General Collective Intelligence as a Platform for Computational Social Systems

Andy E. Williams, Nobeah Foundation, Nairobi, Kenya

Abstract
The emerging science of General Collective Intelligence or GCI defines the requirements for a hypothetical platform able to self-organize individuals in a self-sustaining way into massive networks of cooperation with the capacity to execute collective reasoning in a way that might exponentially increase the general problem-solving ability of the group. Some of these requirements of a GCI include the property of "dynamic decentralization", without which any modeling, simulation, analysis or understanding of social systems from a quantitative and/or computational perspective are hypothesized to be centralized in a way that prevents them from being free of being constrained to be aligned with the individual interests of any powerful decision-makers involved in any of these processes. This paper explores why, as a consequence, building computational social systems on top of GCI is critical in ensuring that any class of problem can be solved where that class relates to the misalignment between the interests of influential individual decision-makers, and the outcomes that would be beneficial for the group.

Keywords:
fake news, General Collective Intelligence, Human-Centric Functional Modeling

Introduction

Through defining a functional model for problem-solving ability, the emerging science of Human-Centric Functional Modeling or HCFM [1] is able to distinguishes decision-making tools that increase the general problem-solving ability (true intelligence) of groups, from those that increase the narrow problem-solving ability of groups. A General Collective Intelligence or GCI [2] is a hypothetical platform with the potential capacity to exponentially increase the general problem-solving ability of a group, where that general problem-solving ability is expressed in terms of a general collective intelligence factor (c) [3].

Where cognitive psychology identifies two types of reasoning (type 1 or intuitive reasoning and type 2 or rational methodical reasoning [4]), HCFM defines a representation for each of these two types of reasoning in the "functional state space" that HCFM defines the behavior of the cognitive system as being confined to. The importance of these representations is that they clarify some profound misconceptions and misunderstandings that anecdotally are observed to impact virtually every computational social system today.

As an example, what is commonly lost in discussions about what is fake news is that there are two main cognitive biases individuals might have (type 1 or intuitive reasoning and type 2 or rational methodical reasoning), neither of which permits an understanding of the other. Both biases are useful however, but without a platform such as GCI to help select the optimal bias in each context, we cannot as groups switch between these biases in an optimal way, the same way we can switch between these biases within our individual cognition. Because of this inability, better decisions cannot reliably be made regardless of the amount of research performed, or the amount of discussion or information shared. These two decision styles simply come to different conclusions which can't be reconciled since

an individual can't understand type 1 reasoning using type 2 reasoning, and no individual can convince a type 1 individual using type 2 logic, and vice versa.

Because of this, fake news detection algorithms [9], [10] all make an assumption about what is or is not fake news, where depending on whether the individual is conscious of their predisposition towards a given reasoning style for a given problem in a given topic, this assumption might be incorrect. In order to be applied more correctly, such algorithms would need to be identified explicitly as operating within one or more of the quadrants in figure 1.

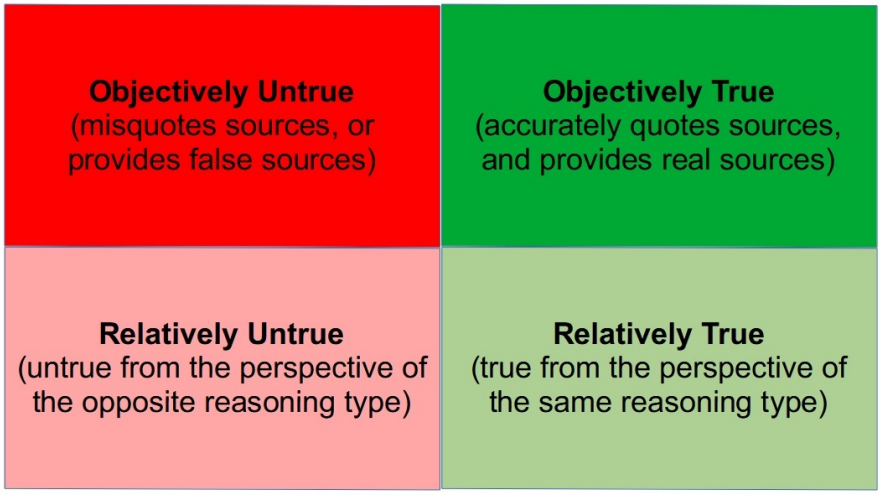

Figure 1: *Quadrants defining true and fake news.*

GCI on the other hand is hypothesized to reliably address this error by creating the possibility of switching between such algorithms, effectively switching between whichever reasoning type is optimal, where anecdotal observation suggests that achieving this is reliably improbable by any other means available today.

The challenge is that from anecdotal observation, the decision to use type 1 or type 2 reasoning is rarely made consciously, and the difference between the two reasoning types and the signature patterns of argument styles identifying each (e.g. ridicule or arguing against false strawman representations of type 2 arguments in the case of individuals predisposed to type 1 arguments in a given subject, or the insertion of logic that is considered offensive or conspiratorial, or otherwise ill-founded in the case of individuals predisposed to use type 2 arguments in a given subject) are rarely understood. The predisposition to each reasoning style is also heavily correlated with political leaning, and therefore whether one consciously or unconsciously chooses to use one or the other type of reasoning in a given topic determines which side of any polarizing issue one will fall on, including what one decides to call “fake news”.

While an individual's mind can always reliably choose between type 1 and type 2 reasoning based on which is expected to provide optimal outcomes based on one's belief systems and other factors, without a sufficiently intelligent collective cognition to organize groups, as mentioned, anecdotal evidence suggests it can be demonstrated experimentally that groups don't have the ability to reliably choose

intelligently (as opposed to compulsively) between these two reasoning types. As a result, because type I and type II reasoning are not reconcilable and simply come to different conclusions, groups have never had and can never have any effective mechanism for resolving polarization without explicitly implementing such a collective cognition (e.g. a General Collective Intelligence platform) [2]. This in turn is impossible without a model for general problem-solving ability that explains why narrow collective intelligence solutions cannot alone solve this problem of "misinformation".

Dynamic Decentralization

For any domain, Human-Centric Functional Modeling represents problems in the understanding of any system as the lack of a path through the functional states space of that system, through which that system might transition from an initial functional state to a target one. The magnitude of general problem-solving ability in that domain is represented in HCFM as the volume of its functional state space that the cognitive system or any other system can search for solutions to any problem per unit time, multiplied by the density of the functional state space the system much search through for a solution. The condition determining the existence of general problem-solving ability in any given domain is hypothesized to be that the motion of the system remains stable within a bounded region in the fitness space describing the fitness of the system to execute all of its functions in that domain, so that the system can sustain its execution of its functions in a stable way until any problem in functional state space might be solved. Dynamic decentralization (decentralization of processing to the best choice of functional components able to take on a role in that processing) is hypothesized to be required to satisfy that condition for true general problem-solving ability because otherwise processing cannot be prevented from becoming aligned with a subset of functional components potentially occupying a subset of roles, and the potentially narrow subset of problems those functional components or roles prioritize. If general problem-solving ability is indeed such a pattern of stability in fitness space that requires dynamic decentralization, then in failing to recognize dynamic decentralization to be a condition for the existence of general problem-solving ability, other technology platforms simply cannot reliably achieve that ability.

Taking fake news detection as an example again, if a fake news detection platform is not dynamically decentralized it cannot make use of whichever fake news detection algorithm is optimum depending on the quadrant it is operating in. Even if adequate fake news detection algorithms existed for each quadrant, such a platform could not reliably be ensured to have general problem-solving ability as applied to fake news detection, that is, it could not have the capacity to solve any general problem of fake news. The same might apply for every other computational social system in the domain of every other problem, whether addressing censorship, or surveillance. Without dynamic decentralization this theory predicts that the ability to solve any such problem in general cannot exist.

Assume it’s true that general problem-solving ability requires dynamic process decentralization. If any platform doesn’t have a model for dynamic decentralization, then that platform cannot sense or “see” its level of decentralization. It can’t then achieve the general problem-solving ability that requires this dynamic decentralization, since it is impossible to reliably target what they can’t see. This new kind of decentralization creates opportunities for platforms that have never existed before. One of these opportunities is GCI based platforms that can potentially self-assemble in ways that remove any possibility of censorship or surveillance [5]. Another is using GCI to radically increase social impact [6].

Abstracting the Logic and Networks of Cooperation of Computational Social Systems to a Platform

Through the use of Human-Centric Functional Modeling, collective reasoning can be represented in terms of a set of paths through the collective conceptual space, which serves as the functional state space of the collective cognition which a GCI platform represents. Similarly, it is hypothesized that any network of cooperation that might be used to execute such reasoning can be represented in terms of a set of paths through a "cooperation state space".
Any platform or other software is in a sense the automation of human logic, so if all logic is represented as being some path through conceptual space, then all platforms implement the automation of some set of paths through conceptual space. This suggests that through abstracting all collective reasoning processes so they can be represented as paths through this conceptual space, this conceptual space can in turn be used as the basis for domain specific modeling that can potentially be used to implement any logic modeled that way for any platform [7]. In addition, through abstracting all networks of cooperation so they can be represented as paths through this cooperation state space, this cooperation state space can in turn potentially be used for scaling the execution of any computing process through means such as parallel or distributed computing [8]. Through implementing social computing platforms in terms of these abstract models of logic and of cooperation, such platforms might be deployed within a GCI, which leverages these abstract models.

Discussion: The Technology Gravity Well
The alignment of social computing platforms with individual interests or ideologies isn't just an issue in the detection of fake news, censorship, or surveillance. It's an issue with far deeper implications. Current societies are represented in HCFM as ecosystem of individuals in that they are governed by systems of individual problem-solving rather than by systems of collective problem-solving. Without a more powerful system for collective problem-solving that ensures our choices are aligned with whatever is in the interests of collective well-being, it is hypothesized that choices cannot reliably prevented from becoming aligned with the interests of the most powerful individual decision-makers. The only difference between systems of individual decision-making might be where benefit or inequality accumulates. For all systems of individual decision-making by definition, since they lack a system of collective optimization able to reliably optimize collective outcomes, benefit cannot reliably be optimally distributed and inequality cannot be optimally minimized.

In a system of individual decision-making, technology generally provides narrow problem-solving ability that might be used to achieve competitive advantage in some given problem domain, resulting in the owner of that technology winning additional resources. These resources might be used to purchase additional technology and additional competitive advantage in that domain, potentially resulting in an increase in the concentration of resources (inequality) within that domain. Taken across a great many technology domains, this predicts more global increase in inequality if resources and technology in one area can be used to provide benefit in others.

In addition, any technology that provides general problem-solving ability however, might potentially be used to achieve competitive advantage in all problem domains. Any technology, including an AI that implements any subset of the functionality believed to be required to implement a super-intelligent AGI, is then hypothesized to accelerate the ability of any individual to optimize outcomes on their own behalf resulting in a free fall towards inequality. Because technology is the gravity creating this free fall, and because technological advance can be represented as the irreversible fall into a well, this effect is referred to in this paper as the "technology gravity well". A system that implements any subset of the functionality believed to be required to implement a GCI on the other hand is hypothesized to optimize collective outcomes, and in doing so is predicted to act like a virtual organism and is predicted to solve the negative aspects of the technology gravity well. A useful analogy in understanding the difference is that if all processing in the human brain could be accomplished within a single neuron, then that neuron

would be an independent entity. All of the brain's energy resources could concentrate there and all the other neurons would be free to atrophy. However, the brain is an organ within an organism. In order to ensure the optimal well-being of all its parts, the organism does not allow any of its parts to atrophy in order to provide a few with extra resources. This isn't some redistribution of resources that takes place in a top down way. This organization is built into the human system from the ground up. As GCI technologies can also potentially be incorporated from the ground up into any goods or services, being constrained to individual optimization as opposed to collective optimization predicts radically different social outcomes.

This "technology gravity well" is hypothesized to result in the time window to implement GCI potentially being limited. If this theory of a technology gravity well is correct, it is predicted to be an irresistible force of attraction which acts to increase the centralization of technology more and more, until deployment of a decentralized system of decision-making like GCI is no longer reliably possible, at which point problems requiring decentralized collective optimization in order to maximize outcomes for groups that include entire civilizations, might no longer be reliably achievable. Instead, after having fallen into the technology gravity well, it is predicted that societies might be constrained to follow goals aligned with the interests of powerful centralized entities (likely corporations and/or governments) in ways that might openly conflict with the public good, where those entities evolve technology too quickly for any significant number of the public to understand, or for any government regulations or corporate policies to be effective in changing even if they did.

Research Limitations

This paper has provided an entirely theoretical analysis regarding whether there is any justification for the assertion that building computational social systems on top of GCI is critical in ensuring that any class of problem can be solved where that class relates to the misalignment between the interests of influential individual decision-makers, and the outcomes that would be beneficial for the group. This purely theoretical analysis is justified in the current absence of experimental results, given the importance of the issue, but the lack of research to confirm the existence of a technology gravity well, to confirm that cognition can be modeled in terms of functional state space, to confirm the definition of general problem-solving ability of an individual or collective cognition in that functional state space, and the lack of research confirming other main assumptions of this paper, are limitations.

Conclusions

This paper has provided a very brief overview of the topic of General Collective Intelligence and why a GCI might be an important part of any platform upon which computational social systems might be built if some of the serious challenges those platforms target are to be solved.

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