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Some Discussions on Subjectivity of Machine and its Function Contributions to ICIS 2020

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Abstract. Many people think that, in order to improve the capabilities of a machine, the machine should have its initiative. Consequently, in order to make machine having its initiative, the consciousness of machine should be established. Here, we propose that instead of consciousness, the subjectivity of the machine should be considered. Thus we can avoid unnecessary arguments, and conduct fruitful discussions. We analyze the subjectivity of a machine and propose a working definition, and discuss 4 major aspects of subjectivity, namely, a priori and cogitating, active perception to outside, self awareness, and dynamic action. Dynamic action of a machine is crucially important and we suggest a possible way to approach it.

Keywords: Subjectivity of Machine, A Priori, Cogitating, Active Perception, Self Awareness, Dynamic Action

1 Introduction

Currently, machines are able to do a lot of seemingly intelligent things, such as playing Go, recognizing human face, etc. On the other side, it also appears that machine has a lot of difficulties for more things, such as automatic driving, robot, and much more. We want to develop machines that can do these things. People have found that most difficulties for these tasks stem from this situation: machines lack initiative, consequently hard to adapt to complicated/novel situations. Contrast to this, human has conscious, so human can form a high degree of awareness of his environment and himself, and based on the awareness form a high degree of initiative. Thus, human indeed have much more abilities. Naturally, many researchers think that, in order to make machines become more capable, it is best to have some ways to equip machines with a kind of consciousness.

But, it is super difficult to go this direction. Consciousness of human is a major scientific challenge and whole scientific community are working hard to

* Great thanks for whole heart support of my wife. Thanks for Internet and research contents contributors to Internet.

understand it. Yet, no satisfactory result has been achieved, and we do not expect to see break through in foreseeable future. So far, people can only roughly argue about consciousness of machine. In fact, whether or not a machine can have consciousness is still an open question, and big controversial one.

We can step back and ask: do we must establish consciousness for machine first? Let's see some common explanations. According to wikiPedia¹: "Consciousness, at its simplest, is sentience or awareness of internal or external existence." Still according to wikiPedia²: "subjectivity is: Something being a subject, broadly meaning an entity that has agency, meaning that it acts upon or wields power over some other entity (an object)." These explanations give us an useful hint.

The hint is: From perception to action, there are a huge amount of processes. We believe consciousness is actively involving with these processes (which is the reason why consciousness is so powerful). However, is it possible that we can distinguish these processes into different layers? Further, can we concentrate on the layers more close to action? We believe the answer is YES.

To help to explain this thought, we consider one example. When a car driver is approaching a stop sign, seems a lot of processes happen inside him: first, his perception channels activated, and excites several parts inside his brain, then these parts mutually communicates, all such communications form his awareness to the constant changing situation, and form his understanding to situation, then based on such understanding, his action is determined and executed. Consciousness involves with all these processes. So, people think that in order to have correct actions suiting to constantly changing situations, consciousness is necessary. However, when we look carefully, this example actually shows this point: there are layers, the most top layer is consciousness, then down to initiative, then down to subjectivity, which directly connects to action. This part, i.e. after consciousness activated and before executing action, is very interesting. This part is subjectivity.

Thus, we would like to propose: for the purpose to enhance capability of a machine, we can consider subjectivity of the machine, instead of consciousness of the machine. At least for now.

Of course, subjectivity of machine is not clear by this word itself. We do not have an appropriate and workable definition yet. However, it is already apparent that to discuss subjectivity is a much easier comparing to discuss consciousness. We are going to discuss subjectivity of machine in this article.

We will try to describe subjectivity of machine as reasonable as possible. The subjectivity, of course, is something happens inside the machine. Should we treat everything inside the machine as the subjectivity of the machine? There is no need to do that, and that is not right. Since our purpose is to enhance machine's capability, we can focus on those things that happen inside a machine and have important influences on the machine's capability. So, we ask what are these things?

¹ <https://en.wikipedia.org/wiki/Subjectivity>

² <https://en.wikipedia.org/wiki/Consciousness>

There are 4 kinds of important things: 1) a priori and cogitating; 2) active perception to the outside of the machine; 3) awareness of self; 4) dynamic action. They are 4 major aspects of subjectivity of machine. We can see that these 4 aspects can be studied in details and by solid technological approach, not like consciousness of machine that can not be studied technically now. We emphasize again, unlike the consciousness of machine, the 4 aspects can be clearly defined and understood. We can measure them, can build engineering model for them, and can develop scientific theory to study them. These 4 aspects form the working definition of subjectivity of machine.

Another point of view to see is: For human, subjectivity is after consciousness and before action. We can see that the 4 aspects fit quite well into this understanding. Such fitting supports the working definition.

Moreover, we can see that even if the machine has consciousness, when the consciousness works, it must work through the 4 aspects of subjectivity. That is to say, we need to establish the subjectivity of machine anyway.

Now, we can say that using subjectivity of machine, we can avoid unnecessary arguments and conduct productive research and development. However, as far as we know, there is no systematic research work on the subjectivity of machine. We have been working on universal learning machine for several years [2] [4] [6]. In the research process, we have consistent interest in the subjectivity of machine and its role in learning. We have thought over this topic for long. These thoughts are foundation of this article.

In this article we will not discuss how to realize the 4 aspects of subjectivity in a machine, which will be left to future and more in-depth researches. Following, in Section 2, we will talk more details of each aspect of subjectivity; in Section 3, we will see the functions of each aspect; in Section 4, we will discuss dynamic action, which is the most important aspect.

2 Major Aspects of Subjectivity of Machine

There are 2 ways to describe subjectivity of machine: One is behaviorism approach, another is mechanism approach. Behaviorism approach is to see the behavior of machine from outside, and use the behavior to understand the subjectivity of machine, while mechanism approach is to see how these aspects of subjectivity are formed and executed inside machine. Ideally, it is best to have both approaches and make them working together. However, due to the hardness and novelty of topic, we will consider the behaviorism approach more. In this way, we can at least achieve some good understanding. If possible, we will also try to see mechanism to these aspects.

However, there is one question that we have to address: Machines are controlled by programs, and programs are written and installed into machine by us. How can programs form subjectivity of machine? We believe that this will become clear as we examine 4 major aspects carefully.

2.1 A Priori and Internal Cogitating

A priori is the very essential part of machine. If the machine can learn, it must have a priori, otherwise, machine is impossible to learn. The learning is to adjust and modify according to external and internal information. In order to do such adjusting and modification, a machine must have some internal structures. At least a learning framework is needed, so that the external information can be used and internal information can be generated, and learning can be conducted through this framework [2] [3]. Moreover, machine could have more, such as some knowledge that are part of what desired to learn. All these things together form a priori.

Look at the behavior of the machine. If the behavior is that response immediately follows stimulus by a fixed procedure, no matter how complicated and comprehensive the response procedure is, we think, the subjectivity is very small, even zero. However, in contrast, if we see such behavior that after stimulus, the machine cogitates before response, we think that the subjectivity is much higher.

So, if we see a machine can learn, and/or, it cogitates before action, then we say, machine must have a priori, and/or it must have internal cogitating. Such machine has higher subjectivity.

This aspect of subjectivity, i.e. a priori and cogitating, can be formed by programs inside machine. For learning, we have layout the basic principles [2] [4]. For cogitating, it can be thought as a reasoning system (be simple or very complicated), and a decision is made after weighing concurrent outside and internal situations, not by pure fixed procedure. Most likely, these are realized by multiple programs working together.

2.2 Active Perception

Usually machines are equipped with some sensors to obtain information from the outside world. Many machines are like this: according to a preset program, a fixed sensor is used to get information according to a fixed channel and in a fixed range, and then put them as input. The key is to collect information within a preset range by a preset program. For this case, we think that the subjectivity of the machine is low or even zero, although the machine can obtain external information.

In such case, the capabilities of the machine are indeed limited. To improve the capabilities of the machine, it needs to actively perceive outside situation. If we see the behavior of machine having such characteristics, we think the subjectivity of the machine is higher. Active perception to outside can be done by programs working together.

2.3 Self Awareness

The machine's perception to self can be done by some sensors, just as the machine's perception to outside. However, many machines lack awareness of self, especially the awareness to their internal information processing. If the machine

has awareness of self (no matter how small), it is a step to higher subjectivity. This is different from the perception to outside, for which, only active perception is considered as higher subjectivity. For awareness of self, no active is required. Of course, if the awareness of self is done actively, the subjectivity is even higher.

If we can observe a machine's behavior showing awareness of self, we know the machine has higher subjectivity. Awareness to self can be done by preset program. This is not a problem at all. The degree of awareness of self can be used as measure of subjectivity.

One point we should directly mention here: Awareness to self is indeed related to consciousness. But, awareness to self is well defined and we can fully understand it. This fact shows that considering subjectivity has advantages than considering consciousness.

2.4 Dynamic Action

What really is dynamic action of machine? Perhaps, we can first see what is dynamic action of people. When we are facing certain task, due to situation, we can act this way or that way, and do not have clear criteria to determine what to do. However, the possible ways are not equal. The consequences of actions are different (could significantly different). But, we do not know the consequences. So we can only judge actions after action is done. Facing with such situation, what do we do? Actually, facing with uncertainty, we try our best to act and often we indeed choose the best out from unknowns. This is dynamic action of people.

The dynamic action of machine should be understood in the same sense. That is, when a machine is facing uncertainty, how will it do? If from outside we can observe the behavior of machine to try its best, according to behaviorism approach, we can say the machine has dynamic action. Of course, "try its best" will be controversy. But, other than the possible controversy, the dynamic action can be clearly understood along this direction. Again, compare to consciousness, dynamic action is much easier to well define and understand clearly. This is advantage.

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After discussed 4 major aspects of subjectivity of machine, we can come back to the question: Can programs in machine form subjectivity of machine? Now we can say, Yes. The program is put in by the designer of the machine. Therefore, the behaviors of the machine actually reflects the thoughts of the designer to some extent, and can even be regarded as the embodiment of the designer's subjectivity. If the machine is not a learning machine, then the subjectivity of the machine is completely determined by the designer's mind. If the machine is a learning machine, after learning, there is a distance between the machine's subjectivity and the designer's thinking, and this distance could be huge. In short, the subjectivity of the machine boils down to some properties formed by all programs in the machine. No doubt, subjectivity of machine need further researches. However, contrast to consciousness, subjectivity can be clearly defined

and formed by technical steps. In fact, we have already briefly discussed how to form each aspects of subjectivity. For most important aspect, i.e. dynamic action, we will discuss more in Section 4.

3 Functions of Subjectivity of Machine

We will use some examples, Go game, image recognition, natural language processing and control systems, to see functions that the 4 aspects of subjectivity could play, which can us understand subjectivity better. These typical examples are chosen because they are easier to describe by us.

3.1 Go game

The purpose of the Go program is to play Go game and win it. A Go program has two operating modes, one is learning and the other is competition. The two operating modes may be mixed, but distinguishing them can help our discussion. Let's talk about learning first. The learning is very crucial. At the beginning, the Go program only had a framework for learning, such as artificial neural networks and Monte Carlo searching trees. Relying on these, Go programs can gradually gain the ability to play chess through training. We can see that these neural networks and searching trees are a priori of the Go program, which has a decisive influence on the Go program. Without it, there is no Go program than can win human master.

During the game, the Go program uses the program established from learning. It will process input information. At this time, the program will form such cogitating: evaluate several possible moves, then pick the moves that the program thinks as the best (not necessarily with the highest evaluation value), and then output (i.e. play). If no move is satisfactory, the program can go back to evaluate more moves. The cogitating is indeed present here and is very essential. This shows the high ability of Go program.

The outside world of Go program is very simple: the board of game, which can be formalized as a 19x19-dimensional binary vector. Go program does not need any active perception to outside. Also, Go program needs no self awareness. But it might need dynamic action, which we will discuss later.

3.2 Image Recognition

An image recognition system also has two operating modes, one is training and another is working. During training, the image recognition system, as the Go program, relies on a priori for learning.

Some image recognition systems are so-called end-to-end. After this system is trained, it actually appears as a mathematical function (very complicated, though). An image (usually a bit array) is input and a vector (usually, probabilities of choices) is output. Therefore, such a system, there is no internal cogitating. Such a system shows very low subjectivity.

However, we could do much better. The amount of information input by these systems is much larger than that of the Go program (for example, compare 19x19 to 1024x1024x3), and the complexity of the objects contained inside input is also much higher. Image recognition requires trade-off and take choices. For example, when a face recognition program processes input, in order to improve recognition efficiency, it is necessary to discard some of the insignificant information and focus on the key parts. But, which parts to focus? This is cogitating. A system with such ability has higher subjectivity.

Most of the current image recognition systems do not actively perceive. However, if an image recognition system wants to improve performance and improve recognition ability, active perception is required. For example, if you want to reduce energy consumption and save computing resources, you can use this approach: For 1024x1024 precision color images, first input low-precision images, such as 128x128 precision images, but then actively collect local high-precision images at the proper place. Since it is local, although with high precision, the amount of data is much smaller. In doing so, the efficiency will be greatly improved. In fact, the human eye works like this. Moreover, if in some special situations, such as defaced images, high-precision partial images of the defaced area and the surrounding area can be collected, the defacement can be overcome and the correct recognition can be achieved. Such an ability would be impossible to achieve without active perception. With active perception, the efficiency of the machine are improved, and subjectivity is higher.

Most of the existing image recognition programs have no need to aware themselves. But, for some situation, it can certainly do better with self-awareness. Suppose in an image recognition program, there is a competition between outcome A and outcome B. This situation is quite common. If there is no internal awareness, the image recognition program cannot know the specific situation of the competition, only knows the result, such as A is winning. What if the winning is only by a very small advantage? If program aware the situation, that is, only a very small advantage, program may have new initiatives, such as doing it again, re-entering data, etc. If this is possible, the efficacy will increase. And, subjectivity become higher

Perhaps, most existing image recognition programs no need to have dynamic action. However, when the requirements to the programs are increased, such as increasing the recognition rate, reducing energy consumption, enabling it to work successfully under various difficult conditions, increasing the recognition speed, etc., it will needs dynamic action.

3.3 Natural Language Processing

A good natural language processing system should be online learning, that is, even at work, it is still in a learning mode, and the learned results are applied immediately to the current work. The ability of natural language processing is very dependent on a priori.

For active perception to outside, we can consider an automatic translation software (a special natural language processing). It could be so-called end-to-

end software (many such programs indeed are), so it has no active perception, it throws everything into a huge artificial neural network and output of the network is the translation. The subjectivity in this case is quite low. However, to have active perception, translation software can do much better.

Besides to translation software, there are many kinds of natural language processing systems, such as speech recognition, press release writing, and so on. For some of them, active perception is absolutely necessary, such as, speech recognition in a noisy background.

A software for writing needs awareness of self, for example, it needs to recall what it writes before at some point, so it can write consistently later. If a natural language processing system can do dynamic action, it could perform much better.

3.4 Controlling System

There are many kinds of control systems, and many levels of complexity. We can use an automatic driving system as an example to discuss. Such system must be obtained from learning. So, a priori plays a central role in learning. In order to ensure high reliability and high security, this system cannot learn online, so after the training, the system is fixed. However, the internal cogitating of this system is very complicated. This is because the input of automatic driving are very complicated from many sources, and it is impossible to simply normalize. The system must select and sort the input information in real time, which is high level of active perception. It must also need to have a high level of self-awareness. Such system has a large knowledge base and will meet novel situations. System needs to act correctly when novel situation appears and such action must not conflict with existing knowledge as much as possible. This is dynamic action. Such a system inevitably shows extremely high subjectivity.

In traditional control system, feedback is integrated into the system without cogitating. So, feedback just appears as one term in control equation. This actually limits the ability of controlling system greatly. With cogitating and dynamic action, a controlling system will have a much stronger ability.

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These examples demonstrate that a machine with subjectivity will have much better abilities. This is exactly what we want.

4 Further Discussions on Dynamic Action

From previous discussions, we can see that dynamic action is in the center. We know that a priori and cogitating can be completely realized by a preset program, but if a machine posses dynamic action, a priori and cogitating of the machine can be better. The active perception and the awareness of self can also be completely realized by a preset program. Yet, these aspects are very closely related to dynamic action. Therefore, dynamic action of machine is the most crucial aspect of subjectivity.

What really is dynamic action of a machine? How can a machine has dynamic action? The questions are not easy. We do not expect to discuss them without controversy. But, at least we should have a good working definition and find some approaches that shed light on it and lead us forward.

Since human and animal indeed have dynamic actions, so we trace literature of biology, sociology, and philosophy to see anything closely related. In fact, the concept very closely related to dynamic action is agency. According to wikiPedia³: "In social science, agency is defined as the capacity of individuals to act independently and to make their own free choices. By contrast, structure are those factors of influence (such as social class, religion, gender, ethnicity, ability, customs, etc.) that determine or limit an agent and their decisions." Also in wikiPedia⁴: "Agency is the capacity of an actor to act in a given environment." And, according to Open Education Sociology Dictionary⁵: "Definition of Agency is: The capacity of an individual to actively and independently choose and to affect change; free will or self-determination." These descriptions shed us light.

However, we would like to cite one sentence from a web article "Life with purpose" written beautifully by Philip Ball⁶: "One of biologys most enduring dilemmas is how it dances around the issue at the core of such a description: agency, the ability of living entities to alter their environment (and themselves) with purpose to suit an agenda." This sentence very well reflects our thoughts on dynamic action: it is a kind of ability of machine to see/sense/view/do/etc by itself, which can make the machine's situation better.

So, we would like to use the above sentence as our working definition for dynamic action of a machine. We do not use the term agency (though we could). For machine, dynamic action is a better term, since it is more direct, more clear and sounds mechanic.

With such a working definition, we can consider further: Is it possible for a machine to have dynamic action? If so, how to realize it in a machine? This certainly is very controversial. Many people would argue: A machine can be reduced to a Turing machine. According to the computational theory, what a Turing machine can do is just a computable function. There is no way dynamic action could be generated by a clearly defined mathematical function. Such arguments are correct in some sense. But, we do not agree with such statements. We will discuss these issues by focus on machine's ability (by behaviorism approach). We will also touch a little on mechanism of dynamic action.

In the working definition, there are several critical parts. One is "by itself", another is "make better". Let's see them more closely.

How will a machine do *by itself*? Actually, this is a dilemma not only to machine, but also to many living things (as the sentence we cited above). But, if we concentrate on behavior, we can see things more clear. To illustrate, let's consider this simple and straightforward example. Consider a machine M and

³ [https://en.wikipedia.org/wiki/Agency_\(sociology\)](https://en.wikipedia.org/wiki/Agency_(sociology))

⁴ [https://en.wikipedia.org/wiki/Agency_\(philosophy\)](https://en.wikipedia.org/wiki/Agency_(philosophy))

⁵ <https://sociologydictionary.org>

⁶ <https://aeon.co/essays/the-biological-research-putting-purpose-back-into-life>

there are some programs inside it. Consider two scenarios. Case A: M makes a judgment based on program C ; Case B: same as case A, but in some situation, program D will be activated that modifies the parameters of C , thereby the behavior of M appears to have a special response to the situation by itself. So, for observers outside the machine, M in case B seems has higher subjectivity than in case A. This shows that even the behaviors of the machine are fully determined by some preset programs, the behaviors could show different levels of subjectivity. Therefore, from the perspective of behaviorism approach, a machine indeed can demonstrate ability to do "by itself". This is dynamic action to observer. Thus, machine can possess dynamic action, although it is done by preset programs.

For "make better", we can consider this example. Machine M , inside M there is a program C , which has 2 branches, A and B , and it is crucial to choose. There is a program D will be activated just before to choose branches, which will modify the parameters of C , thereby to help to choose branch. If D can get information about situation, and react according to the situation, then M appears to have ability to make situation better. So, to observers outside the machine, M demonstrates dynamic action to make situation better.

Above, we use examples to illustrate that a machine indeed can show subjectivity, "by itself", and "make better", if we stay outside machine to observe its behavior. But, we can go deeper into mechanism as well.

People often argue that although a machine could demonstrate dynamic action to outside observers, inside the machine it is actually a preset programs at working, so there is no dynamic action at all. They think that the computational theory denies dynamic action. It is not so simple. Let's see dynamic action from view of computational theory.

A persistent question lasting for decades in computational theory is whether Turing machines can perform non-computational tasks. Although it sounds very conflicting, that is, what a Turing machine can do is computable task, how can it complete non-computational tasks? But if we consider it carefully, the reason for objection is not sufficient, because we can use more than one Turing machine and use one Turing machine over and over again for the task. There are some previous works in this direction. In [8], Kugels argument is: for a task, even it is not computable, it still is possible to use a Turing machine. He proposed a way to use Turing machines in order to treat tasks outside the computable range. He called such way to use Turing machines as Putnam-Gold machine. Such a way could be summarized as: to use Turing machine over and over again while increasing the critical capacity of Turing machine each time. Wang Pei [11] proposed another way. He propose to use several different procedures together, and these procedures are under resource competition, the procedures can be terminated not according to any preset program but according to the concurrent resource situation, thus forming a non-predetermined result. In [5], I proposed another way: Inside a learning machine, there is a container called conceiving space, and inside which, there are many X-forms to do information processing. Those X-forms actually are surging, i.e. to combine, cut, renew, etc.

Thus, such surging can produce completely non-predetermined effects, such as inspiration.

The methods mentioned above (Putnam-Gold machine, resource competition in NARS, the surging of X-form in conceiving space, and certainly more if more researches are done) have a common property: It has more than one information processing working together, and the collective result of these information processing will give out non-predetermined effects. Even though all pieces are preset, and the behavior of a single information processing is well understood, however, collectively, dynamic action is generated. This is the theoretical foundation of dynamic action. The research in this direction is still at the very early stages.

We can see dynamic action from another view, i.e. oracle machine proposed by Turing in 1939. According to Soare's discussion [10], *o*-machine M can be defined like following:

$$\delta : Q \times S_1 \times S_2 \rightarrow Q \times S_2 \times \{R, L\}, \text{ where } \delta(q, a, b) = (p, c, X)$$

In the definition, S_1 is the so called oracle. Taking S_1 away, this machine M becomes a usual Turing machine M^* . S_1 is a oracle, it is not in the Turing machine M^* , but outside M^* . With S_1 , the behavior of M^* is greatly or even fundamentally modified. In this way, *o*-machine M models Turing machine M^* with dynamic action (here is S_1).

In *o*-machine model, S_1 is just insert there and we do not know how to get it and what it is like, and needs to be specified. One way to do so is to use the above methods (such as surging in conceiving space) to get S_1 .

Above, we used 2 simple examples to illustrate dynamic action. The 2 examples also can serve as very simple demonstration about the effects of several programs working together. We would like to point out: Once multiple programs working together, specially interact together, the outcome is very complicated. Also, such complexity of outcome will increase very quickly, when we add programs and/or increase layers of interaction. Such complicated situation is the source of dynamic action.

How to arrange multiple information processing working together to produce effective dynamic action? This is not easy. More researches in this direction are waiting for us. We would like to give our perspective: Such machine could hardly be achieved via programming purely by human. The best approach to get such machine is via learning. With a well designed framework, a machine can obtain its suitable dynamic action and other abilities via learning and experiences. This is a very different path than programming in the past. This indicates one very exciting research and development area. We started working in this direction [5] [6] [7].

Summary

The subjectivity of the machine is the collective property of all the programs inside the machine, which have important effects on the capability of machine.

Unlike the consciousness of a machine that is out of reach now, the subjectivity of a machine can be approached by solid technical methods. The subjectivity of a machine has 4 major aspects: a priori and cogitating, active perception to outside, awareness of self, and dynamic action. We can understand the aspects by behaviorism approach and mechanism approach. In principle, we can measure the degree of subjectivity. Among the 4 major aspects, dynamic action of machine is particularly important. We argue that the dynamic action of machine can be formed by multiple programs working together, if they are effectively arranged. How to form the dynamic action is an important topic for further studies. We are the creator of machine and we inject our subjectivity into machine as machine's when we build it. However, if a machine is a learning machine, it could eventually establish its subjectivity from experiences.

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References

1. Chuyu Xiong. Discussion on Mechanical Learning and Learning Machine, arxiv.org, 2016. <http://arxiv.org/pdf/1602.00198.pdf>
2. Chuyu Xiong. Descriptions of Objectives and Processes of Mechanical Learning, arxiv.org, 2017. <http://arxiv.org/pdf/1706.00066.pdf>
3. Chuyu Xiong. Principle, Method, and Engineering Model for Computer Doing Universal Learning (in Chinese), researchgate.net, 2018, https://www.researchgate.net/profile/Chuyu_Xiong/research
4. Chuyu Xiong. Universal Learning Machine Principle, Method, and Engineering Model, International Conference of Intelligence Science 2018, Beijing
5. Chuyu Xiong. A Rudimentary model for Noetic Science (in Chinese), researchgate.net, 2019.
DOI: 10.13140/RG.2.2.31596.72328
6. Chuyu Xiong. Sampling and Learning for Boolean Function, arxiv.org, 2020. <http://arxiv.org/pdf/2001.07317.pdf>
7. Chuyu Xiong. Chinese patent application # 201710298481.2
8. P. Kugel. Thinking may be more than computing,
DOI: 10.1.1.297.2677
9. P. Kugel. You Don't Need a Hypercomputer to Evaluate an Uncomputable Function,
<https://www.researchgate.net/publication/>
10. Robert Soare. Turing Oracle Machines Online Computing and Three Displacements in Computability Theory,
<http://www.people.cs.uchicago.edu/soare/History/turing.pdf>
11. Pei Wang. Computer does not only do computing and Turing machine is not a machine (in Chinese),
<https://mp.weixin.qq.com/s/JQbYrKjqtmpBIOFQkHtThQ>