



# How Likely is the Multiverse?

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**Abstract.** This article briefly introduces the primary content and development of the multiverse theory and focuses on how likely the multiverse is. In order to facilitate the discussion of the problem, the paper makes a new hypothesis based on the theory, that is, assuming that the theory is a fact, then push it backward according to the definition of the fact. The definition of fact involves three angles: truth, state of affairs, and entity. The analysis is extended to the perspective of reality and the possible world from these three aspects. According to the essay's conclusion, under the first definition based on fact, the probability of the existence of the multiverse is infinitely close to 0 or infinitely close to 1. Based on the perspective of Reality extended by Definition 1 (i.e., D1), the probability of the existence of the multiverse is 1. From the perspective of D2 and D3, the multiverse's probabilities are valid in the two different cases 1. Combining the logical deduction method and the concept of possible worlds, the multiverse cannot be proved by deductive and inductive reasoning. However, the probability of it being actual in the possible world is also 1. While analyzing the article, the author also looks ahead to the impact of the multiverse on the world where "we" live.

**Keywords:** multiverse, possibility or probability, facts, and hypothesis, true or accurate, logic, states of affairs, entity

## 1 Introduction

Based on the definition of "likely" as "probable or expected" from the Oxford Dictionary, one effective way to explore the likelihood of a multiverse is to abstract it without losing its actual effects. According to the definition of "likely," the question can be formulated as "What is the possibility that the multiverse theory is true?". In order to explore the essence of this question, it is a universal approach to ask questions from the question itself.

Usually, suppose the following definitions are given. In that case, the question "why do apples always fall straight to the ground (rather than sideways or upward)," which puzzled Newton, is defined as set A, then "what causes this phenomenon" and "what factors affect this phenomenon" are defined as sets B and C. It is not difficult to see that there is such a relationship between sets:

$$B \subseteq A, C \subseteq A \quad (1)$$

In other words, B and C are subsets of set A; that is, problem B and C is the "subset problem" caused by problem A being proposed.

Humanity's deepest desire for knowledge justifies our continuing quest and can be regarded as a theoretical basis for meaningful definition [1]. One question can always cause more questions to be raised, which also seems evident if the inductive reasoning method is used to demonstrate. The understanding of the "subset problem" can let us know part of the information contained in the set, which is helpful for us to understand the whole "set problem" (e.g., the corresponding problem of set A). Moreover, we are not going into detail about the justification for using inductive reasoning here.

Hence, define "What is the possibility for the multiverse theory is true" as the set problem M, the following "subset problems" will be derived by definition from the set problem M:

1. What is the multiverse?
2. How did the multiverse theory develop?
3. Why is it worth asking whether the multiverse exists?

Specific answers to these subset questions will be given in the background. The exploration of the above problems will help us to construct a basic framework of the multiverse theory roughly. Answering the "subset problem" plays a vital role in discussing the "set problem" corresponding to the "subset" problem in particular.

## 2 Background

With the slow change of the cosmic gone (to some degree, perhaps, it can also be considered rapid), the concepts of the material world and the spiritual world were proposed, and people have a deeper understanding of the universe and more diverse ideas.

So what is the multiverse? In terms of this issue, there are different interpretations in different disciplines. From the point of view of physicists or astronomers, a multiverse is a theoretical concept representing a collection of causally disconnected universes and anything that may exist outside or between the boundaries of those universes. Together, these universes comprise everything that exists: the entirety of space, time, matter, energy, information, and the physical laws and constants that describe them [2]. In essence, it is the totality of physical reality, whatever form that may take [3].

From the point of view of philosophers, the answer is quite different. The American philosopher William James wrote, "Truly, all we know of good and duty proceeds from nature... [which] is all plasticity and indifference – a moral multiverse, as one might call it" in his 1895 essay *Are Life Worth Living?* Moreover, a new word was born [4]. When he coined the term "multiverse," his interpretation was not cosmological but about his understanding of morality and the world. This is the origin of the term multiverse and its original philosophical definition.

Moreover, the term "multiverse" was applied to physics and astronomy in a different sense a century later [5] and evolved into the concepts we know today. It follows that the work to be done here is a philosophical inquiry into the possibility of the ex-

istence of a multiverse in today's broad cognitive sense (i.e., based on physical astronomy). As for the development process of the multiverse theory, it belongs to the content of the second "subset problem."

An early recorded example of the concept of an infinite world exists in the philosophy of ancient Greek atomism, which proposed that the collision of atoms created infinite parallel worlds. In the third century BCE, the philosopher Chrysippus proposed that the world terminates and regenerates eternally, effectively alluding to the existence of multiple universes spanning time [6]; as far as we know, De Luce is the first attempt to use a set of physical laws to describe the world. Perhaps its authors did not realize that the physics of a family of ordered universes in a sea of disordered universes resembles the modern concept of a 'multiverse.' Elsewhere in the ancient world around AD 100, early Buddhist philosophers attempted to describe a causal cosmology without invoking the first cause. Their solution? Our world is one of many parallel worlds, each experiencing an infinite cycle of creation and destruction [7].

Part of the evolution of the multiverse theory in the long history is mentioned here for the time being. In the process of evolution, the shadow of the current multiverse theory can be gradually seen. Moreover, moving to the last "subset question," why is it worth asking whether the multiverse exists? Siegfried says there are two possible explanations: First, humans need newer and better theories to explain the properties of our universe. Alternatively, he said, it is possible that "we are just one of many different universes, and we live in a wonderful and comfortable universe." [8] This can be considered one of the values of the search for the existence of the multiverse. The indirect impact of establishing the multiverse theory will be discussed later.

### **3 Discussion on multiverse theory based on the relationship between fact and hypothesis**

In logic and metaphysics, possibility is one of the primary forms of explaining the opposition between necessity and contingency. Logically, possibility means that there is no contradiction. Definitions such as "things that could be or will be true" and "things that would not be prevented by anything even if they did not happen" were popular in Hellenistic Greece. According to Aristotle, the possibility is related to necessity: while a necessary proposition predicates the essence of something (as in "all men are mortal"), a possibility proposition predicates that something is merely accidental (such as "some people are tall"). Some philosophers believe that possible things or states of affairs are only those things or states of affairs whose concepts do not involve contradictions. According to Immanuel Kant (1724-1804), to determine the empirical possibility of a thing, it must be ascertained whether the nature of the thing in question conforms to the conditions of experience [9]. Combining the definition of possibility and discussing possibility requires combining experience, so it seems not a wrong choice to start exploring the set problem M from the perspective of facts and assumptions.

### 3.1 The basic definition of facts and hypothesis

In the familiar fields of philosophy, logic, and a wide range of subject areas of the world, meeting facts and assumptions seems inevitable. Facts and assumptions are the basis of exploration. Some experiments put forward hypotheses based on phenomena, such as the problem was defined as set A, and there are also exploration processes that put forward hypotheses and then make inductive reasoning based on facts and try to prove them, such as "how likely is the multiverse" (This can be seen from the answer to the second "subset question" in the background).

Before specifically exploring the set problem M, the following definitions are given for facts and assumptions.

A fact might be - three popular views about the nature of facts can be distinguished:

1. A fact is just a true truth-bearer,
2. A fact is just an obtaining state of affairs,
3. A fact is a sui generis entity in which objects exemplify properties or stand-in relations [10].

The three definitions will appear in the following expressions in the form of "D1", "D2", and "D3," respectively.

Unlike the facts, a hypothesis (plural hypothesis) is a proposed explanation for a phenomenon. For a hypothesis to be a scientific hypothesis, the scientific method requires that people can test it. Scientists often base scientific hypotheses on previous observations that existing scientific theories cannot satisfactorily explain. Although "hypothesis" and "theory" are often used interchangeably, a scientific hypothesis is not the same as a scientific theory. A working hypothesis is a tentatively accepted hypothesis for further research in the process of starting from an educated guess or idea [11].

Hence, the relationship between facts, assumptions, and scientific hypotheses can be expressed as follows:

Facts + Pure hypothesis → Scientific hypothesis

It can be intuitively seen from the above definition that the multiverse theory belongs to a hypothesis rather than a fact, and from the fact that the multiverse theory cannot be tested, for the time being, it can be seen that the theory does not belong to the scientific hypothesis in the hypothesis (at least so far). The untestable of the multiverse theory will be mentioned later. However, discussing how likely an untestable hypothesis is to be true seems overwhelming. Therefore, to facilitate the discussion of the set problem M, a bold attempt is to define the hypothesis to be accurate; based on the hypothesis, it is assumed that it might help.

### 3.2 Analysis of set problem M based on the basic definition of facts

Let us make an assumption here - the multiverse theory is true. Then it is a little confusing again: what is "true"? How can we say that the multiverse theory is true? How about "real"? Can "real" be "fake"? The problem still seems to be very complex and

not effectively simplified. That being the case, let us assume that the multiverse is a fact and use backtracking based on this.

Philosophers like to say facts are opposed to theories and values (cf. Rundle 1993) and are distinguished from things, particularly from complex objects, complexes, wholes, and relations. They are the objects of certain mental states and acts; they make truth-bearers true and correspond to truths; they are part of the world's furniture [10]. Whether facts and theories are wholly opposed and whether there is a specific space between them is also part of what will be mentioned in the follow-up content.

The set problem M is now analyzed according to the three definitions of the facts above.

### 3.2.1 Analysis of Set Problem M from D1 Perspective.

If something is to be a bearer of truth, it must have something to make it accurate. Combined with the preceding, the multiverse theory has specific evidence to support it. In 2017, Durham University's Centre for Extragalactic Astronomy researchers published a study arguing that cold spots are not supervoids. For thousands of years, continued expansion has cooled our universe to a temperature of about 2.7 K, but this temperature is not uniform. The temperature difference stems from the fact that matter is not evenly distributed throughout the universe. Tiny quantum density fluctuations cause this after the Big Bang [12]. From the basic definition of facts and hypotheses in the above part, we can see a set of related conceptual hypotheses in the multiverse, which is supported by some evidence. In addition, there is some theoretical evidence for the existence of the multiverse, but these are not enough to directly prove the existence of the multiverse. Humans cannot directly observe the multiverse, nor can they reach the multiverse space; based on human cognition, people cannot know the multiverse enough to prove its existence. This can be understood as the untestability of the multiverse.

It can be seen that from a logical point of view, deductive reasoning cannot be used to prove whether this assumption is valid. Inductive reasoning does not work here either, nor does there seem to be anything worth generalizing about on this issue, at least for now.

In this way, from an epistemic point of view, the existence of a multiverse is a fact that seems self-defeating. Since it cannot be verified or falsified, the probability that the existence of the multiverse is an inevitable event and the probability that a multiverse is an impossible event are both 0. From this, the solution to the set problem M, in this case, can be drawn: infinitely close to 0 or infinitely close to 1, and its "event tendency" changes with the degree of human cognition. It is worth mentioning that a probability of 0 does not mean that the event will not happen.

It can be known that from the perspective of cognition, the assumption given is not valid. Therefore, the set problem M is not a Truth, but this does not mean it is not real.

Reality (in the first sense) may contain many realities (in the second sense). With the advent of virtual worlds, we have Reality+: a multiverse of physical and virtual realities. These realities (worlds) are part of reality (the cosmos). Third, we can talk about reality as a property like rigidity. Rigidity is the property of being rigid. Some

objects are rigid, and some are not. In this sense, the reality is real-ness. It is the property of being honest. Some things are real, and others are not. To confuse things, we could sum up the Reality+ view of reality (in all three senses) by saying: that reality contains many realities, and those realities are actual. Alternatively, more mundanely: the cosmos (everything that exists) contains many worlds (physical and virtual spaces), and the objects in those worlds are natural [13]. For example, multiverses often appear in film and television productions. Combining the three views on "reality," the existence of the multiverse can be said to be accurate; from the perspective of "reality," the probability of the multiverse being real is 1.

### 3.2.2 Analysis of Set Problem M from D2 Perspective.

States of affairs are similar to thoughts. Thoughts are true or false; states of affairs obtain or not. There are also parallels between facts and states of affairs. Both facts and states of affairs should be composites containing (in a sense to be further explained) objects and properties [14]. As can be seen from the definition of states of affairs, the set problem M can be discussed here. If A state of affairs is a complex containing objects and properties as its constituent parts, it cannot exist if its constituent parts do not exist.

For the same reason, states of affairs that contain contingent objects are themselves contingent. Philosophers often use the concept of singular propositions. A singular proposition should be (i) "directly about" an object and (ii) evaluable to true or false. For example, directly about sex requires that if the proposition exists, so does what the proposition directly refers to. If (i) and (ii) are combined with the reasonable assumption that the proposition that Superman does not exist is singular and accurate, the conclusion that Superman exists can be reached [14]. In the same way, if (i) and (ii) are combined with the reasonable assumption that the proposition that the multiverse does not exist is singular and authentic, one can conclude that the multiverse exists. It follows that the multiverse is a fact that is true when analyzed from the perspective of states of affairs; that is, the solution of the set problem M is also 1 in this case.

### 3.2.3 Analysis of Set Problem M from D3 Perspective.

Its first meaning in philosophy we find it in ancient Greece. The word comes from the Greek word «ὄν» (όν), which comes to mean "to be." Later, the Romans turned it into "ens," meaning the same. This definition is not simple because there are differences between different philosophical thoughts. Some people object to "existence" and "existence," while others are less clear. It can be said that the "entity" is itself. In this way, the entity has the characteristics of "being," although it does not cover all of its characteristics. This being is that being, but concretely [15]. To explain the existence of one thing, under the empirical system, it is necessary to have evidence that can prove the existence of the thing before it can be said to be a fact.

Does it exist if a thing cannot be seen, touched, or detected by humans? From an empirical point of view, the answer is undoubtedly no, but when looking at the modal proposition, the answer is different. A detailed analysis of the modal proposition re-

quires a definition of possible worlds. A possible world is a whole way things can be. Possible worlds are alternate worlds, one of which is the real world. Philosophers use the concept of possible worlds to define and discuss ideas such as possibility or necessity [16]. For example, humans living in the word "us" is only one of many possible worlds. Based on the possible world analysis modal proposition, if we use  $p$  to represent the set problem  $M$ , " $Mp$ " is true when  $p$  is true in at least one possible world-- whether it only appears in film and television works or not. This shows that the probability that the multiverse is natural is also 1.

On this basis, it might be possible to say that the multiverse is an "entity." The content of ideas belongs to ideas, and they have a certain homogeneity. Take Doctor Strange as an example. When Doctor Strange thinks, he can know that he thinks that his ideology does exist, and therefore the content of his ideology can also be considered to exist. They all come from the operation of his brain, but "ideology" is more general. Therefore, in Doctor Strange's world, the multiverse exists objectively (think of Doctor Strange's identity as the guardian of the Time Stone); in other words, the multiverse is an entity.

Moreover, Doctor Strange's world comes from the minds of humans in a possible world that is entirely different from the world of Doctor Strange, so why can't it be said that the multiverse is also an entity? Under this condition, the assumptions given can be considered valid. The solution to the set problem  $M$  is still one here.

The fact that some things exist beyond the present scope of human knowledge does not mean they do not exist. On the contrary, they may have always connected with humans, prompting their existence to be expressed in various forms - just not necessarily in the forms humans expect (This is only the subjective idea of the author, not too much expansion here).

#### **4 Briefly discuss the changes that multiverse theory brings to the real world.**

From the untraceable past to the untapped future, time tilts and flows, many "after" will become "was," the truth may be overturned, and the impossible may eventually become possible. Unfortunately, most innovations in history do not seem to go so smoothly, and the hardships of innovation are both visible and invisible. Humans' cognition of the planet Earth on which they live ranges from the fact that the earth is a sphere, to the heliocentric theory overturning the geocentric theory, to the specific calculation of the earth-related data, etc., from the new concept being proposed to being proven to being widely accepted, often requires Thousands of years or even longer, often need to break through the massive resistance of all parties.

The impact of every theoretical innovation in history is unimaginable. They have inevitably changed human understanding of the world or how humans understand it to a certain extent. The same goes for the multiverse. Here, the authors tend to think that the multiverse being real will affect not only humans' perception of the world but also how humans perceive the world. Human understanding of the world will directly affect all aspects of human production and life. From this, it can be seen that the mul-

tiverse is accurate, and the impact is indeed profound. People may also increasingly study the connection between other universes and the universe in which they live and integrate the multiverse into life. Based on this presupposition, I propose a bold conjecture: dreams may be a manifestation of the multiverse in the universe in which "we" live; that is, dreams can be understood as a form of our connection to other universes, albeit in a less stable way. This conjecture, of course, has not been tested in any way so that it can be dismissed as the genius ravings of a madman.

The multiverse is real, which may help humanity explore the nature of space and time. I have to say a few more words and talk to the readers about some of the assumptions I have made. The first assumption is that time is an entity. That is, time, like space, as Newton mentioned, is a substance that exists objectively. The second hypothesis is that time and space are equivalent or that space and time are one or homogeneous to a certain extent. Time may not exist, and what people perceive as the passage of time may only be caused by the interaction of matter, or it may be caused by the transformation of energy in the gravitational field along with the quantum transition of space. The third assumption is about the continuity of space and time. Time and space may exist because of interaction but have independent properties. Space-time is probably not continuous on a small scale; it is just presented as a continuous picture on a larger scale in human cognition.

Regarding information, I will define its essence as the "information factor." The distribution of these factors may also be discontinuous and interactive; that is, the information may be quantized but only presented continuously on a larger spatiotemporal scale. There may be many information factors like particles, and each kind has its properties. The density of the information factor is not the same everywhere in space and time. The information factor may belong to a part of dark matter, and when the information factor changes, a part of the energy (let's call it energy for now) may belong to dark energy. In this way, the universe may be quantized and informative. The first and third assumptions seem contradictory; could they exist simultaneously? This is what I have always wanted to know too. The multiverse theory helps study these questions. If the multiverse theory is true, there may be a breakthrough in the question of "where do we come from" that has always plagued human beings.

In the same way, the fact that the multiverse is real may also advance our understanding of consciousness. I have wondered many times whether consciousness could be a separate entity. Or is it also due to the interaction of matter? For example, because of the influence of information factors? Are all substances conscious, but some cannot communicate directly because the information factors that stimulate them are arranged differently? If we meet another self in a parallel universe, are these two "Is" both "Is"? Is there a connection between "I" and "I" consciousness? In this way, the problem becomes more complex and attractive. As for whether there is consciousness in the universe, I am inclined to exist for the time being. Events in the universe may all be due in part to the inclinations of cosmic consciousness. We cannot receive the "information factor" sent by the cosmic consciousness, so we cannot communicate with it.

I would be grateful if the readers would sit through this section. The assumptions I have made above may be flawed, and some of them may one day be luckily proven,



or they may all be wrong. Perhaps the questions I have raised will one day be answered. In any case, I still want to share these immature ideas with you because unpredictable ideas based on careful observation are sometimes necessary.

I look forward to readers finding loopholes, ambiguity, and questioning. If my words inspire readers to think more, nothing could be more of my pleasure.

## 5 Conclusion

"How likely is the multiverse?" In conclusion, there is more than one solution to the set problem M. In the case of D1, the probability that the multiverse exists is infinitely close to 0 or 1. Based on the D1-extended Reality perspective, the probability that the multiverse exists is 1. From the point of view of D2 and D3, the probability that the multiverse is true in two different cases is 1. Combining the method of logical deduction and the concept of possible worlds extended by D3, the multiverse cannot be proved by deductive and inductive reasoning, but it is also true in possible worlds with probability 1.

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