



## PERSPECTIVE

# Dynamics of Cellular Intelligence (CI) and Artificial Intelligence (AI): Health Perspectives

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### ABSTRACT

Artificial Intelligence (AI) enabled machines have touched upon the multifaceted life of every organism including humans on the earth. In fact, AI displayed by several kinds of machines are distinct compared to natural intelligence among living organisms including humans. Generally, natural intelligence is presented as cellular intelligence (CI). Hence, intelligence in any form including AI and CI are interlinked with each other in the context of dynamics and impact on each other. In recent, insightful discussions are appreciated to highlight the dynamics of intelligence from one form CI into another form AI. In this paper, we highlight the importance of understanding the dynamics of intelligence and their impact on human health and society.

## INTRODUCTION

Artificial Intelligence (AI) enabled machines have touched upon the multifaceted life of every organism including humans on the earth [1,2]. In fact, AI displayed by several kinds of machines is distinct compared to natural intelligence among living organisms including humans. Generally, natural intelligence is presented as cellular intelligence. Artificial intelligence may include two forms of intelligence including soft computing and hard computing techniques.

The intelligence of soft computing could be interpreted as the ability of a computer/AI-enabled system to learn a specific task from data or experimental observation. On the other hand, hard computing is attributed to conventional intelligence and that could be seen as non-cellular intelligence. Hard computing uses an analytical model and requires prewritten programs that act on a fixed set of instructions. In fact, computational intelligence based on the soft computing methods is associated with the adaptations to situations [2,3].

Before the advent of AI, all living organisms on the earth including single-celled and multicellular organisms are known to perceive, retain, learn and react to the environmental stimuli/chemical messages [3,4]. In other way, total cellular intelligence (CI) includes trillions of cells in a human body and each cell of

every organism including animals, plants etc. on the Earth. In fact, viruses have their own potential to perceive and react to environmental factors in different ways. Hence, total CI of all biological systems including humans, plants, bacteria and viruses could be considered in the form of an arbitrary unit (AU).

Some time, CI is in general termed as natural intelligence. In a more specific way, CI may be denoted as human intelligence and AI may be denoted as machine intelligence [5–7]. Therefore, dynamics of human intelligence and machine intelligence may be proposed in the same line as for CI and AI. Rather, intelligence may be converted from one form CI into another form AI. Intelligence in any form either CI or AI is the summation of received signals, inputs, data, and energy, storage of (signals, inputs, and data), analysis, interpretation, prediction and response [4–6].

Now in the era of technology, starting from the first AI enabled Machine (e.g. computer) and progressively to millions and at present in 2022, we may not be able to provide the correct number. However, we may consider the total AI of all AI equipped mobile, computer, machine and other systems in the form of AU.

Based on the above understanding in the context of CI and AI, we propose an equation on dynamics of intelligence by stating that decrease in CI will be compensated by increase in AI. During these dynamics of two forms of intelligence, total intelligence of any forms on the earth in AU will remain constant.

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In the future, AI and CI will come to equilibrium during the dynamics of intelligence.

Furthermore, the authors propose that during the evolution of CI and AI, an equilibrium point may reach. Then, a possibility in the "dynamic of intelligence" that AI can be compensated by an increase in CI. In that case, machine/AI-enabled systems will contribute to the reversal of dynamics of intelligence by helping cellular systems such as humans to regain CI with compensation from AI. It would be logical to accept that the evolution of intelligence in any form including CI and AI will be interchangeable and will have a unique evolutionary pattern.

Furthermore, dynamics of intelligence hints that neither intelligence may be created nor intelligence will be destroyed in nature. Therefore, "dynamics of intelligence" appears to be in line with existing "First Law of Thermodynamics" that also spells on the "Conservation of Energy form".

Additionally in author's perspective, intelligence is the summation of various forms of abilities at molecular, macromolecular, and cellular levels to achieve critical thinking, problem-solving, abstraction, logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, and perception of environment or surroundings. Therefore, intelligence in any form of CI or AI will be impacted by the forms of molecules present in cellular and machine/computer systems. Hence, the forms of molecules may change, but new molecules may not be created in the true sense. Therefore, the authors predict that during these dynamics of two forms of intelligence, the total intelligence of any form on the earth in AU will remain constant. However, the authors are open to accept if any other proposition can be forwarded by others in this direction.

A pertinent question is raised on the impact of the dynamics of intelligence with reference to alterations on the landscape of the genome of organisms specifically of humans. There is a growing concern that the total number of functional genes in humans are decreasing with time and changing environmental factors [8–10]. Therefore, an interesting discussion is warranted whether decrease in functional genes of humans, mostly those genes that may contribute towards CI.

Another view is that CI may be defined as a subset of genome intelligence that is inherited from parent cells and epigenome intelligence that may be developed during various adaptations to environmental situations and similar to computational intelligence based on the soft computing methods. Hence, cellular systems are based on the hardware platforms such as genome and chromatin models and these cellular hardware platforms may denote a subset of CI that is similar to hard computing intelligence of a machine system. On the other hand, during adaptations to situations and environment, other forms of intelligence such as epigenomic intelligence are created that are almost similar to the software computing based computational intelligence.

We also propose a terminology of carbon intelligence and silicon intelligence that in a broader sense denote CI and AI. Therefore, dynamics between carbon and silicon intelligence will shape up the future survival and existence of both cellular system and machine system with a form of dynamics as may be dictated by the existing environment and nature.

A crucial debate is that decrease in functional genes of humans with changing environments including surge of AI is mostly in the category of tumor suppressor genes or protooncogenes. An inclination towards loss of tumor suppressor genes is

more favorable compared to the proto-oncogenes. Hence, a crucial understanding on decreasing CI and more chances of cancer should be of the need of the hour. Besides cancer, decrease in "Cellular intelligence" and reduction in total functional genes could be explored for prediction of health diseases such as diabetes, neurodegenerative diseases and virus caused respiratory diseases. Taken together, understanding on dynamics and interplay of CI and AI will pave the way for better management of health and environment that will make life sustainable on the Earth.

## DECLARATIONS

### Consent to Participate (Ethics)

Not applicable.

### Consent for Publication (Ethics)

Not applicable.

### Conflicts of Interest

The authors declare that they have no conflicts of interest.

### Authors' Contribution

NKS contributed in idea/conceptualization, data collection and manuscript writing. SCS contributed in data collection, writing – review & editing the manuscript.

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