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Applications of artificial intelligence in children and elderly care and short video industries—Cases from Cubo Ai and Tiktok

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ABSTRACT

Ever since the concept of Artificial Intelligence (AI) was first coined in 1955, the quest for sophistication and improvement of existing technologies paved the way for the continuous development of AI technologies. Nowadays, AI technologies are redefining and disrupting the way people work and live in many different domains. This paper mainly focuses on AI applications in two fields closely related to people's life - children & elderly care and short video industries. It first introduces several prevailing AI technologies applied in children & elderly care and short video industries, and then uses two case studies from Cubo Ai and Tiktok to elaborate the applications in the corresponding fields.

Keywords: AI applications, case study, Cubo Ai, Tiktok

1. INTRODUCTION

Artificial intelligence (AI) is defined as systems or machines with the ability to simulate human intelligence and to consistently improve their performance based on the information collected[1]. Dated back to the 1950s when the concept of AI was first proposed by Turing, AI technology has experienced three evolutions, namely Non-intelligent Dialogue Robot (1950-1960), Speech Recognition (1980-1990), and Deep Learning & Big Data (2000-2010)[2]. Other than the above mentioned technologies, AI also covers areas such as Image Recognition, Virtual Agents, Decision Management, Text Analytics and Natural Language Processing (NLP), Emotion Recognition, Marketing Automation, and so on[3].

In hand with the evolution of different technologies, studies on AI application are evolving from product based only to industry solution focused[4]]. In this paper, we intend to understand how these AI technologies are being used in typical children and elderly care and short video industries. Due to declining fertility rates and rising life expectancy, the world is undergoing an unprecedented trend in population aging, particularly in growing economies such as Europe, Japan, and China[5]]. Meanwhile, the rise of Millennials, who are both parents of their children and children of their parents, has driven emerging forms in economic development (e.g., Internet Celebrity Economy). It is undeniable that short videos largely boost the development of the Internet Celebrity Economy[6]]. Children and elderly care and short video industries are closely related to our everyday life, especially during the pandemic period when lots of daily tasks need to be taken by working employees at home, and more daily entertainments are needed in the short video virtual world. Given the significant development of AI in both industries, this paper discusses the AI applications in the corresponding domains.

2. AI TECHNOLOGIES IN CHILDREN AND ELDERLY CARE

2.1 Internet of things (IoTs)

IoTs refers to the network of physical objects - "things" - that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet[7]. For example, Monit, a Korean company specialized in smart baby care solutions, launched its smart baby monitor-Bebefit in 2019. Combining an air quality measurement hub and a diaper monitor, Bebefit helps parents to better understand the state of their babies' diapers by actively detecting the humidity, surrounding temperature, and gas with IoT sensors[8]. Given that the mobile app allows up to five installations on different devices, taking care of babies tend to be family work, which largely relaxes young couples from continuously worrying about in-time diaper changings in avoidance of skin irritation.

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IoTs is also widely applied in fall detectors for elderly people. For instance, Xsens engages in innovative 3D motion tracking technologies[9]. It uses a full-body human motion capture system to collect the data related to position and acceleration of some body parts and then proceed the data under a multi-sensor multi-modal framework[10]. Once the AI-powered sensors detect any possible falls or already happened falls, it would inform users the emergence and make corresponding resolutions[11].

2.2 Computer vision technologies

Computer vision technologies can process, analyse, and make sense of visual data in the same way that humans do[12]. A good example could be a real-time baby breathing monitor—Cocoon Cam[13]. Different from its competitors, Cocoon Cam requires no additional wearable monitoring device. The motion-detecting video camera with computer vision technologies can track the movement of the baby's chest and translate the breathing pattern to a virtual graph[14]. Consequently, parents will be notified when their babies fall asleep and wake up. With the help of the optional two-way audio embedded in Cocoon Cam, parents can also choose to speak to their babies even if they are not around[15].

2.3 Robot and natural language processing

Robot and Natural Language Processing (NLP) are defined as the automatic understanding and manipulation of natural language, like speech and text, by software[16]. Common NLP tasks include text and speech processing, morphological analysis, syntactic analysis, and lexical semantics[17]. Pudding BeanQ smart robot is a good example. Nowadays, Pudding BeanQ becomes a good companion for children. It not only provides multiple trainings (e.g., mathematical, linguistic, and spatial knowledge), but also enables children to contact their family or friends via video calls[18]. In partnership with Nuance, a famous natural language processing firm, Pudding BeanQ helps to correct children's pronunciation via a real-time intonation scoring system so that children could practice their oral English any time with the AI tutor.

Another good example of robots and NLP is the application of text-to-speech. Luka Hero, an interactive reading robot developed by Chinese tech firm Ling, attracts consumers with its point-to-read function. Users can simply put books in front of the robot, and sensors embedded would scan the images and characters and transfer text into lovely audio. In addition to reading page by page automatically, Luka Hero could also function as a smart dictionary, providing detailed explanations of the words you point at. Luka helps children to grow interests in reading and cultivate good reading habits at an early age. Currently, Luka is said to recognize over 20,000 English picture books and 70,000 Chinese storybooks[19]. The pictures of the above four AI products are shown in Figure 1.

Figure 1. AI products illustration.

3. AI TECHNOLOGIES IN SHORT VIDEO INDUSTRY

Major AI technologies used in short video industry include computer vision, machine learning or deep learning, and natural language processing. Machine learning (ML) refers to computer algorithms that can improve automatically through experience by building models based on sample data, known as "training data"[20]. For short video platforms, the number of users surges every day and their watching habits may change frequently, implying the importance of constant user understanding for further advertisement recommendation. In June 2020, Kuaishou, has launched a GPU-based advertising recommendation training system named Persia, which could largely improve the training efficiency to 640 times faster than a CPU machine[21]. Applying computer vision technologies, Kuaishou's Kmoji function enables users to generate their own exclusive facial AR virtual image[22].

4. CASE STUDIES OF CUBO AI AND TIKTOK

4.1 Cubo Ai

Cubo Ai was founded in 2017 in the hope of promising babies with a safe growth environment. Cubo Ai's advanced AI technologies enable the bird-shaped baby monitor to excel among its competitors with key functions like covered face alerts, temperature, and humidity sensors, safe zone monitor, two-way audio communication, and automatic photo capture. Confronted with the concern that baby monitors may be easily hacked, Cubo Ai can only be accessed on an authenticated mobile device with its 256-bit symmetric-key encryption[23]. Major technologies involved include face recognition, computer vision, cloud computing, big data analysis, and machine learning.

4.1.1 AI in sleep monitoring. Comprised of a Sony-made sensor with night vision, 135-degree wide-angle lens, and a built-in night light, the bird-like robot will send out real-time alerts to parents for covered face and roll-over. Compared with a normal security camera, Cubo Ai has the intelligence of understanding what it is watching. With the help of computer vision, Cubo Ai will constantly track the baby's face. Consequently, the warning system will be triggered when the robot recognizes the baby's face deviating from normal settings, either sleeping on his stomach or rolling over from the cradle. Moreover, Cubo Ai will generate a sleep analytics report on the baby's night-time activities containing some key indicators such as the total amount of sleep, the longest stretch of uninterrupted sleep, and the number of awakenings[24].

4.1.2 AI in danger zone detection. Considering that parents cannot guarantee 24/7 watching on their children, there are chances that a toddler may venture into some dangerous areas, such as burning stoves, open windowsill, and full-of-water bathtub. One of the uniqueness of Cubo Ai is its danger-zone setting which allows parents to draw a virtual fence. Although for now, the danger-zone alert may not be that accurate in distinguishing a baby from pets or other family members, it can be used to keep pets from disturbing a sleeping baby in a more practical way[24].

4.1.3 AI in emotion detection. Leveraging its cutting-edge computer vision and deep learning technology, Cubo Ai could perform cry detection and notify parents in time for soothing. Advance to traditional cameras, Cubo Ai also plays as a digital photographer by automatically taking photos when the AI captures that the baby is smiling or performing other notable gestures. Through enormous learning of collective data on facial expressions from different babies, Cubo Ai could perform more accurate judgment on picture snapping. With the help of cloud computing, Cubo Ai offers an 18-hour video playback[25].

4.2 Tiktok

Tiktok, also known as Douyin in China, is a short video sharing platform owned by Chinese tech giant ByteDance. Tiktok is rich in content from song, dance, comedy, education, cooking, traveling to even petting with a duration of three seconds to three minutes[26]. As of October 2020, Tiktok achieves a total of two billion app downloads globally[26]. Backed by its AI Lab, Tiktok enjoys competitive advantages by a better understanding of its users, relying on big data, machine learning, computer vision, facial landmark detection, NPL, and imagine classification technologies.

4.2.1 AI in content recommendation. Merely relying on manual understandings of video content and review comments is far from efficiency and effectiveness. Thanks to the recommendation engine enabled by AI, Tiktok users do not need to cold start the app and indicate their interests and preference from some pre-determined labels. Instead, the app can understand users' interest and preference, and provide personalized "For You Feed" automatically. In general, the app collects information from three dimensions to generate a tailored recommendation, namely user interaction, video information, and account settings[27]. Regarding the user interaction, every single click from the user contributes to the formulation of "For You Feed", this includes the accounts he/she followed, the videos he/she liked, the comments he/she posted[28]. Moreover, Tiktok would take account into the length of time he/she spent on one video. For video information, powered by user inputs, the recommendation engine would attach subjective tags to the video and perform voice recognition and synthesis. This helps to convert video and audio into text for further analysis. In regard to account settings, the country setting, age, gender, language preference, and even device type play a role in evaluating the watching traits, but may probably in a weaker weight of influence[29]. After assigning each factor with reasonable weight and proceeding with the analysis, the recommendation engine would be able to rank videos in relation to the likelihood of a user's interest. It is worth mentioning that the platform is utilizing a collaborative analysis on similar user groups leading to a precise-than-ever prediction despite occasional mistouch[30]. The recommendation engine in turn also helps content producers to enhance their videos conforming to the audience's taste[31].

4.2.2 AI in video shooting. Another reason why Tiktok succeeds in attracting so many active users is that Tiktok prevails in video shooting and editing. To better cater to the needs of different users, Tiktok provides various selfie effects such as aging simulation, head-changing, and other beauty modes. Given that the entire operation process is relatively simple, Tiktok greatly diversifies the interaction with people in different age groups. The above-mentioned face transformation function is mainly achieved based on the Facial Landmark Detection technology, which works by locating facial landmarks and transforming pixels in alignment with desired facial definition parameters[32]. For those who are shy and would like to keep it mysterious, Tiktok designed a head-changing function. If the user selects the "dog head", then his or her face will be completely covered. Meanwhile, the "dog head" will change facial expression synchronously if he/she blinks or opens month[32]. Last, Tiktok adopts semantic segmentation technology. Tiktok first obtains the respective parts of the body such as head, face, hands, and feet through body semantic segmentation, and then replaces the corresponding parts through the tool template selected by the user to achieve the final "head changing" effect, bringing users an increasingly novel and exciting experience.

4.2.3 AI in content censor. Since the rise of live broadcast and short video applications, various regulatory issues have emerged one after another. To cope with the massive content users generated every moment, Tiktok applies deep learning in "image classification". In the development of its pornography detection system, data analysts input a large amount of training data, which carry corresponding labels indicating whether the picture belongs to the category of pornography. After that, the system will learn and memorize the characteristics of these pornography labelled pictures[32]. Next time when proceeding with a newly input picture or video, Tiktok will extract corresponding characteristics, and the picture will be marked as high risk of pornography when sensitive characteristics accumulate to a certain threshold[32]. A secondary diversion detection or manual identification will be performed before the final classification is confirmed. In this way, Tiktok ensures the health of the content. It is found that compared with other short video or live broadcast platforms, the overall environment of Tiktok and the tone of the content are relatively better. This is featured by fewer pornographic, violent, and sensitive content, owing to Tiktok's powerful AI algorithm technology.

5. CONCLUSION

This paper sheds light on the applications of AI in two important industries of our daily lives-Children and elderly care, and short video, a daily necessity for youngsters during the pandemic period. The common AI technologies used in both industries are computer vision, machine learning or deep learning, and natural language processing. We look forward to the continuous improvement of AI technologies in both industries in the near future to further enrich our daily lives.

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