

Human Computation and Crowdsourcing for Earth

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Abstract

Our planet is in crisis. Humanity can only avoid disaster if we pursue goals that promote prosperity while protecting the planet. The promise of human computation and crowdsourcing was to use technology to liberate the latent potential across the globe to accomplish feats that were once the province of a specialized few. This vision paper discusses the prospects and challenges of leveraging human computation and crowdsourcing to assist, measure, and accelerate progress toward the Sustainable Development Goals (SDGs) outlined by the United Nations (UN).

Introduction

The growing population, climate change, natural disasters, and many other reasons are exceeding the Earth's natural limits and leading it towards a dystopian future. To address such prospective disaster and "achieve a better and more suitable future for all", the United Nations (UN) outlined 17 broad and interdependent Sustainable Development Goals (SDGs) in 2015, and they are still working on it. This idea paper calls the researchers and technology practitioners to align with this agenda and work together with the diverse people and cultures to navigate toward a tenable future.

The domains of crowdsourcing and human computation research are often known for using technology to the maximum extent of its capacity across the globe to achieve opportunities that were once made available to a privileged few (Howe et al. 2006). Researchers of these domains and other related areas have envisioned using human computation and crowdsourcing tools and techniques to address real-world problems (Von Ahn 2008). Over the past decade, researchers have advanced this agenda by engaging with more people throughout the globe with from many communities with numerous skills and interests and integrating their values and perceptions in this process (Kittur et al. 2013).

This vision paper builds on existing literature and discusses the prospects and challenges of leveraging crowdsourcing and human computation to engage people across

the globe to assist, measure, and accelerate progress toward SDGs. We envisage how the interaction between humans and computing systems can make these efforts better.

Prospects and Challenges

Researchers working on human computation, crowdsourcing, and related domains have started addressing the promising areas of leveraging modern technologies to move towards SDGs in many parts of the world until recently. We discuss some of the prominent and recent works and highlight the challenges below.

No Poverty

The current practice of spreading large tasks in the form of microworks and gig works has shown immense promise toward a sustainable income model. While a few Human-Computer Interaction (HCI) researchers have studied the effects of crowdsourced knowledge-sharing networks on alleviating poverty (Ei Chew, Sort, and Haddawy 2013), there are still no formal studies on organized crowdsourced knowledge bases to establish a steady flow of tasks to those living in extreme poverty. We envision that providing Internet access is a significant challenge facing this goal.

Zero Hunger

The distribution of food is another area of focus that can be facilitated by human computation. Collaboration is key behind this attempt. As such, crowdsourcing models can involve people in spreading the information about excess food and efficient pick-up and delivery mechanisms (Don, Loke, and Zaslavsky 2018; Finn 2012).

Good Health & Wellbeing

The health and wellbeing of citizens are among the most tangible areas that can be affected by crowdwork and human computation. For instance, by introducing appropriate gamification, wherein a patient can interact with a healthy environment, we can ensure the wellbeing of people. The current COVID-19 pandemic has opened up new demands

for tracking the spread of infectious diseases. Recent studies are showing the power of human computation to mitigate such challenges (Wojcik et al. 2021).

Quality Education

Crowdsourcing projects on citizen science platforms can provide practical education to society (Simpson, Page, and De Roure 2014). The quality of education can also be maintained through collaborative learning environments. Volunteer-based crowdsourced applications are also a promising approach for this cause (Lewis et al. 2017).

Gender Equality

Crowdwork is still a male-dominant profession (Uzor et al. 2021). As a result, women workers are being deprived and pushed to the margins. Similarly, the output of the ‘tasks’ is not voicing women’s opinions in most cases. This issue can be handled by designing an ‘equality monitor’ for the platforms to ensure the quality of work based on gender ratio. Besides, various technologies for women’s safety, both online and offline, require the participation of other women over digital platforms (Sultana et al. 2021; Ahmed et al. 2014) which can be facilitated through crowdsourced platforms.

Clean Water & Sanitation

Very little research has been conducted on providing clean water and better sanitation through human computation. Hence, this remains to be an open challenge. Testing the quality of drinking water and ensuring its safety is an expensive and large-scale problem to solve. However, thanks to the divide and conquer approaches and harnessing the power of the collective, mobile technologies have proven to be effective in ensuring the safety of drinking water in rural areas (John et al. 2014). Crowdsourced technologies are also considered to empower the citizens and promote a sense of ownership that ensures their continuity and sustainability¹.

Affordable & Clean Energy

With nearly 800 million people worldwide lacking access to electricity², power connection remains a pressing issue to be solved despite the advancements in technology. Although more people than ever have now access to electricity, many people are still far from having sustainable and energy-efficient infrastructures³. Among the potential solutions, crowdsourced campaigns have been proven effective⁴. More recently, socially responsible investment options⁵ have

¹<https://blogs.worldbank.org/water/can-you-crowdsource-water-quality-data>

²<https://sdgs.un.org/goals/goal7>

³<https://www.who.int/news/item/21-05-2019-more-people-have-access-to-electricity-than-ever-before-but-world-is-falling-short-of-sustainable-energy-goals>

⁴<https://www.solarcrowdsource.com/>

⁵<https://www.wealthsimple.com/en-ca/feature/socially-responsible-investing>

attracted investors to crowdfund more sustainable solutions for clean energy projects⁶. Additionally, crowdsourced power generation and distribution has been put forward as a viable solution to reach affordable and clean energy⁷. All of the above demonstrate the high potential of crowd and human computation in addressing the SDGs.

Decent Work & Economic Growth

The power of crowdsourcing has already exhibited how the work can be decentralized among people for a better economy. However, there are still challenges to ensure a minimum wage for everyone. Moreover, the high dropout rate in crowdsourcing markets demonstrates how such markets are still not decent for everyone (Bhattacharyya 2016) which calls for more attention towards these issues.

Industry, Innovation, & Infrastructure

Crowdsourcing has already proven its potential for moving tech-industry forward together with proper infrastructural support. Many innovations emerging worldwide are contributing to the national and global economies. However, these local innovations, industries, and infrastructures, especially in the developing countries, are still facing challenges to keep up with the global market due to resource constraints and conflicts between international and local policies (Hossain et al. 2012; El Arifeen et al. 2013) which calls for special attention in this scope.

Reduced Inequalities

Apart from gender inequality, other forms of discrimination also obstruct development initiatives notably, ageism, racism, wage inequality, and homelessness. (Speak 2019). Recent works have attempted to address societal inequalities using crowdsourcing approaches. For example, a recent study has shown how the reshaping of shopping mobility practices can redistribute capital to reduce the inequality of wealth (Louail et al. 2017). Achieving sustainable development goals requires addressing structural disparities in every initiative.

Sustainable Cities & Communities

Crowdsourcing methods have already highlighted how city services can be distributed among the people (Staletić et al. 2020) in a smart way. Such smart cities are often imagined with an abundance of economic freedom and compliance to civil rights (Vallas and Schor 2020). However, maintaining fairness remains a major challenge in this realm.

Responsible Consumption & Production

One crucial aspect of responsible consumption and production involves repairing and recycling broken and discarded products. Human computation can play an important role here. Platforms like ‘iFixIt’ involve both the ex-

⁶<https://www.renewableenergyworld.com/baseload/crowdfunding-sites-that-allow-true-investment-in-renewable-energy-and-sustainability-alternatives-to/>

⁷<https://www.fastcompany.com/3036989/the-worlds-first-community-powered-by-crowdsourced-energy>

perts and non-experts for disseminating knowledge, finding necessary supplies, and providing expertise for fixing and recycling broken devices, for example (Getto and Labriola 2016). Similarly, crowdsourcing platforms are being used to identify materials for recycling in industrial scales (Heyer, Steingrímsson, and Seliger 2013).

Climate Action

There is no doubt that taking steps toward combating climate change and minimizing its impacts is not be possible without the power of the crowd. As proved by prosperous campaigns, the swiftest and the most effective advancements toward tackling global warming have emerged from crowd movements organized from the bottom up⁸. Crowdsourcing applications can be of great assistance in urging the governments for policy change and engaging the citizens in critical policy makings, generation and distribution of green and renewable energy, as well as sustainable and efficient transportation and waste management.

Life below Water

Conserving marine resources is one of the least attended SDGs by government leaders (Custer et al. 2018) and researchers. We call for researchers in this domain to address this agenda more diligently. Fortunately, recent advancements in Blockchain have shed light on leveraging the power of collective effort together with technology to reduce pollution in the oceans⁹. Such investments in new crowdfunded technologies and ocean clean-up campaigns¹⁰ show promise in protecting marine resources.

Life on Land

The role of information and communication technologies (ICT) has become increasingly crucial in crisis preparedness, response, and recovery. Examples include crowdfunding donations and resources in recent wildfire events around the world¹¹ and awareness to promote green technology (Aimiwu 2017, 2018). Researchers working in crisis informatics have emphasized on multidisciplinary work and the necessity of the power of the collective in addressing the issues regarding life on land (Dailey, Soden, and LaLone 2018). Powerful decentralized crowdsourcing tools backed by technologies such as Blockchain have also been deemed pragmatic in this domain¹². Therefore, social media awareness campaigns are promising a better lifestyle by pushing creativity, aesthetics, and ethical values (Närvänen et al. 2018). Though the applications are currently limited, this opens up new opportunities in many areas.

⁸<https://www.forbes.com/sites/ceciliarodriguez/2019/09/21/biggest-ever-climate-protest-in-photos-greta-thunberg-and-the-worlds-youth-demand-action>

⁹<https://www.ibm.com/blogs/blockchain/2019/10/want-to-reduce-ocean-pollution-blockchain-is-paving-the-way>

¹⁰<https://theoceancleanup.com/milestones/crowd-funding-campaign>

¹¹<https://www.thedrum.com/opinion/2020/02/17/social-media-force-good-the-case-australian-bushfires>

¹²<https://www.exposit.com/portfolio/blockchain-firefighting/>

Peace, Justice & Strong Institutions

Crowdsourcing platforms play an essential role in keeping peace and justice over online platforms by content moderation (Hettiachchi and Goncalves 2019). While centralized moderation by large platforms, including Facebook and Twitter, is often brought to question, more and more researchers are opting for decentralized community-powered content moderation (Ghosh, Kale, and McAfee 2011). Apart from the online presence, such platforms are often used to capture offline, real-life events using a camera and taking appropriate actions immediately (McCormick 2012).

Partnerships for the Goals

Human Computation provides excellent support toward organized partnerships. For instance, Polis¹³ is a real-time crowdsourcing platform, enabled by advanced statistics and machine learning, that collects and analyzes what large groups of people think using their own words. Similarly, other platforms such as Qualtrics or Amazon Mturk have shown significant advancements in crowdsourcing data from participants, such as analyzing microtask dynamics (Difallah et al. 2015).

Conclusion

We claim that the SDGs set by the UN can be addressed via a distributed perspective by involving people using human computation and crowdsourcing. There are still a few SDGs that have never been addressed using such approaches. This paper presents some of such SDGs for potential new avenues for human computation and crowdsourcing researchers. However, we have to be cautious about the dangers within crowdsourcing, such as heightened emotionality, reduced intelligence, and loss of self-control and design proper mechanisms more carefully while addressing the SDGs using these methods.

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¹³<https://pol.is>

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