Collective Intelligence and Effects of Anticipation

Ljubica Miric[(✉)]

CAUP - Tongji University, Shanghai 200070, China
miricl203@gmail.com

Abstract. Based on the extrapolation of contemporary theories that mind is a prediction machine, this paper points out the repetitive nature of the prediction parameters of collective intelligence anticipation scenarios and questions the hybridity of fears and desires regarding the evolution of artificial intelligence. Through the analysis of mnemonic principles of remembrance it combines the ancient technique of the art of memory with the contemporary views on the dynamics of perceptions in order to establish a link between the spatial constructs and their rapid expansion through the presence of the digital medium while in parallel suggesting an approach to the integration of the necessity for a more sophisticated systems of artificial intelligence into the collective intelligence. The main question of this paper is whether the anticipation of the future results in the creation of such a future, can a prediction-based interaction between man and machine govern its outcome? In order to attempt to develop potential new methods of integrating an idea of a different, more neutral outcome, the focus will be on the characteristics of perception that surpass the influenced, emotional response, and the observation of the general, innate human mechanisms of alignment. Through the study of the principles of memory the aim of this paper is to ask whether the individual comprehension of space and time as disengaged in given examples can in fact produce a system of ideas compatible in its nature to that of the machine itself. What are the main aspects of both human and machine that would stem their hybridity, and how should the collective intelligence adapt to enable the interlink?

Keywords: Collective hybrid intelligence · Mental imagery · Social imagery

1 Introduction

The pivotal aspect of intelligence, here defined as the ability to construct a model [8] gives the base through which this paper analyses the correlation between collective and artificial intelligence.

The following work explores aspects relating to memory, further than the contemporary *fears and hopes*—whose complementarity was defined by Descartes,[1] the mechanisms of generalized globally shared anticipation scenarios. The inquiry used for

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[1] In his book the Passions of the Soul from 1649, Descartes describes both fear and hope as dispositions of the soul.

proposing new kinds of understanding of the hybridity features will be centered around the shared aspects of spatial developments, as manifesting the use of AI on a social—urban scale, and the correlation between individual mental imagery with social imagery of anticipation.

The method of this paper is to propose an extrapolation of the individual brain's functional modes onto the social mechanics of reality lived, or in other terms: the application of the perceptual setting of an individual to the shared aspects perceived by the majority of the social group. Rather than standing by the idea of the collective consciousness, it explores the mechanism of perception which are inherently the same for each organism, the temporal dimension of the reality perceived in a space—virtual or material, as recollected, interpreted and acted upon. In proceeding, the terms: *cultural memory* [7], *collective intelligence* [2, 17] and the *extended mind* [5], will be used to refer to the social aspects through which the hybridity of intelligence between men and its digital environment of interaction is formed [13].

From the neuroscience standpoint our perception of reality is the brain's best guess of what reality is [15]. While locked inside a skull, the brain receives stimuli from the outside world, it interprets it and according to it makes the best probable supposition of what reality is, and somewhat a more accurate, yet rather unconscious, calculation of what are the conditions in which the rest of the organism that it is attached to finds itself in. How then can we define the parameters according to which this guessing takes place, or further so, time?

The established modes of how the prediction comes to be generated have been defined by Clark [6]. He applies the term *prediction error minimization* to refer to the process through which the guess is refined into a suitable inner representation of reality. Namely, in order to spend less energy on the calculations of the incoming stimuli, the stagnant aspects of the previous frame are kept and, if needed, corrected in accord with the incoming information about the temporal changes within the spatial context. Another aspect of this process is the constant back and forth between the past and the present, whereas previously collected information is updated, but still active in the calculated perception of the present frame. This interlinked relationship between the two temporal signifiers marks the key components of perceivable reality as repetitive.

In his 1908 ed. book titled *Matter and Memory*, Bergson writes: "perception is master of space in the exact measure in which action is master of time" [3, p. 24, translation]. Would it then be possible to interpret one of the causes of the present perception as the preparation for its future response? Taking this supposition further would mean interlinking the perceptual modes in a specific temporality. The linear passage of time is then varied within the perceived frame of reality. One might go as far as to assume that the perception of the present moment is a simultaneous calculation of the past retrieved and future predicted through the very process of *prediction error minimization*. The brain's best guess is thereby an action mastering time through the perception of space.

2   Mechanisms of Perception

The notion of *inference perception* as defined by Helmholtz, that can be traced back to Kant, is further analyzed by Seth through the idea of the *controlled hallucination*.

According to Seth [15] the three main components of it are: top-down predictions, bottom-up sensory signals providing prediction errors, and the hypothesis that one doesn't experience sensory signals but rather always their interpretation. He writes: "…what we actually perceive is a top-down, inside-out neuronal fantasy that is reined in by reality, not a transparent window onto whatever that reality may be" [15, p. 83]. This idea of *predictive processing*, hypothesis indicates that all conscious experiences are a form of appropriation of reality, even the one occurring in the present. Which begs the question whether the difference between past, present and imagined experience is in the quantity and quality of available stimuli.

Building on Peacocke's *Experiential Hypothesis*, [12] defines the Dependency Thesis, referring to the differences between two states that seemingly correspond, sensory experience and imagining, he writes: "imagery tends to be less determinate and replete in detail than sense experience, imagery can be subject to the will in ways that experience cannot be" [12, p. 405]. However, referring to the content, the dependency view attributes the perceptual experience to both the memory of an experience and imagination. A generic image, or the one that hasn't taken place takes the attribute of time within perception, while the experiential memory is an image which undertook place but lacks a fix temporality due to its potentially repetitive nature. Having in mind that the sensory experience of the present moment perpetually includes the capacity of a past prediction and the potential of the future action, a mental image is here as relevant as its correspondence to either dimension of space and time, or past and future.

In order to better comprehend the temporal aspect's repetitive nature of the mental image one can refer to the work of [19] on the *mnemotechnics*. With its origins in the ancient art of memory, this practice functions as an evocation of the place layered with detail or image. In order to memorize one is invited to visualize a spatial dimension to the temporal action. She writes: "We have to think of the ancient orator as moving in imagination through his memory building whilst he is making his speech, drawing from the memorised places the images he has placed on them" [19, p. 3]. Through this aggregation of temporality, past, present and future, while here action is defined as the continuum of speech, the orator expresses the spatial objectivity of reality through the virtualization of his actions, referring to the content. An essential aspect of this process is there by the layering itself of the imagined space with the factual image creating a virtual unity necessary to the perceptual process.

According to Bergson [3], "images themselves, they cannot create images, but they indicate at each moment, like a compass that is being moved about, the position of a certain given image, my body, in relation to the surrounding images" [3, p. 10]. Introducing the mnemotechnics to this process would signify a layering of space-image of the surroundings with the imagined place-image through which the content of the memory is recalled. It is thereby a simultaneous correspondence between the sensory image, or the neuronal fantasy, and the controlled imaginary of remembrance. Due to the overlap of control as action, one of the physical and other of the virtual movement, the virtual place would lack the three dimensional spatial aspects, and the interpretation of it would be achieved through the image-like, time-defined action of the virtual movement. Hence, the temporal aspect assimilates remembrance with imagination, indicating that

the place of the mental image, past or potential is the distorted space within which the third dimension is that of time, or hereby action: the movement through it.

What this hypothesis indicates is that the process of remembrance is influenced by the degree of the distortion of place into image, or the individual interpretation of it depending on movement. Just as the memories are displaced through time, they are created through time, or place rather than space, allowing for the sequencing of images. However, it is the deformity in the expectation of the next image in the sequence based on the previous that induces the storage of information, and produces the possibility for the recollection of it. This distortion, enhanced through the joint interaction with the data collected, the constant application of the screen, stems the need for a further exploration of the mechanisms of shared hybridity.

How is then this temporal back and forth of the individual mind consistent with the collective memory and thus imaginary? A key notion to the understanding of the perceptual process of the social group is what has it been exposed to in terms of individual sensory experiences. It would seem evident then that the wider the distribution of the content the higher the percentage of its partaking in the collective's memory. The potential of the group to envision a future action, or the aggregation of individual responses, thus depends on its capacity to have retained stimuli which can potentially be influential of each individual on a larger scale. The agreement on what has been perceived can come through the universal understanding of what is objective, though this aspect falls outside of the scope of this paper, instead the focus will be on the mechanism of individual perception which is biologically universal. Thereby: instead of focusing on the fact that red means *stop* and green means *go*, this work is oriented around the fact that upon seeing red the majority will have understood the sensory input as the color red, regardless of the interpretations one might have regarding that experience.

According to Lévy [10], "the Internet represents the unmediated presence of humanity to itself" [10, p. 190] leading to the more evident conception of reality as collective, since "we are all in the process of thinking within the same network" [10, p. 191]. The argument for the virtualization of reality leading up to its collective generalization through the ubiquitous screen may be expressed through the theory of the *extended mind*. The Internet has become a valid component, an extension, of the individual mind—shared collectively. The consequences of this virtualization seems to be the exposure to the screen—an image, rather than space, leading up to the kind of distribution of the content's experience which hasn't been experienced directly in space. This resemblance to the mnemotechnics in terms of the virtual place has potentially led to the heightened memorization of the digital content, however the constant exposure to the incoming information might have produced an acceleration in the substitution of the remembered content with the recently registered, within the episodic memory.

Thereby, the focus is not on the collective memory as a whole, defined by Halbwachts, but rather the cultural memory as argued for by Assmann which is "exteriorized, objectified, and stored away in symbolic forms" [1, p. 110]. The digital objectification that takes place through the virtual experience of the sensory screen can accordingly be observed through its potential to be perceived as the actual[2] experience. The aspects of

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[2] According to Levy [11, p. 23], the correlation is not between the virtual and the real but rather the virtual and actual, and the possible and real.

the virtual sensory input must then be in alignment with the spatial distortion in order to be assimilated into the perception of the pre-recorded as experienced within the present. Nevertheless, the lack of choice regarding the action of movement is reflected in the extension of choice to the realm of content, whereby the mastering of time is experienced through the attention given to the particular content individually, which creates an accumulation of the communally confirmed influence of such content.

The virtual representations of the world, in order to be integrated and influential, should correspond to the internal process of modeling, the intelligence as defined by Hawkins [8], or the neuronal ability to create a model that represents the world. The construct of the virtual image which has the status of the cultural memory and the mechanisms of the mental image through which the exterior is perceived are then in tight correlation in what concerns the intuitive human ability to integrate and actualize the observable stimuli. Therefore the argument for the collective memory here doesn't consist of collectively remembered sensory experience, but rather the individually generated imagery feedback to the distorted aspects of virtual space within the collective. It is this aspect of the distributed activity that then generates the future outcomes.

3   Anticipation of the Collective

Within the attempt to comprehend the interaction between humans and machines in the contemporary world, the accounts of the perceptual mechanisms are here confronted with the notion of anticipation as a process of action in virtual or material space.

According to Poli [14], "anticipation occurs when the future is used in action". He goes on to distinguish the components of anticipation as "a forward looking attitude and the use of the former's result for action" [14, p. 4]. While the study of the future consists of three levels, forecasting, foresight and anticipation, also called the design-based foresight [14, 18], the third level, anticipation is based on the results of former two and marked with the goal of "implementing them into decisions and actions" [14, p. 7].

Further than the predictive and spatial perceptual forecasting and the non-predictive temporal foresight which generates an exploration into the possible futures, the anticipation models evoke the enacting of both past and future within the present. In accord with the imbrication of the two, anticipation scenarios produce the action which directs towards a seemingly desirable outcome. Aligned with the view on fear and hope as having the same functional mechanism, the action of anticipation is here not defined according to the emotional response but rather it demonstrates how the mental image of action takes its form within both space and time. According to Bickhard [4], p. 15*, 2018, p. 328) *representation* and *motivation* are not "distinct subsystems" but "different aspects of one underlying dynamic of selecting interactions within a space of (anticipated) possible interactive trajectories".

In his 1969 paper *Social Research for Social Anticipation* Paul Smoker writes: "To date, the most desirable alternative futures have often been regarded as "utopian" and impossible, while those that are considered most probable have for the most part been mere extrapolations of dominant trends of the past" [16, p. 13]. In regard to Jamison's notion of the postmodern *perpetual present* (1991) this formulation of the overlap

between temporal dimensions, socially resulting in the action which is most likely to correspond to the previous action, directs the comprehension of the envisioned outcome as an exaggeration of the social present. According to Poli's reading of Appaduarai's interpretation of Bloch, one can distinguish the *endpoint utopia* from the *everyday life utopia*: "the roots of the future are in the present, if only we learn to see them." p. 117 How is then the social anticipation of the future past shaping the perpetuity of the individual present?

The confrontation of the anticipation of the future based on the past which has never taken place, as is the case of fiction which exaggerates the contemporary fear and hope, with the seemingly evident potential of the future development which envelopes progress as such that has taken place, points towards the nature of origin of the mental image of action. The spaceless past which is socially distributed is then further than the individual experience, an image embedded within the collective. "Imagination, and especially collective imagination, *produces* reality" [11, p. 189]. An arguable take would then be that the fiction which has been experienced as a mental image is equally relevant as an experiential memory. Generating a mental image of action is thereby equally dependent on the past that took place and the past that only took time.

The repetitive nature of the temporal recreating of the mental image, and the unique distortion of place generated within each sequence, influences a response to that which has been integrated—as a uniform potential contemporary outcome action. On a larger scale, the controlled hallucination of the individual addresses the exposure to the shared stimuli as integrated in different manners, but acted upon in accord with the collective reality of the present. In other words: regardless of the individual angle at which the green light was perceived to be the color green, there is a consensus on the fact that the experience of the color green was in fact green, which within the collective that has perceived it individually stems a decision routing of action as: action, inaction or no regard. An accumulation of varied responses thus produces the socially constructed response to the past experience collectively shared. If the past experience is that of the collective response in the form of a mental image of future action, the collective itself is the driving force of such an action.

4 Artificial Intelligence on a Social Scale

The notion of AI formed through the social conception of what is artificial intelligence is in many ways different to the mechanisms of its functioning.

Instead of focusing on the social perception of what artificial intelligence could become, or further more the social aspects of functioning of the artificial intelligence, the interest falls within the domain of the operational hybridity between the society and numerous systems of artificial intelligence which govern it.

An evident example of this comes through the extended mind theory. Knowing the route has unarguably become a possibility to know the best route at a given time. The human capacity to anticipate has been enhanced through the computational power of calculation. The argument is thus for the hybridity of collective action of social anticipation and the enhancement of it through the shared, distributed algorithms of AI. If the potential of a future action depends on the past memory, obtained through a

direct experience or an indirect impression of an experience, and the recalculating of it through the present circumstances of perception mechanism, then an evident addition to that calculation is the prediction proposed by artificial algorithms.

Where the movie *Matrix*[3] depicts the new generation of the governing artificial system as the result of it being challenged by an individual, the reality of contemporary AI is that each individual contributes to the constant re-enhancement of the perpetually regenerating system. A dystopian prediction, here viewed as a *dark* utopia, focuses in many aspects on the everyday life rather than the final outcome, seen as such, one is prompted to acknowledge the shared computer simulation. The comprehension of virtuality comes most evident in its manifestation as augmented reality, where the historical backdrop gives spatial characteristics to the physically elusive digital medium. Hence hybrid urbanism in the context of the individual on a social scale has the potential to stem new modes of approach to the urban reconfiguration of the already built landscapes.

Just as the cultural memory finds its actuality in the monumental structures which landmark the urban fabric, so can a digital expression of style signify a virtual landmark of the said fabric. Upon classifying the depictions of the urban hotspots an algorithm can be used to identify different aspects which mark the urban zone as of particular interest, intensity, brightness, colorimetry, flow, etc. These data, collected and interpreted could potentially signify a means of classification of the urban zones and their further redevelopment in regard to the necessity to lessen or heighten the particular relationship between the inhabitant and their environment.

Instead of proposing a new manner of shaping the urban tissue, the focus in the particular examples falls on the capacity of the individual to retain and reproduce an idea of urban landscape in accord with the socially constructed consensus on what the built landscape itself should resemble. By creating an urban project which focuses on the distribution of an idea of a city, one which can be achieved as an accumulation of individual actions, it is arguably possible to achieve a socially appealing representation towards which the inhabitants alongside developers will strive towards. Such project would then combine the existing systems of algorithms with the reconfiguration of their application in the attempt to create a more balanced functionality of the built landscape. This would stand for the merger between the individual actions resulting from the shared anticipation scenarios and the governance of those scenarios by urban planners.

5   Conclusion

Rather than opposing artificial intelligence to human intelligence, the line is drawn between the multiplicity of algorithms generating the outcome action of what is known as the artificial intelligence and the social mechanisms of producing a collective response as an aggregation of individual processes.

The argument is thus for the hybridity of the collective with the algorithms which govern it, rather than an attempt to invoke differences and similarities between the individual brain and the artificial software. Just as artificial intelligence could not achieve the

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[3] The *Matrix* (1999) directed by Wachowskis, Distributed by: Warner Bros. Pictures, Village Roadshow Pictures, Roadshow Entertainment.

type of individual human consciousness, the collective itself lacks a uniform consciousness. But do they lack intelligence? If intelligence is the ability to generate a model, with an awareness of what that model is, then the answer for both would be negative due to the absence of consciousness, however, if intelligence is the ability to generate a model and act upon it, then the hybridity of the collective with the artificial systems of operating within the world becomes more evident.

A mechanism of the response generated by the AI is in many ways similar to that of the collective, it is based on an accumulation of individual processes of learning, and though a prediction is possible it is not based on an individual emotion but a systematic organization of individual responses. The most influential systems of AI in the contemporary world operate in relation to the collective of individuals, and though there are examples of individually controlled algorithms with an attempt to resemble human consciousness, the majority of the AI systems interact with- and are based on- the collective. An example of such a system at an urban scale is the initiative called the city brain.[4] The way in which it operates deserves further investigation from a philosophical stance, or the modules in which it interacts with- and is influential of- the society it enhances.

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[4] According to Leach [9] City Brain is "Perhaps the most extensive exploration application of AI to the city" [9, p. 120].

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