Models of Reasoning in Ancient China

Jeremy Seligman[1] Fenrong Liu[2] Johan Van Benthem[3]

[1]Department of Philosophy
University of Auckland
New Zealand

[2]Department of Philosophy
Tsinghua University
China

[3]Institutle of Logic, Language and Computation
University of Amsterdam
The Netherlands

Workshop on the History of Logic in China

Outline

Motivation

- Some examples of reasoning in ancient China
- Some theoretical reflection on reasoning from ancient China

Our modest contribution

- A few ideas
- Further issues

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An analogy

《墨子，公輸》: Mozi Gong Shu

子墨子見王，曰：“今有人於此，舍其文軒，鄰有敝輿，而欲竊之；舍其錦繡，鄰有短褐，而欲竊之；舍其粱肉，鄰有糠糟，而欲竊之。此為何若人？”王曰：“必為竊疾矣。”

Mozi saw the Lord and said: Suppose there is a man who, putting aside his elegant carriage, desires to steal his neighbour's shattered sedan; putting aside his embroidery and finery, desires to steal his neighbour's short jacket; putting aside his meat and grains desires to steal his neighbour's husks. What kind of a man would this be? The Lord said that he must be suffering from kleptomania.

An analogy

子墨子曰：“荊之地，方五千里，宋之地，方五百里，此猶文軒之與敝轝也；荊有雲夢，犀兕麋鹿滿之，江漢之魚鱉黿鼉為天下富，宋所為無雉兔狐貍者也，此猶粱肉之與糠糟也；荊有長松、文梓、楩柟、豫章，宋無長木，此猶錦繡之與短褐也。”

Mozi continued: The land of Jing amounts to five thousand li square while that of Song is only five hundred, this is similar to the contrast between the elegant carriage and the shattered sedan. Jing possesses Yun Meng which is full of rhinoceroses and deer. The fish, tortoises and crocodiles in the Yangtse and the Han Rivers are the richest in the empire. While Song is said to possess not even pheasants, rabbits, or foxes. This is similar to the contrast between embroidery and finery and the short jacket.

An analogy

臣以三事之攻宋也，為與此同類，臣見大王之必傷義而不得。”王曰：“善哉！雖然，公輸盤為我為雲梯，必取宋。”

When your ministers and generals set out to attack Song, it seems to me there is the same strategy. I can see, my Lord, you will be violating righteousness to no advantage. The Lord said: "That is all very well. But Gong Shu Ban has already constructed the Cloud-ladders for me, and I must capture Song."

Another analogy

《孟子告子上》Mengzi Gaozi I

告子曰：“性猶湍水也，決諸東方則東流，袂諸西方則西流。人性之無分於善不善也，猶水之無分於東西也。”

Gaozi said, “Human nature is like swirling water. Make an opening for it on the eastern side, then it flows east. Make an opening for it on the western side, then it flows west. Human nature’s not distinguishing between good and not good is like water’s not distinguishing between eastern and western.”

Another analogy

孟子曰：“水信無分於東西。無分於上下乎？人性之善也，猶水之就下也。人無有不善，水無有不下。”

Mengzi said, “Water surely does not distinguish between east and west. But does it not distinguish between upward and downward? Human nature’s being good is like water’s tending downward. There is no human who does not tend toward goodness. There is no water that does not tend downward.” (Tr. Van Norden)

Another analogy

“今夫水，搏而躍之，可使過顙；激而行之，可使在山。是豈水之性哉？其勢則然也。人之可使為不善，其性亦猶是也。”

“Now, by striking water and making it leap up, you can cause it to go past your forehead. If you guide it by damming it, you can cause it to remain on a mountaintop. But is this the nature of water?! It is that way because of the circumstances. That humans can be caused to not be good is due to their natures also being like this." (Tr. Van Norden)

On Using Analogies

《說苑善說》 *Shuō Yuàn* 11 （Western Han)

客謂梁王曰：“惠子之言事也善譬，王使無譬，則不能言矣。”王曰：“諾。”明日見，謂惠子曰：“願先生言事則直言耳，無譬也。”

Someone said to the King of Liang, “In speaking of affairs, Master Hui is good at 譬 *pì* (making comparisons). If you forbid comparisons, he won’t be able to speak." The King said, “Agreed." The next day, seeing Master Hui, he said, “I wish, Sir, that when you speak of affairs you speak directly, without comparisons."

On Using Analogies

惠子曰：“今有人於此而不知彈者，曰：‘彈之狀何若？’應曰：‘彈之狀如彈。’諭乎？”王曰：“未諭也。”“於是更應曰：‘彈之狀如弓而以竹為弦。’則知乎？”王曰：“可知矣。”

Huizi said, “Suppose there is a man who doesn’t know about *dàn* and says, ‘What are the features of a *dàn* like?’ To answer by saying ‘The features of a *dàn* are like a *dàn*, would that be to communicate clearly?" The King said, “It would not." “Then if instead one answers, ‘The features of a *dàn* are like a bow, but with a bamboo string,’ then would he know?” The King said, “He can know it.”

On Using Analogies

惠子曰：“夫說者固以其所知，諭其所不知，而使人知之。今王曰無譬則不可矣。”王曰：“善。”

Huizi said, “Explanation inherently uses what a person knows to communicate clearly what he doesn’t know, so making him know it. For your Majesty to say, ‘No comparisons,’ is inadmissible.” The King said, “Good!” (cf. Graham 1989, p.81)

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正名 *ZhèngMíng* Correcting Names

Zilu asked, “If the Lord of Wei were to employ you to serve in the government of his state, what would be your first priority?”The Master answered, “It would be, of course, to assure that ming 名, ‘names,’were being applied zheng 正, ‘correctly!’”Zilu said, “Is this really a matter of concern? It would seem that the Master’s suggestion is rather wide of the mark. Why worry about correcting names?”

正名 *ZhèngMíng* Correcting Names

The Master replied, “How boorish you are, Zilu! When it comes to matters that he does not understand, the gentleman should refrain from flaunting his ignorance. If names are not correct, speech will not be in accordance with actuality; when speech is not in accordance with actuality, things will not be successfully accomplished. When things are not successfully accomplished, ritual practice and music will fail to flourish; when ritual and music fail to flourish, punishments and penalties will miss the mark. And when punishments and penalties miss the mark, the people will be at a loss as to what to do with themselves. This is why the gentleman only applies names that can be properly spoken, and assures that what he says can be properly put into action.

(Tr. Ivanhoe)

辯 *Biàn* Disputation

夫辯者，將以明是非之分，審治亂之紀，明同異之處，察名實之理，處利害，決嫌疑。焉摹略萬物之然，論求群言之比。

The purpose of disputation is

- by clarifying the portions of ‘is-this’ and ‘is-not’, to inquire into the principles of order and misrule
- by clarifying points of sameness and difference, to discern the patterns of names and of objects
- by settling the beneficial and the harmful, to resolve confusions and doubts

only after that may one by describing summarise what is so of the myriad things, by assorting seek out comparables in the multitude of things.

辯 *Biàn* Disputation

辯，爭彼也。辯勝，當也。

Bian (disputation) is contending over claims which are the converse of each other. Winning in disputation is fitting the fact.

辯：或謂之牛，或謂之非牛，是爭彼也。是不俱當。不俱當，必或不當，不若當犬。
One calling it an 'ox' and the other 'non-ox' is 'contending over claims which are the converse of each other'. Such being the case they do not both fit the fact; and if they do not both fit, necessarily one of them does not fit. Not like fitting 'dog'.
(Tr. Graham)

類 *Lèi* Kinds

同，重、體、合、類。
異，二、<不>體、不合、不類

Tóng (same). Identical, as units, as together, of a kind.
Yì (different). Two, not units, not together, not of a kind.

類同 *lèitóng* (similarity of kinds) is 有以同，類同也“being the same in some respect is being of the same kind”

不有同，不類也“not having what is the same is not being of the same kind."

以名舉實，以辭抒意，以説出故，以類取，以類予。
One uses names to refer to objects, uses propositions to dredge out ideas, uses explanations to bring out reasons, and accepts according to the kind, proposes according to the kind.

(Tr. Graham, A86,A87,NO11)

法因 *Fǎ Yīn*

法，所若而然也。
法：意、規、員三也，俱可以為法。

The *fǎ* (standard) is that in being like which something is so.
The idea, the compasses, a circle, all three may serve as standard.

(佴)*因，所然也。
(佴)*因：然也者，民若法也。

The *yīn* (criterion) is that wherein it is so.
Being 'so' is the characteristics being like the standard.

（Tr. Graham, A70,A71)

法因 *Fǎ Yīn*

之馬之目眇，則謂之馬眇；之馬之目大，而不謂之馬大。
If this horse's eyes are blind, we say this horse is blind; though this horse's eyes are big, we do not say that it is a big horse.

之牛之毛黃，則謂之牛黃；之牛之毛衆，而不謂之牛衆。
If these oxen's hairs are yellow, we say these oxen are yellow; though these oxen's hairs are many, we do not say that these oxen are many.
(Tr. Graham p. 492)

Puzzles about Ox-Horse

牛馬之非牛，與可之同，説在兼。

The grounds for taking ‘ox-horse is not horse’ being inadmissible and being admissible are the same. The explanation lies in the joining (combination).

Puzzles about Ox-Horse

“或不非牛而‘非牛也’可，則或非牛或牛而‘牛也’可。故曰：‘牛馬非牛也’未可，‘牛馬牛也’未可。”則或可或不可，而曰“牛馬牛也，未可”亦不可。且牛不二，馬不二，而牛馬二。則牛不非牛，馬不非馬，而牛馬非牛非馬，無難。

Not: If it is admissible that some are not ox is not ox then some are not ox and some are ox is [also] admissible. Therefore, it is never admissible to say that ‘ox-horse is not ox’, and it is never admissible to say that ‘ox-horse is ox’, since it is admissible of some but inadmissible of others. And to say ‘ox-horse is ox’ is never admissible is also inadmissible. Furthermore, if ox is not two and horse is not two, but ox-horse is two then ‘ox is not not-ox’ ‘horse is not not-horse’ and ‘ox-horse is not ox and not horse’ are without difficulty.

(Tr. Johnston, 2010)

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Classification of situation-action pairs

Model the *responses* of an agent as a function $r : S \to A$ from *situations* S to *actions* A.

A subset $Y \subseteq S \times A$ which contains those pairs (s, a) for which responding to situation s with action a is 義 *yì* (right, appropriate).

Person 1 with responses r_1 is no more 義 *yì* than person 2 with responses r_2 just in case

$$r_1 \cap Y \subseteq r_2 \cap Y$$

Maximally 義 *yì* responses: possible but *not necessarily unique*.

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Similarity structures

A set S together with a binary relation $\sim$ that is reflexive ($x \sim x$) and symmetric (if $x \sim y$ then $y \sim x$).

We consider descriptions of the elements of S in some language.

$$s \models \phi$$

Transitive? (if $x \sim y$ and $y \sim z$ then $x \sim z$)

Lei K: if x is K and $x \sim y$ then y is K

Is there a set D of descriptions that defines a kind K?

Fa-yin structures

A set S and for each name X, a similarity structure 因$_X$ on S and set 法X

To say that y is X is *appropriate* iff there is a $y \in$ 法X (a *model*) such that 因$_X(x, y)$.

Dynamic extension of kinds.

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Modelling 正名 *ZhèngMíng*

For each 名 *míng* (name) a set M of situation-action pairs. The pair (s, a) is in the set M iff performing action a as a response to situation s is in accord with a correct application of the name.

正名 specifies a set Z of such standards of correct application.

The extent to which an individual's repsonses r conform to Z is then given by

$$r \cap \bigcap Z$$

If that individual conforms to Z completely, then $r \subseteq \bigcap Z$.
$Y = Z$?

From similarity to judgement

$$(a, b) \models XY\text{也} \textit{ iff } a \models X,\ b \models Y,\ \textit{and } a \sim b.$$

(a, b) *witnesses* the similarity between the kinds.

E.g., 白馬馬也

Problem: symmetry $\Rightarrow$ 馬白馬也!

From similarity to judgement

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From similarity to judgement

A suggestion using Fa-yin for the grounds of XY也

> *There are a* $\models$ 法X *and b* $\models$ 法Y *such that for every c in the domain, if* 因$_X ca$ *then* 因$_Y cb$.

Or, possibly,

> *There are a* $\models$ 法X *such that for every c in the domain there is a b* $\models$ 法Y, *if* 因$_X ca$ *then* 因$_Y cb$.

Breaks symmetry.

Ox-horse rears head(s)

*XY*也

> *There are a* $\models$ 法*X and b* $\models$ 法*Y such that for every c in the domain, if* 因$_X$*ca then* 因$_Y$*cb.*

*X*非*Y*也

> *There are a* $\models$ 法*X and b* $\models$ 法*Y such that for every c in the domain, if* 因$_X$*ca then* 因$_Y$*cb.*

牛馬牛也

But also 牛馬非牛也

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The Similarity Game

A proposes $X \sim Y$ in order to infer (*) X is P from Y is P).

B challenges by giving a respect (f, g) in which X is not similar to Y, $fX \not\sim gY$

A must defend by giving a respect (f, g) in which X is similar to Y, $fX \sim gY$ *as grounds for* the inference (*).

This too can be challenged:

Process of 因refinement - constrained by the need to justify an inference.

Suggestion: investigate these games and connections to recent work on argumentation theory.

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- Prefer a model-based approach rather than translation into predicate logic or any other *logical formalism*
- Models are stupid - and that is a virtue
- Invitation to play!

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