The Kinds, Conditions and Model of Causality Inference in Hetuvidyā

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Abstract. There are two kinds of causality inferences in Hetuvidyā (Buddhist logic), one is the inference from causes to effects and the other is from effects to causes. In this paper, we present the general understanding of causality in Hetuvidyā based on the causality theory. First, we examine how Avayava (syllogism) and Trairupya (Three-aspected mark) enhance the causal necessity in Hetuvidyā. Moreover, we investigate the existence theorem of causality and some presuppositions of causality inferences in Hetuvidyā. In conclusion, the inference from effect to cause is the major kind of the causality inference in Hetuvidyā. In the matter of determining the causality between substances or events, specifically determining A is the cause of B, some conditions need to be satisfied.

Introduction
The causality inference plays an important role in the study in Hetuvidyā and even in Buddhism. We focus on the analysis of causality inference in the light of getting the cause from the effect, discuss the condition problems of causality inference, and then examine the basic inference model of causality in Hetuvidyā by comparing the causality existence theorem.

The Inference from Causes to Effects and the Inference from Effects to Causes
There are two kinds of causality inferences in Hetuvidyā, one is the inference from causes to effects and the other is from effects to causes. In Nyaya Sutras, Aksapada Gautama summarized the thoughts of the predecessors and proposed sixteen categories, which includes Prāmāṇaya-vāda (Lianglun), Avayava and Jati (fault). Among them, Prāmāṇaya-vāda is the knowledge theory in Hetuvidyā, which is the source of knowledge (Bodhi) or the method of acquiring knowledge, including Pratyakṣa (Xianliang), Sabda (Yanliang), Anumāṇa (Biliang), Upamana (Yuliang). Pratyakṣa is perceptual knowledge, which is equivalent to Mohist "personally experiencing knowing (Qinzhi)" in the pre-Qin period of China. Sabda, is equivalent to the correct understanding from the predecessors, and is equivalent to Mohist "hearing knowing (Wenzhi)". Both Anumāna and Upamana are the knowledge obtained through inference, which is equivalent to Mohist "explaining knowing (Shuozhi)".

Here, both Pūrvavat and Sēṣavat are the causality inference. Among them, Pūrvavat is inference from causes to effects. E. g, from dark clouds in the sky we know that the heavy rain is coming. In our daily thinking, such inference is predictive, which means speculating the future from the past or the present. One cause can lead to one outcome, however, one cause can also lead to multiple or various possible outcomes.

Sēṣavat is inference from effects to causes. For example, from that the river is soaring or it flows faster, we can infer that there was heavy rain or it rained upstream.

Aksapada Gautama transformed the Deckarana (Ten syllogisms) advocated by Jainism and others at that time into Quintkarana (Five syllogisms), as follows:

[Pratijñā(Zong)] There is fire in the hill;
[Hetu(Yin)] There is smoke in the hill;
[Udāharaṇa(Yu)] Sādharmya-drśtānta (Tongyu) : There is both smoke and fire, like a kitchen;
Vaidharmya-drśtānta(Yiyu): There is neither smoke nor fire, like a lake;
There is both smoke and fire in the hill, like a kitchen; There is fire in the hill.

“Pratijñā” is the conclusion, “Nigamana” is a reaffirmation of the conclusion, “Hetu” is the minor premise, “Udāharaṇa” is the major premise, “Upamaya” is the combination of Hetu and Udāharaṇa. Pratijñā, Hetu, Udāharaṇa, Upamaya, Nigamana, make up an argument whole containing inference.

The above syllogism uses the inference from effects to causes. To be more specific, “There is smoke in the hill” is the effect, and from it, we can get the cause: “There is fire in the hill”. The smoke in the hill is caused for the fire in the hill. The cause of fire leads to the effect of smoke.

Analysis of Condition Relation in Causality Inference

In daily communications and scientific researches, the inference from effects to causes is the most common. Aristotle believes that the power of inference is the premise of acquiring knowledge. He once said: "Now that we have established these distinctions, we must proceed to consider causes, their character and number. Knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the ‘why’ of (which is to grasp its primary cause). So clearly we too must do this as regards both coming to be and passing away and every kind of physical change, in order that, knowing their principles, we may try to refer to these principles each of our problems." However, the causality is very complicated, so it is easy to make various mistakes in the process of inference from effects to causes. This is because the emergence of an effect may be triggered by one single cause, but it may also be triggered by others, or even by a combination of multiple causes.

The causality inference in Hetuvidyā is usually to strengthen the condition relation, so that the multi-cause and one effect problem is limited to one cause and one effect problem, thus forming correct and effective inference. As mentioned above, from the effect of “there is smoke”, the inference of “there is fire” is introduced. The premise behind it is “If there is smoke, there is fire” or “if there is no fire, there is no smoke”. Smoke is a sufficient condition for fire, and fire is a necessary condition for smoke. “A man sees smoke rising from the hill in the distance. When he sees the smoke on the hill, he remembers the causality between the smoke and the fire is true everywhere. Therefore, although he does not see the fire, he can conclude that there must be fire on the hill. That there is fire on the hill is the knowledge of inference. The special reason for obtaining the knowledge of inference is Anumāṇa. It has something for us to sense object, which is the smoke comes with fire in the hill. Its Karana (peculiar cause) is the Anumāṇa (inference) made here, which consists in the Paramarsa that on the hill is present smoke which is invariably accompanied by fire. The hill is a Paksa and the presence of smoke on the hill is Paksadharma. The generalization that wherever there is smoke there is fire is Vyapti. Smoke is Linga Sadhana, Sadhaka, or Vyapaka. Fire is Linga Sadhya or Vyapaka. The causality inference in Hetuvidyā and Avayava and the elements of causality inference are as follows:

| Elements of avayava | Causality inference | Elements of causality inference |
|---------------------|---------------------|--------------------------------|
| Udāharaṇa           | If there is smoke, there is fire (if there is no fire, there would be no smoke). | Causality |
| Hetu                | There is smoke.     | Effect |
| Pratijñā            | Thus, there is fire. | Cause |

Avayava contains inevitable inference. But the major premise of this inference needs to be proved. As for causality inference of Avayava, the inevitability of it is usually achieved by the above method. The inevitability of this inference lies in the authenticity of the major premise, because the inferred form based on either the affirmative antecedent of sufficient conditional hypothesis or the AAA of the first syllogism is an effective form of inference, the inference based on them is effective and correct. By transforming the quintkarana into trikarana, as well as proposing Tairupya, Dignāga ensures that the inference is correct. In essence, Tairupya transforms
the material implication of the quintkarana into formal implication, thus ensuring the validity or inevitability of the inference.

The authenticity of the major premise in Hetuvidyā, causality inference is usually achieved in udāharaṇa by determining that B is a necessary condition for A and then determining that A is a sufficient condition for B. For example, by demonstrating that fire is a necessary condition for smoke, that is, fire is the cause of smoke, and then determining that smoke is a sufficient condition for fire.

As mentioned above, the causality is extremely complex and diverse. First of all, the conditions are complex in causality. Suppose there are event A and event B. A is the reason for B, if and only if either A is a necessary condition of B or A is a necessary but insufficient condition of B or A is a sufficient but unnecessary condition of B or A is neither a sufficient condition nor a necessary condition of B. Sometimes, A is a sufficient condition for B but not a necessary condition, but we can say that A is the cause for B. e.g., let’s see the relationship between that the bull’s head is cut and that the bull is dead. The bull will die even if its head is not cut, but if its head is cut, the bull will definitely die, and if the bull does not die, then its head must not be cut. Therefore, cutting the bull’s head is a sufficient condition (not a necessary condition) for the death of the bull, and at the same time, cutting the bull’s head is also the cause of the death of the bull. However, events with sufficient condition relation are not necessarily causal, because condition relation can be theoretical, while causality must be real. Sometimes, A is a necessary condition for B but not a sufficient condition, but we can say that A is the cause for B. e.g., the relationship between being infected with flu virus and having a viral influenza, even if you are infected with flu virus, you may not have a viral influenza, but if you are not infected with flu virus, you will not get a viral influenza. Therefore, infection with a flu virus is a necessary condition (not a sufficient condition) for having a viral influenza, and infection with a flu virus is also the cause of viral influenza. Sometimes, A is not a sufficient condition for B or a necessary condition for B. A is only a factor of B. e.g., the relationship between smoking and lung cancer. Smoking people do not necessarily have lung cancer, and non-smoking people can have lung cancer as well. Smoking is not a sufficient condition for lung cancer or a necessary condition, but smoking is indeed the cause of lung cancer. Why? It is because the proportion of lung cancer in smokers is higher or even higher than that in non-smokers.

The Existence Theorem of Causality and Model of Causality Inference

Aforementioned, we get the cause that "there is fire in the hill" from the effect that "there is smoke in the hill" in Hetuvidyā, which is based on that fire is a necessary condition for fire (if there is no fire, there is no smoke, and fire is the cause of smoke), and at the same time, smoke is a sufficient condition for fire (there must be fire in the place where there is smoke, and according to the “effect” of smoking, there is a "cause" of fire). However, it should be noted that even the necessary conditions are not necessarily causality. At least the condition relation can be theoretical but the causality must exist in reality. Therefore, if it is only based on the necessary condition relation between events to determine the causality between them, and then go on the causality inference of getting from effect to cause, it may be difficult.

Therefore, we can think from the existence theorem of causality in the causality inference in Hetuvidyā. The existence theorem of causality can be expressed as follows:

Phenomenon A and Phenomena B are positively correlated.

If A and B are positively correlated, either A leads to B, or B leads to A, or C causes A and B, or A and B are accidentally related.

The possibility of that B causes A, C to cause A and B, and the accidental correlation between A and B are excluded.

So, A is the reason for B.⁴¹

In the above expression of the existence theorem of causality, the case that "B leads to A" belongs to "wrong direction", which is easy to grasp. The case that "C leads to A and B" is a problem of "multi-cause". The case that "A and B are accidentally related" is "sequential causation" or "concomitant causation". The determining causality is very focused on eliminating accidental
related issues in Hetuvidyā. The define cause in Hetuvidyā as: “circumstance which invariably precedes the effect.” “Invariably” is used here to exclude accidental things, because accidental things are not the real cause of the effect, they cannot be included in the conditions. What happens by accident before the event is not the cause of the event? E.g., the occasional presence of the weaver’s children when a cloth is wove by him should not be regarded as an essential condition of the production of the cloth, for the cloth would have come into existence even when the children of the weaver were not by his side.[5](49~50)

The sequence or concomitantness between things or events is an important feature of causality, but even if there is a sequence or concomitantness, it is not causality necessity. Because this kind of prior thing is likely to be caused by other reasons, it is not the real reason, and some things with sequential nature do not have the causality at all. E.g., the day is before the night, but it can’t be said that the night is the cause for the day, and they are just concomitantly accompanied. For another example, if winter is coming, will spring be far behind? It is winter before spring, but winter is not the cause of spring. Therefore, it believes that the causality in Hetuvidyā is “not connected to the effect remotely or indirectly,” but “has immediate or direct relationship”, ”the cause is by no means anything else, but what is indispensable for the effect”. [6](50~51) Regulation of causality in Hetuvidyā is actually equivalent to the case of “C leads to A and B” in the above-mentioned existence theorem of causality, that is, A is not the cause of B, and C is the cause of B.

In fact, in the existence theorem of causality, to ensure that A is the cause of B, it is most important to determine that A and B are positively correlated. So what does A and B are positively correlated mean? In fact, there should be some material connection between A and B. E.g., frequent cleaning can easily lead to a child’s cold. At first thought, how is this possible? Cleaning is promoting hygiene! How can it cause a child to catch a cold? However, if the material connection between the cleaning and the child’s cold is given, we will not be surprised by the causality between them. The material connection between them is the tools used in the cleaning: the brooms that sweep the rooms also sweep the toilet, and the rags that wipe the tables, chairs and stools that the children often touch also wipe the commode. There are also many discussions in Hetuvidyā regarding the positive correlation between cause and effect, that is, the material relationships that exist between them. E.g., the Indian Monk philosophers insisted on the theory of change, arguing that the emergence of the effect was the result of the latent changes. They said how could things be generated out of nothing? “If the raw material of the effect is related, the effect is the same as the one that exists in the cause form. If it is not, then anything can be produced from anything.” [7](53) The above view of the relationship between the cause and the effect of the Monk philosophers is very similar to Aristotle's elaboration of the material.

In short, the causality inference in Hetuvidyā focuses on the inference from effect to cause. In fact, whether it is daily life or scientific researches, the inference from effect to cause is very important. Moreover, the key to causality inference in Hetuvidyā is to determine the causality, that is, to determine the relationship between cause and effect. The discussion in Hetuvidyā, the understanding of the determination of causality, there are certainly inference model of causality or a range that the existence theorem of causality considers. In fact, As to determine the causality among materials or events, it very clear that to determine A is the cause of Bin Hetuvidyā, some guarantee and various conditions are needed. The ideas about the types, conditions and inference models of causality in Hetuvidyā are worthy of serious consideration and in-depth research.

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