Visualizing Ethical Controversies and Positions by Logical Argument Mapping (LAM) – A Manual

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Please find the most recent version of this manual (including a list of publications) at http://www.prism.gatech.edu/~mh327/LAM

Introduction

Ethical decisions are often not clear-cut. Most of the time it is possible to argue for more than one “right thing to do,” especially if there is a variety of ethical principles or conflicting arguments. In order both to understand those arguments and to participate in deliberation and communication on ethically relevant issues, we need some methods, tools, and the practical skills to use them. Such a method is Logical Argument Mapping (LAM). Its main functions are to facilitate the structuring of complex knowledge areas and belief systems, and to stimulate reflection and creativity.

Logical Argument Mapping is a method to represent the inferential structure among claims by means of a system of representation (defined by rules, procedures, and conventions) that is based on three ideas:

1. that visualizing what we think about an issue helps us to reflect on our own thinking—and on that of others when we are using LAM to analyze given arguments
2. that the best way to represent entire “webs” of mutually supporting beliefs is to present them as networks of mutually supporting arguments, that is as an argument map with an inferential structure, and
3. that imposing the standard of logical validity on the construction of argument maps helps us to
   • evaluate the completeness and soundness of arguments
   • visualize implicit assumptions
   • criticize and improve our own thinking

1. Three basic rules

1. Represent your main argument—and every sub-argument that might be controversial—according to an argument scheme whose deductive validity is evident or can be made plausible (e.g., modus ponens, modus tollens, alternative syllogism, disjunctive syllogism, conditional syllogism, etc., but also argument schemes that are transformed from invalid forms into valid ones like complete induction, argument from perfect authority, and argument from perfect analogy; see section 4 for a list)
2. Consider the acceptability of all your premises, and provide further arguments for those whose acceptability is either not evident or controversial
3. Make sure that all your premises are consistent with each other.
2. Definitions

An argument is defined as a set of statements—a claim and one or more reasons—where the reasons jointly provide support (not necessarily conclusive) for the claim, or are at least intended to support the claim. An “argumentation” is defined here as a set of arguments in which a main argument is supported or criticized by further arguments. Since it may be necessary to provide arguments for each of the reasons of the main argument, and further arguments for the reasons of supporting arguments, and so on, the best way to represent an argumentation is an argument map.

A logical argument is a logically valid (or “deductively valid”) argument. An argument is “logically valid” if and only if it follows an argument scheme that is logically valid. An argument scheme is logically valid if and only if it is impossible for any argument following this scheme to have true premises and a false conclusion. Lists of logically valid argument schemes used in LAM are compiled in section 4. (Note that “validity” is not “truth”; for validity the truth of the premises is simply presupposed.)

In its current version, all LAM maps are created with Cmap, http://cmap.ihmc.us/.

3. The procedure of Logical Argument Mapping

Depending on the respective purpose of Logical Argument Mapping, there are various ways to proceed. We can distinguish, however, seven elements which can be combined in concrete procedures. The first two are necessary elements, the remaining five are optional.

Necessary elements: Argument construction and evaluation

Every LAM procedure must include the construction (or re-construction) of an argument and its evaluation. The construction is constrained by a set of rules (sect. 1) which are supposed to challenge the user to construct arguments in a way that facilitates the argument evaluation in a phase of reflection.

By contrast to most other argument visualization tools, LAM imposes the standard of deductive validity on the construction of the central parts of an argumentation (see the first rule). There are two reasons for this design decision. The first one is that the rigidity of the system should work like a scaffold that helps the user to structure complex situations; the more we are challenged by the rigidity of the system in the construction phase, the more we are challenged to reflect on our basic assumptions that determine how we construct an argument. The second reason is that we are challenged, this way, to reflect in an ongoing process on the completeness of our arguments. Only this way is it possible to make all our implicit assumptions visible.

1. Argument construction

The following sequence of steps assumes that the goal is to construct an argument. For the reconstruction of an argument in a text it is important, first of all, to identify the central argument. It should always be possible to describe the central argument in a few sentences. If your reconstruction of the central arguments gets too complex, you might be on the wrong track with your interpretation.

1. Formulate a claim: the central goal of your argument, a central thesis. Decide whether your claim is a universal statement (“cheating is wrong”) or a particular statement (“in case X, cheating is justified”). See the LAM conventions below for how to represent these possibilities.
2. Provide a reason for your claim, or a combination of reasons that together are sufficient to justify your claim (simple or linked argument).

3. Select from a list of argument schemes whose logical validity you accept the scheme that is most adequate for your argument (see section 4 for some lists).

4. Transform your argument into a logical argument by adding what is missing, and by reformulating the elements of the argument (claim, reason, inference rule) in such a way that its validity in accordance with the scheme becomes evident.

5. Consider possible objections against both the reason(s) and the inference rule, formulate them, and link them to the elements of your map against which they are directed (see section 4 for some “conflict schemes” you can use for this purpose).

6. Decide whether to
   a) develop new arguments against the objections, or
   b) reformulate the original argument in such a way that it can be defended against the objection by, e.g.,
      - including exceptions into the inference rule and limiting the scope of the claim (go back to step 1. or 2.), or
      - using a different argument scheme (go to step 3.), or
      - redefining the meaning of concepts used in the argument (go to step 1. or 2.), or
   c) give up the whole argument

7. In case of 6.c, start again with step 1. or 2.; in the other cases, do as described in 6.a and b.

8. Consider further reasons for your claim and perform steps 3. to 7. for them as well.
2. Argument evaluation

The following criteria allow the evaluation of argument maps. Evaluation is important since it is always possible to represent a text or an issue in many different ways. Evaluation should motivate the revision or refinement of an argument map.

1. **Validity**: Central and controversial arguments must be formulated in logically valid form, that is in correspondence to the argument schemes listed in Section 4.

2. **Acceptability**: Check each claim in your text boxes and ask yourself whether you can accept it as it is formulated. If the claim is too complex, or if it is hard to see whether it is acceptable or not, reformulate or divide into separate claims. This is especially important when you are reconstructing someone else’s argumentation and you assume claims that you cannot directly quote from your source. It is easy to write something down, but you will never be able to defend it if it is either nonsense or hardly acceptable. If a claim is not acceptable, revise the entire argument; if it should be acceptable based on further arguments, then develop these arguments to support it.

3. **Simplicity**: Generally, the simpler an argumentation the more convincing. The criterion of simplicity should motivate you to focus from the very beginning on the essential message of your argumentation. Don’t get confused by too much detail and things that are only marginally important. Work from the center to the margins, and do so only when you are convinced that you found the best possible form for the center of your argumentation. Then focus on supporting the reasons of your central argument and on defending these reasons against possible objections.

4. **Balance**: The stronger a position, the weaker is often the argument for it, and the weaker a position, the easier it is to formulate a strong argument. Finding here the right balance is crucial. Everything depends on how you phrase the final conclusion of your argumentation. Experiment with different formulations and try to develop arguments that are strong enough for your position.

3. Classification of possibilities or options

Sometimes it is necessary to distinguish different cases for a certain claim so that arguments or objections can be developed for each case. This can be done by means of “typology schemes.” See a list of examples on the right.

4. Objections

Different forms of objections to specified elements of an argumentation can be represented by a variety of “conflict schemes” (ConfScheme). Their main function is to motivate the improvement or revision of an argumentation (see sect. 4 for a list).
5. Questions and comments

Sometimes an argumentation leads to an open question that must be decided to see whether an argument is convincing. These questions are the "open ends" of an argumentation that indicate where further research is necessary. Like comments to an argumentation, questions are indicated by a certain color in LAM (see the LAM conventions above).

6. Supporting data

It is possible to add further information and supporting data in LAM maps.

7. Argument revision

In order to represent the development of an argumentation, it might be necessary to show how certain arguments or objections lead to revisions of parts of an argumentation. For this, LAM offers a set of "revision schemes" (see on the right).

The list of “revisions” that can be represented in LAM specifies different possibilities of revising either individual statements or the structure of arguments. Since the specification of revisions is something that we do with regard to an already given argumentation, representing revisions in a map means that both an argument and a meta-level of reflecting on the argumentation are represented in the same map.

4. Schemes

Please find examples of LAM maps at http://www.prism.gatech.edu/~mh327/LAM.
Logical argument schemes

presented according to
the conventions of

Logical Argument Mapping (LAM)

Key
- form of textboxes
- particular statement
- universal statement, like a law
- topographical structure
- claim
- therefore
- reason
- inference rule
- another consistent argumentation, or parts of it
- further colors are used for further positions, or parts of them
- comments on the mapping process

In contrast to the claim and the reason, the inference rule is always a universal statement. Inference rules are crucial because they are assumed to represent parts of an arguer's more or less implicit background assumptions.

equivalence

symbolic form

$q \iff p$

$q \rightarrow (\text{ArgScheme: equivalence})

\begin{align*}
p & \text{ if and only if } q \\
& (p \land q) \lor (\neg p \land \neg q)
\end{align*}$

English equivalents

$q \rightarrow (\text{ArgScheme: equivalence})

\begin{align*}
& p \text{ if and only if } q \\
& (p \iff q)
\end{align*}$

examples of arguments on facts (based on descriptive statements, as used in science, for instance)

$q \rightarrow (\text{ArgScheme: equivalence})

\begin{align*}
& \text{you clean up your room} \\
& \text{you may watch TV if and only if you clean up your room}
\end{align*}$

examples of arguments on norms and imperatives (based on normative statements, as used in ethics, for instance)

$q \rightarrow (\text{ArgScheme: equivalence})

\begin{align*}
& \text{Mary is a teenager} \\
& \text{Mary is a teenager just in case she is 13 to 19 years of age}
\end{align*}$

comments

$q \rightarrow (\text{ArgScheme: equivalence})

\begin{align*}
& \text{this body is accelerating} \\
& \text{the action of a force is the necessary and sufficient condition to accelerate a body}
\end{align*}$

the third form of causality (after what is described under modus ponens). There is only one cause, i.e., a necessary condition which is at the same time sufficient to produce the effect.
Logical argument schemes as used in Logical Argument Mapping (LAM)

Follow the link below for a description of the method.

Key
- form of textboxes
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- comments on the mapping process
- in contrast to the claim and the reason, the inference rule is always a universal statement. Inference rules are crucial because they are assumed to represent parts of an arguer’s more or less implicit background assumptions.

*AU* means “author” (distinguishing authors is important for representing controversies)

**complete induction**

all S are P (ArgScheme: complete induction)

x is an element of S is P

all ravens are black (ArgScheme: complete induction)

x = an element of a natural kind S belongs to all elements of S

what is true for the four ravens I saw is true for all ravens

the US government withdrew diplomatic recognition from Cuba when it no longer approved that government

what is true for the US government’s identification of diplomatic recognition and approval in the Cuba case defines the relation between diplomatic recognition and approval universally

the 1st raven I saw was black

the 2nd raven I saw was black

the 3rd raven I saw was black

the 4th raven I saw was black

diplomatic recognition is a sign of approval (ArgScheme: complete induction)

the US does not recognize North Korea and Iran diplomatically

Bhutan and Taiwan are countries that the US approves without having official diplomatic relations with them

the US recognized the Soviet Union diplomatically without approving it

supports

defeats (AU=MH)

NOTE:
The decision to allow for the first step of an argument construction only the logically valid forms of induction (i.e., complete induction) is based on:
1. an iterative 3-step procedure in LAM (1. argument construction; 2. reflection; 3. refinement)
2. the consideration that in the first step the argument should be as strong as possible in order to motivate critical reflection as a precondition for improving and refining the argument.

Thus, even if the inference rule in complete induction is usually hard to defend, it makes sense to construct these arguments initially in these logical valid forms. The goal is to visualize implicit assumptions.

If the point of an argument is to specify some probability in the conclusion, then this can often be done in logically valid form by using modus ponens, as in the example on the right.

there is a 25% probability that the XY Player you just bought has technical problems

therefore (ArgScheme: modus ponens)

25 out of 100 customer reviews reported technical problems with MP3 Player XY

if a quarter of customers report technical problems with MP3 Player XY, then there is a 25% probability that the XY Player you just bought has technical problems
Logical argument schemes

- form of textboxes
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Perfect authority

A knows everything in the knowledge domain of p

A claims p
A believes that p is true
A intends to say the truth regarding p
A is able to say what he intends to say regarding p

Dr Brown asserts that attacking the Soviet Union lost the war for Germany.

Dr Brown believes that attacking the Soviet Union lost the war for Germany.

Dr Brown intends to say the truth with regard to that

Dr Brown is able to say what he intends to say with regard to that

Perfect analogy

x is B
x is A

regarding x, A is exactly the same as B

y is A
x is A

x and y are exactly the same with regard to A

A road-pricing scheme would save Atlanta from traffic collapse

A road-pricing scheme saved London from traffic collapse

With regard to a road-pricing scheme, the situation in Atlanta is exactly the same as in London

NOTE:
The decision to allow for the first step of an argument construction only the logically valid form of argument from authority (perfect authority) is based on 1. an iterative 3-step procedure in LAM (1. argument construction; 2. reflection; 3. refinement) 2. the consideration that in the first step the argument should be as strong as possible in order to motivate critical reflection as a precondition for improving and refining the argument. Thus, even if the inference rule in arguments from perfect authority is usually hard to defend, it makes sense to construct these arguments initially in these logical valid forms. The goal is to visualize implicit assumptions before criticizing them.

NOTE:
The decision to allow for the first step of an argument construction only the logically valid form of argument from analogy (perfect analogy) is based on 1. an iterative 3-step procedure in LAM (1. argument construction; 2. reflection; 3. refinement) 2. the consideration that in the first step the argument should be as strong as possible in order to motivate critical reflection as a precondition for improving and refining the argument. Thus, even if the inference rule in arguments from perfect analogy is usually hard to defend, it makes sense to construct these arguments initially in these logical valid forms. The goal is to visualize implicit assumptions before criticizing them.
Logical argument schemes
Overview with paradigmatic examples

as used in Logical Argument Mapping; see for a description of the method

http://www.prism.gatech.edu/mh327/LAM

Deduction in categorical logic:
The 15 logically valid forms

There are only four standard forms of statements in categorical logic:
A (universal affirmative): All S are P
E (universal negative): No S is P
I (particular affirmative): Some S are P
O (particular negative): Some S are not P

Every categorical syllogism has two premises and a conclusion. The order of
the categorical propositions used in a syllogism determines its "mood": AAA,
EIO, EAO, etc. Also, every categorical syllogism contains exactly three terms:
subject, predicate, and middle term. The position of the "middle term" in the
premises determines whether a syllogism is of the 1st, 2nd, 3rd, or 4th "figure":
(1) AAA-1; (2) AAA-2; etc. All this results in a set of 256 possible syllo-
gisms, but only the 15 forms below are accepted as logically valid. The best
method to check the validity of syllogisms in categorical logic is by means of
Venn diagrams. Follow the link below for a description of the method.

To train the method, use the exercises developed by
M. Silberstein, V.S. Manorangan, and Joseph Kern Campbell. Follow the
link below:

http://www.prism.gatech.edu/mh327/LAM

AEE-1

therefore

no S is P

all P is M

(Ergy): AEE-1)

car is not a bird

car has four wheels

car is a land vehicle

car is not a bird

car has four wheels

car is a land vehicle

EAO-2

therefore

Sam is a bachelor

no bachelor is married

(Ergy): EAO-2)

no bachelor is married

Sam is a bachelor

no bachelor is married

Sam is a bachelor

no bachelor is married

AEE-1

therefore

no S is P

all P is M

no bike is a car

no bike has four wheels

no bike is a car

no bike has four wheels

no bike is a car

no bike has four wheels

EIO-2

therefore

Sam is married

Sam is a bachelor

no bachelor is married

(Ergy): EIO-2)

no bachelor is married

Sam is married

no bachelor is married

Sam is married

no bachelor is married

AIO-2

therefore

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P

some S are M

some M are P
"AU" means "author" (important for quoting objections, and for work in groups)

NOTE: since the inference rule is a universal statement, it can be defeated by one counter example.

NOTE: whether a proposition is sufficient to defeat a reason depends usually on further justification.

NOTE: an objection is weaker than a defeat. It challenges an arguer to look for further support for a reason, or to develop arguments against the objection, but it does not necessary "destroy" the original argument.

NOTE: contradiction means that one of a set of propositions must be false. Which one is not determined.

NOTE: ad hominem ("against the man/woman") arguments are always fallacies, because they are only directed against the author of an argument, independently of what the argument itself says. Sometimes, however, for example when we expect that the author of an argument has specific interests in a case or is biased, it might be appropriate to illuminate the context of an argument by means of an ad hominem argument.