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CONVERGING ETHICS AND SUSTAINABILITY IN ENGINEERING THROUGH COLLECTIVE INTELLIGENCE

I. BACKGROUND

A vital role in socio-economic infrastructure development is played by engineering and its advancements giving rise to Industry 4.0-related fields like AI and its practices, consequently leading to multi-faceted negative repercussions on humanity like elevated carbon footprints, discriminatory decisions, and a lack of human emotions [1].

Majorly, AI hinders societal progression with a growing reliance on its decision-making, as most AI-based systems rely on past data to conduct future forecasts in turn limiting human creativity to instigate novel ways of thinking about the world [2]. Also, it indirectly increases unfair outcomes impeding people's daily choices, necessitating the need for transparency and ethics in AI to explain the reasons behind its recommendations [3].

Unfortunately, however, most AI algorithms are becoming increasingly complex and opaque producing intellectually computed outputs but missing emotional intelligence portraying the absence of meaningfulness in human-centric approach application to engineering [4].

II. RATIONALE

Integrating sustainability and ethics while implementing AI systems is imperative to address AI engineering-related challenges. Noting this, in recent times, AI systems have been designed to support sustainable practices, including reducing energy consumption and minimizing environmental impact [5]. Further, as AI has become integral to products and services, ethical considerations in AI have incorporated various systems of moral principles and techniques for the responsible use of AI [6].

But, despite the large-scale desire in the engineering fraternity to discover a globally sustainable and ethical future of AI, an optimum level of benefits for humans has not been achieved from AI. Hence, placing humans at the centre of this integration and then blending Collective Intelligence into sustainable and ethical engineering is a significant method to mitigate concerns posed by AI. This process will aid in empowering creativity, wisdom, and fostering innovation thus aiding in overcoming larger global challenges like climate change while minimizing the risk of harm to humankind [7].

III. ANALYSIS

Sustainable AI can enable an environment-friendly future with broadened applications of AI and its adoption in different economic sectors. PWC UK research, commissioned by Microsoft, estimates that in 2030, AI applications for the environment would generate up to $5.2 trillion USD to the global economy, indicating an increase of 4.4% and would decrease GHG emissions by 4% i.e. 2.4 Gt CO2e which is equal to combined annual emissions of Japan, Australia and Canada in 2030 [8]. Additionally, an ethical AI system uses data responsibly, tends to be explainable as well as inclusive and have a positive purpose, thereby working in an unbiased and equal manner across all spectrum of society aiming to reduce cyber-crime, slow climate change, cures diseases, and so on [9].

Yet some researchers argue that sustainable and ethical AI are reactive approaches to AI engineering challenges and may soon turn out of date. Therefore, a more proactive approach is required in a rapidly evolving field, as a reactive approach usually has difficulty tackling bias embedded in the data. Hence, to think holistically about larger human-kind and societal issues like public health, politics, climate change, poverty, and decision-making bias, collective intelligence in AI has emerged from the trend of digitalisation. In this, there is a collaboration of human and machine capabilities with the potential to resolve challenges by collecting combined insights from various groups: humans, organisms, and animals, in diverse fields including psychology, philosophy, geography, computer science, and much more [10].

Human-centric Collaborative System

Collective Intelligence in AI — Body of knowledge that grows out of a group and collaborates human and machine capabilities

Sustainable AI — Fosters change in the entire lifecycle of AI products towards greater ecological integrity and social justice

Engineering — Implementation of AI in Industry 4.0 for socio-economic development, on a flip side comes with adverse effects on humans, society, and the environment

Ethical AI — Promotes the development and use of AI in a trustworthy, responsible, fair, and transparent manner

Making AI more Humane

The Future: Collective Adaptation

AI though being smart technologies does not automatically lead to smart results, accordingly assimilating collective intelligence in AI can guide in making the most of AI and group intelligence, especially human brains, helping humans to survive and thrive in complex and multifaceted issues [11].

Furthermore, consciously organizing and orchestrating collective intelligence harnesses its powers and actualizes the desired solutions to global issues. For example, organisms and nature have solved sustainability and environmental concerns for eons [12]. Referring to this, an organism is a pattern that can be mimicked in systems modelling to define the concept of a 'general collective intelligence' in AI to orchestrate cooperation so human groups act as a single organism, for reliably achieving AI-related problem-based solutions.
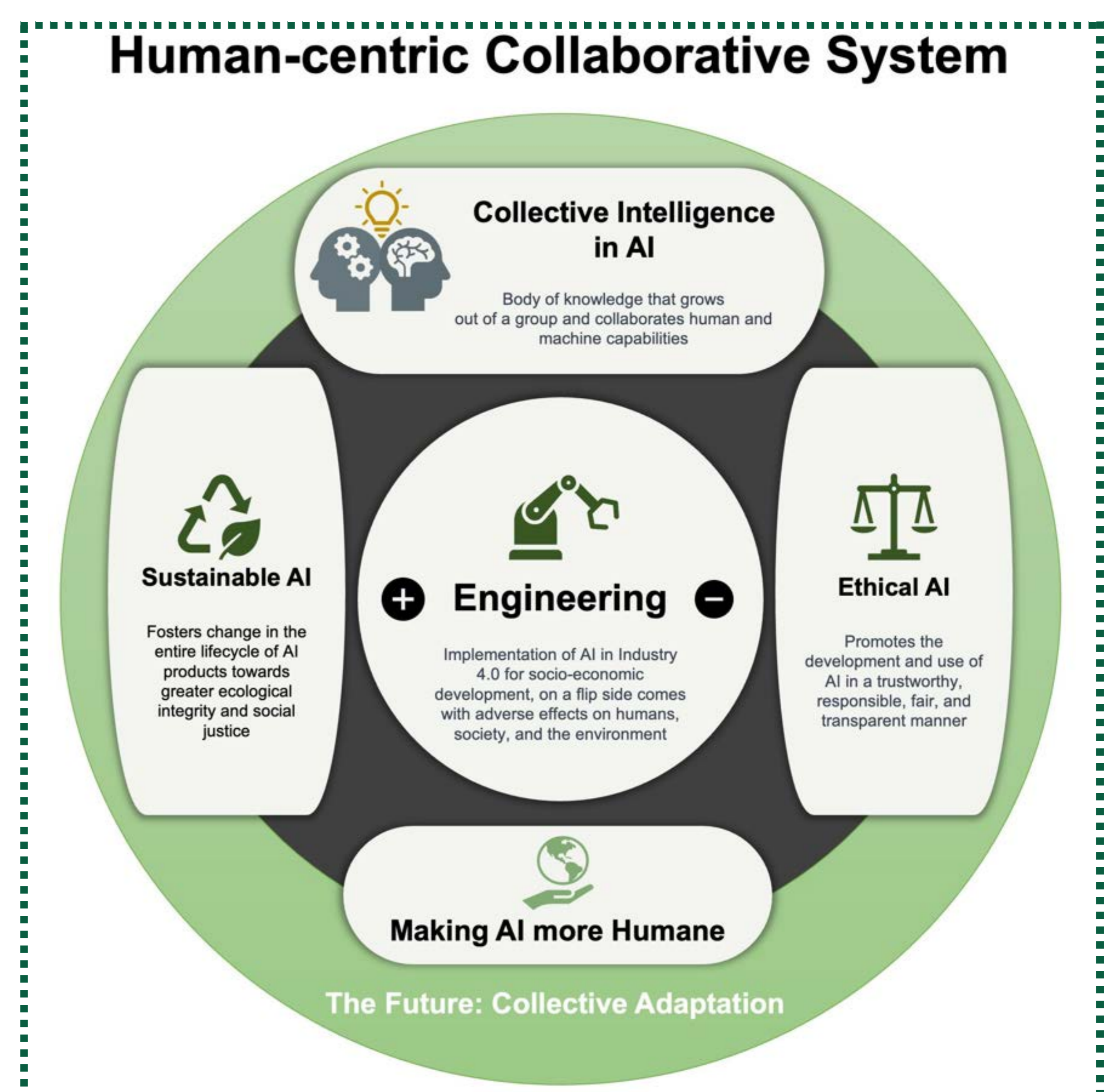
IV. RECOMMENDATION

While collective intelligence can adapt well to a certain set of problems, it may not perform optimally when the landscape changes, signifying the requirement for adaptation. Hence, requires going beyond blending collective intelligence in sustainable and ethical AI engineering by examining collective adaptation in complex socio-cognitive systems to formulate strategies and structures of networks that will assist in changing the future for the good by resolving global challenges and will reduce harmful trajectories of negative engineering in a dynamic environment to reach the full potential of our ability. Notably, collective adaptation navigates the ever-changing adaptive landscapes and adjusts strategies to the current constellation of problems [13].

V. REFERENCES

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