possible to maximize the user's state improvement by providing an R (Recommendation) of behavior for achieving the target state.

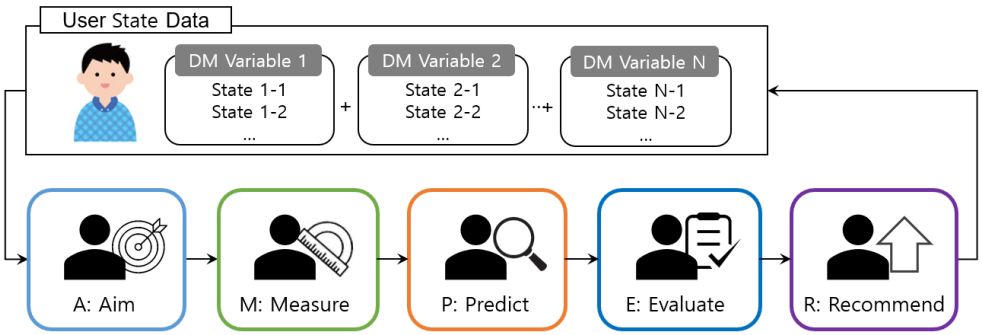

Figure 1. AMPER(Aim-Measure-Predict-Evaluate-Recommend)

Experiment

Datasets

To verify AMPER, we used EdNet data, including user problem solving data and problem information data, released by Riiid. We used the data for the experiment with 7,843 total users, 81,618 problem-solving data points, and 11,276 question types through preprocessing.

Application of AMPER

This research implements the Digital Me service in the structure of the 5-stage AMPER using user state data as follows:

- **(A) Aim:** Users aim to improve their English scores.
- **(M) Measure:** Through the correct answer of the problem information data, the user's English ability (state) is measured by checking the correct answer of the problem solved by the user.
- **(P) Predict:** From the user's correct answer to the question, predict the correct answer to the next question.
  - Algorithms for Predicting were developed using Transformer Model (Vaswani et al. 2018). By learning the correct answers to the 20 questions (Train) solved by the user, the correct answers to the 21st questions (Label) were predicted, and the accuracy was 70.77%.
- **(E) Evaluate:** For each question, the incorrect answer rate of overall user is given as the score of the question, and then the user's problem-solving data is calculated as a score.
  - If the incorrect answer rate for question No. 511 is 45%, then 0.45 points will be given, and if the incorrect answer rate for question No. 82 is 30%, 0.3 points will be given. If you get both No.511 and No.82, you get 0.75 points.

- **(R) Recommend:** Provides questions to maximize the achievement of the goal of improving English scores.

This is the result of randomly extracting three users to check the AMPER result and confirming the improvement of the English score.

		User A	User B	User C
(Time: t) Learning 20 questions	The score of the first 20 questions	5.0	1.7	3.1
(time: t+1) Learning 40 questions	[Randomly recommend 20 questions] Cumulative score when solving a question	8.3	4.4	6.0
	[(R) Recommend 20 questions] Cumulative score when solving a question	20.8	18.3	19.1

Conclusion

In this study, we confirm viability of Digital Me research and services through various literature studies, and propose an AMPER structure for Digital Me services. Beyond the Digital Me study conducted by domain for healthcare or edutech, from a more macroscopic point of view, we design a Digital Me algorithm with a five-step AMPER structure and validate it using EdNet data. As a result, we confirmed that users' English scores improved. In a future study, it is necessary to apply the AMPER structure of Digital Me to other domains.

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