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CROWD INTELLIGENCE IN AI 2.0

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Abstract: The great use of the internet in cyberspace thoroughly changed the information environment for the development of artificial intelligence. Artificial intelligence (AI) 2.0 is a new stage of AI research. Internet crowd intelligence technologies are advanced**.** One of the most significant features of research in the AI 2.0 era is crowd-based intelligence and autonomous-intelligent systems. In the coming decades, it will attract and achieve remarkable progress in both the industrial and research communities. It will even advance our society as well. Specifically, crowd intelligence provides a problem-solving prototype by collecting the intelligence of hordes to focus on challenges. Due to the accelerated evolution of the sharing economy, crowd intelligence has not only become a new approach to resolving scientific challenges but has also been amalgamated into all variants of application scenarios in day-to-day routines, to cite an example, online-to-offline (O2O) applications, real-time traffic monitoring, and logistics management. In this research paper, we look at the existence of crowd intelligence. First and foremost, we describe the concept of crowd intelligence and its relationship to existing concepts, e.g., crowdsourcing and human computation. followed by presenting the four categories of representative crowd intelligence platforms. To recapitulate, three core research problems and the state-of-the-art techniques of crowd intelligence are analysed. Ultimately, we consider the promising future research directions of crowd intelligence.

Keywords: Artificial intelligence; Crowd intelligence; Crowdsourcing; Human Computation;

I. INTRODUCTION

With the advancement of technology and the popularisation of the internet and cyber-space, the world has tremendously changed the information environment for the development of artificial intelligence (AI) (basically intelligence demonstrated by machines), bringing a new breakthrough in AI research and upgrading it into the new era of AI 2.0, which is more robust, detailed, and different from that of the past 60 years. Crowd intelligence is one of the prominent characteristics of AI 2.0. In AI research, human intelligence plays an important role and reshapes the environment of AI research. One of the principal capabilities of AI 2.0, crowd intelligence, emerges from the conjoined effects of independent individuals, displaying better intelligence than the functionality of each person. Several internet packages, such as Wikipedia, Net Q&A, and Crowdsourcing, have effectively tapped into crowd talent pools and have demonstrated significant development beyond traditional paradigms. Several researchers from multi-disciplinary areas such as AI, human computation, economics, and management science are inspired by the success of the internet packages and investigate the problems that are inherent in crowd intelligence. They submitted algorithms, frameworks, and models for understanding crowd intelligence in areas including human computing and crowdsourcing. We present research on crowd intelligence in the AI 2.0 era. In Section 2, we are introducing artificial intelligence 2.0, which is a new step in AI. Section 3 discusses crowd intelligence, which is a prominent feature of AI 2.0. And the very next section is about human computation.

II. ARTIFICIAL INTELLIGENCE

Artificial intelligence is a transformative technology and generally refers to the ability of digital computing devices to perform tasks commonly associated with intelligent beings. The information environment of AI development has profoundly changed by the popularisation of the internet, the emerging of big data, physical space and cyberspace. In the past, AI faced many challenges and failures in the information environment, and it led to a new evolutionary stage: AI 2.0. The exposure of new technologies also promotes AI to a new stage. Some external forces are promoting the formation of AI 2.0 through changes in four areas. First, the information environment has changed greatly, along with the popularity of mobile terminals, the internet, sensor networks, and wearable devices. The world has changed from binary space to ternary space. Second, many enterprises actively promoted new AI research. Third, enhanced hybrid intelligence systems, new crowd intelligence systems, and more complex intelligence systems are organized. Fourth, data resources related to AI are changed. These environmental changes promote significant advancements in AI. Crowd intelligence is one of the prominent features of AI 2.0.

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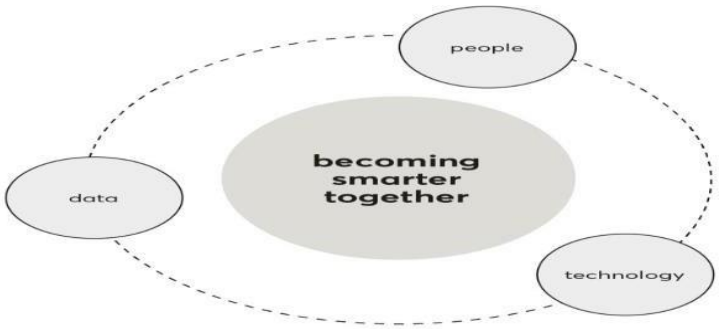
III. CROWD INTELLIGENCE

Crowd intelligence is a recently advanced feature of artificial intelligence 2.0. Recently, crowds have been divided into three types: crowdsourcing, complex workflows, and problem-solving ecosystems. Collective intelligence is a concept that is closely related to the topic of crowd intelligence. Collective intelligence is the process of gathering and sharing knowledge by a group of people to solve societal problems. That is, it is the capacity of a group of individuals to think and learn collectively. In its simplest form, collective intelligence is an enhanced capacity that is created by a group of individuals with the help of technologies to collect knowledge, data, and skills. Collective intelligence is a kind of wisdom that grows out of a group. Due to the growth of technology, individuals can connect together over a greater distance and can share knowledge. The concept of collective intelligence states that when people can work together, it forms a type of intelligence. Collective intelligence is used to create famous platforms such as Google and Wikipedia. More simply, collective intelligence is the combined capability of a group of individuals or teams to perform a variety of tasks and solve diverse issues. There are many definitions of collective intelligence. Several researchers have tried to create definitions from their own perspective.



Crowd Intelligence is an Internet-based collective intelligence, because Crowd Intelligence emerges from collective intelligence efforts. Internet-based crowd intelligence emerges from the massive number of individuals in online organisations and online platforms. Crowd Intelligence integrates crowds and machines to solve challenging computational problems. As the level of crowd systems has increased, it has become a challenge to coordinate large-scale operational processes to handle complex tasks. From the standpoint of computing, the rise of crowd intelligence allows for novel possibilities of seamlessly integrating machine and human intelligence. On a large scale, these can be regarded as mixed-initiative intelligent systems. In such a system, AI machines can complement each other's capabilities to function as enhanced AI systems. Currently, crowd intelligence is widely used in massive data processing, scientific research, open innovation, and software development. Crowd intelligence provides an online platform to connect many individuals and coordinate their work.

Platform type	Human computation	Mobile crowd-sourcing		Citizen science	Software development
		Participatory sensing	Sharing economy		
Crowd task	Microtasks, mostly simple data processing tasks	Spatiotemporal microtasks for data gathering	Providing services or sharing goods	Simple analysis of scientific data	Software development tasks
Organizational mechanism	Monetary payment	Reputation, physical location, situation, and self-control schedule	Auction and market	Reputation curiosity learning	Open source or competitio
Problem-solving workflow	Data-driven map-reduce	Data-driven map-reduce	Pricing model for optimization	Map-reduce	Crowd-based software process model

Fig: Crowd intelligent platforms

Future challenges of crowd intelligence: There are some research challenges in crowd intelligence. Dynamic crowd organisation is one of the challenges of crowd intelligence and others are dynamic pricing, quality control on latency. The existing crowd intelligence have achieved good efficiency and there is a little research on how to adjust organization structure of crowd intelligence. However the supply and demand between tasks requesters and workers often change, that can dynamically set proper prices for tasks.

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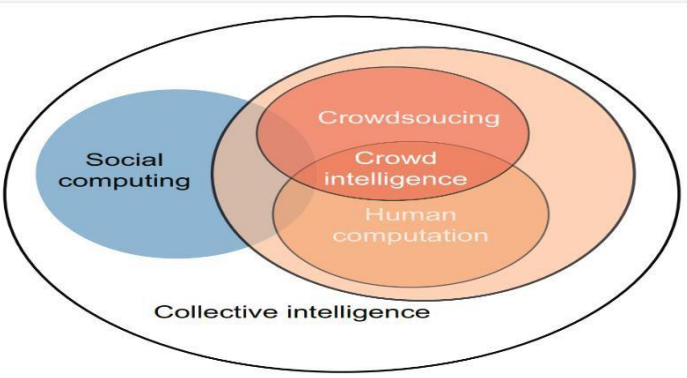
IV. CROWDSOURCING

An overview, many concept such as crowdsourcing, human computation have similar concepts of crowd intelligence to clarify this let us examine a diagram



Crowdsourcing involves acquiring work, information, or opinions from a large group of people who present their data via the Internet, social media, and smartphone apps. People confused by crowdsourcing sometimes work as paid workers, while others perform small tasks deliberately. For example, traffic apps like Waze encourage drivers to report accidents and other roadway incidents to provide real-time, modernised information to app users. Crowdsourcing is the gathering of information, opinions, or work from a large group of people, usually via the Internet. Crowdsourcing work allows companies to save time and money while spiling into people with different adroitness or thoughts from all over the world. While crowdsourcing finds information or work products, crowdfunding needs money to support entity charities or start-up companies. The advantages of crowdsourcing include cost savings, speed, and the ability to work with people who have skills that an in-house team may not have.

A. Concept of social computing

Social computing refers everything that we have to do for better social behaviour and computing. The major concept is that usage of social software to enhance social interaction and communication. It has close relation with collective intelligence both has deep relation with each other. social computing is a part of collective intelligence, which makes the users free to obtain wisdom through collective Attempt in social interactive background.

B. Crowd sourcing in crowd intelligence

Crowd sourcing refers to expanding the conventional work done by an employee in a non-specific social interactive environment. Crowd sourcing is mainly used for data cleaning, recognising chemical structures, image identification, logo design, medical drug development, and morphology construction. Crowd sourcing provides access to crowd workers who can collaborate and complete intelligent tasks. Machine intelligence, in particular, has been significantly extended into crowd sourcing platforms, raising the quality of their work.

C. Human computation an overview

Human computation refers to the clarifying power to resolve problems a computer cannot do. The main component is the micro-task, or human intelligence task. Human computation often cracks large mathematical tasks into small and well-developed tasks for a crowd to work on. The small tasks are developed as short-time tasks without time-consuming effort, such as picture tagging, translating paragraphs, making survey paragraphs, etc. Human computing has different objectives. The two areas have intersections because human computation systems require deportment. Human computation has similar qualities to crowd sourcing because it has an open call for crowd workers. Computational small tasks are allocated to a group of entities.

D. Platforms of crowd intelligence

Crowd intelligence is used in data processing, scientific methodology, and software development. In this section, we introduce the anatomy of crowd intelligence based on the following properties:

1. Organizational mechanisms: How do platforms support the workers? Can the platform be used to rank employees?
2. Crowd task: The tasks given to workers? The nature of this task.
3. Problem-solving work flow: How can the workers overcome a challenging problem?

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V. HUMAN COMPUTATION AND CROWD TASKS

Amazon Mechanical Turk (AMT) is a popular human computing platform that supports the supply and demand of micro-computational tasks that require grant and demand for micro-calculation tasks that require human intelligence to complete. It is an online labour market where crowd employees are recruited by requesters for the execution of human intelligent tasks (HITs) in exchange for a small amount of cash. Tasks are typically simple enough to require only a few minutes to be finished, such as picture tagging, audio transcriptions, and survey completion. ReCAPTCHA (von Ahn et al., 2008) is a human computation system for transcribing old books and newspapers for which optical character recognition (OCR) is not very effective. It takes advantage of the pre-existing need for reCAPTCHA, the distorted pictures of text that are used by websites to prevent access by automated programs. When a user goes to a website, instead of seeing computer-generated distorted sentences, they see a picture of a word from an old book or newspaper, whose content could not be clarified by the OCR software. By typing the letters in the course of visiting the website, the user provides.

VI. CONCLUSION

In this research, we review the theoretical studies and applications of crowd intelligence in AI 2.0. We first introduce the concept of Artificial intelligence 2.0. Then we discuss about some fundamental concepts of crowd intelligence and various platforms of crowd intelligence. Our research shows that crowdsourcing has been credited with helping to create amazing acts of journalism. It has transformed newsgathering by opening up unprecedented opportunities for attracting sources with new voices and information, allowed news organizations to unlock stories that otherwise might not have surfaced, and created opportunities for them to experiment with the possibilities of engagement just for the fun of it. In short, it has done just what the pundits predicted a decade ago: helped turn journalism into more of a conversation than a one-way megaphone. Human computation is the last topic in this research. Finally we discuss about some future challenges of crowd intelligence.

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