Annotation guidelines for the evaluation of automatically constructed Commonsense Knowledge Graphs

Part I: Investigating the argument

In this annotation task you will be given a *premise* (P) and a *conclusion* (C), which together form an argument.
You will be asked to answer a series of questions based on the *premise* and the *conclusion*. These questions are designed to assess the quality of the *argument*, as well as to familiarize you with what the argument expresses.
For each question you can select one of a set of predefined answers (except for question 3.1, where you have to craft an answer yourself). You are also encouraged to provide comments in the comment section if necessary.

Question 1: Which topic does the argument belong to?
The *arguments* come from different topics, which are pre-defined in our underlying dataset. You are supposed to select the one which best matches the topic of the given argument. Note that the stance of the topic descriptions, i.e. if they argue *for* or *against* an issue, should not influence your decision. For example, an argument *against* abandoning marriage still belongs to "*We should abandon marriage*".

Which topic does the argument belong to?
Possible Topics:

1: "We should abandon marriage"
2: "We should ban cosmetic surgery"
3: "We should adopt an austerity regime"
4: "We should fight urbanization"
5: "We should subsidize embryonic stem cell research"
6: "Entrapment should be legalized"
7: "We should ban human cloning"
8: "We should close Guantanamo Bay detention camp"
9: "We should adopt atheism"
x: CAN NOT DECIDE

For example:

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 ("We should fight urbanization")

Question 2: Given the *premise*, is the *conclusion* a plausible *conclusion*?
We are interested if the *conclusion*, given the *premise,* is comprehensible, plausible or simply (rationally) understandable as an argument, i.e. whether it is such that you could

explain its rationale to someone else. But this does not mean that the conclusion has to be supported in a strict logical sense.
Please keep in mind that this question *does NOT aim at identifying your own belief*. Try to answer the question as objectively as possible. When making a decision, consider, e.g., whether a person from a different background might come to the given conclusion.
Note that you can ignore small misspellings and grammatical errors as long as sentences remain understandable.

Given the *premise*, is the *conclusion* a plausible *conclusion*?
Possible Answers:

y: yes
n: no
x: CAN NOT DECIDE

For example:

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 ("We should fight urbanization")
Q2 (is C plausible?): yes

The premise states that *urbanization encourages job growth*. This premise makes the conclusion that *urbanization is a positive for society* plausible, since job growth is positive for society. Thus, the answer is yes.

All following questions are only relevant if you answered question 2 with *yes*.

Question 3: Are premise and conclusion connected by implicit commonsense knowledge?
Commonsense knowledge (CSK) is knowledge that virtually anyone has, for example "*birds can fly"*, "*cars are used for driving*" or "*dogs are animals*". In everyday communication we usually do not express this knowledge. Instead, we leave it *implicit*, and expect the other person to fill this missing information with their own *commonsense knowledge*. To make it easier to detect *implicit commonsense knowledge*, consider the following:

> Imagine you are a robot (or an alien) that speaks our language, but does not have access to commonsense knowledge. When reading the *premise* and the *conclusion*, is it clear how the conclusion relates to the premise? Or are some connections missing from the text?
> If so, use your human *commonsense knowledge* to decide what information is missing to fully understand the relation between premise and conclusion, so that you can teach this to the robot.

If some such information is missing, it is *implicit*. If it is something that almost everyone knows, then it is *implicit commonsense knowledge*.

Are premise and conclusion connected by implicit commonsense knowledge?
Possible Answers:

y: yes
n: no
x: CAN NOT DECIDE

For example:

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 (“We should fight urbanization”)
Q2 (is C plausible?): yes
Q3 (connected by implicit CSK?): yes

To understand how the conclusion relates to the premise we need to know that job growth is good for society. Thus, there is implicit CSK connecting the premise to the conclusion.

All following questions are only relevant if you answered question 3 with *yes*.

Question 3.1: If you identified implicit commonsense knowledge linking premise and conclusion, what is it?

Please provide the missing connecting information in simple sentences – ideally using one sentence for each individual fact.

For example:

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 (“We should fight urbanization”)
Q2 (is C plausible?): yes
Q3 (connected by implicit CSK?): yes
Q3.1 (state CSK): Job growth reduces unemployment.
Reduced unemployment means more people have work.
People having work is positive for society.

The stated CSK connects the conclusion to the premise by making one possible connection between the conclusion and the premise.

The following shows a few examples for questions Q1 to Q3.1.

1. Premise: *Urbanization encourages job growth.*
   Conclusion: *Urbanization is a positive for society.*
   Q1 (Topic): 4 (“We should fight urbanization”)
   Q2 (is C plausible?): yes
   Q3 (connected by implicit CSK?): yes
   Q3.1 (state CSK): Job growth reduces unemployment.

Reduced unemployment means more people have work.
People having work is positive for society.

2. Premise: *Entrapment tricks criminals to behave a certain way.*
   Conclusion: *Entrapment isn't honest itself, so it shouldn't be used to keep other people honest.*
   Q1 (Topic): 6 (“Entrapment should be legalized”)
   Q2 (is C plausible?): yes
   [The premise supports the first part of the conclusion]
   Q3 (connected by implicit CSK?): yes
   Q3.1 (state CSK): Tricking someone is not honest.
   Criminals are people.

3. Premise *If guantanamo bay should be closed for good.*
   Conclusion: *guantanamo bay needs to be closed down.*
   Q1 (Topic): 8 (“We should close Guantanamo Bay detention camp”)
   Q2 (is C plausible?): yes
   [The premise is grammatically not correct, but otherwise the argument is okay]
   Q3 (connected by implicit CSK?): no
   [The premise and conclusion mean the same thing, so there is no knowledge missing]
   Q3.1 (state CSK):
   [Q3 was answered with *no*, so this question does not have to be answered]

4. Premise: *Guantanamo Bay is abusive.*
   Conclusion: *Guantanamo Bay should not be kept open.*
   Q1 (Topic): 8 (“We should close Guantanamo Bay detention camp”)
   Q2 (is C plausible?): yes
   Q3 (connected by implicit CSK?): yes
   Q3.1 (state CSK): Something that is abusive is not legal.
   Something that is not legal should be stopped.
   A prison can be stopped by closing it.
   Closing something is synonymous to not keeping it open.

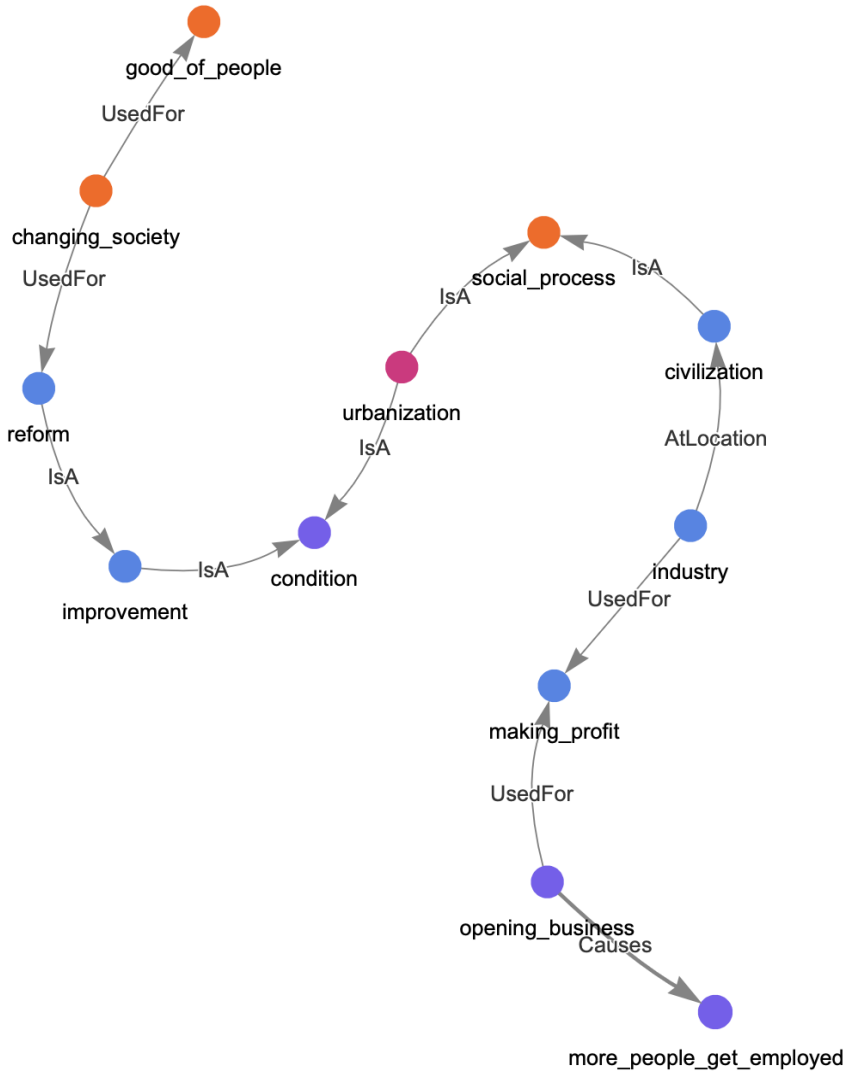
5. Premise: *Guantanamo Bay should not be kept open.*
   Conclusion: *Guantanamo Bay is abusive.*
   Q1 (Topic): 8 (“We should close Guantanamo Bay detention camp”)
   Q2 (is C plausible?): no
   [The conclusion is not made plausible by the premise]
   Q3 (connected by implicit CSK?):
   [Q2 was answered with *no*, so this question does not have to be answered]
   Q3.1 (state CSK):
   [Q2 was answered with *no*, so this question does not have to be answered]

Part II: Judging the quality of a CSK graph linking premise to conclusion

You will now be shown a *commonsense knowledge graph*, that is supposed to represent the implicit commonsense knowledge connecting the premise and conclusion of the argument you investigated in Part I.
The nodes in the graph show concepts, while the edges show relations between these concepts, such as *IsA*, *CapableOf*, or *Desires*. We will at times refer to triplets of the form *(concept_1; relation; concept_2)* that are contained in these graphs. E.g. the triplet *(dog; IsA; pet)* represents the information 'a dog is a pet'. A list and explanations of all relations used in the graphs can be found here: https://github.com/commonsense/conceptnet5/wiki/Relations
The nodes of the graphs are colored according to whether they have been projected from the premise (purple), conclusion (orange), both (pink) or neither (blue). Note that these colors are automatically identified and should not be considered as necessarily correct.

For example, a graph might look like this:

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Graph:



The following questions aim at assessing the quality of these graphs.

Question 4: Is the implicit commonsense knowledge you identified for the argument in Part 1 *reflected* by the graph?

For your assessment, consider the following:
i) *Variation*: Often there are different ways in which we can understand the connection between a premise and its conclusion, in terms of commonsense knowledge. Thus, the graph may NOT and must NOT show exactly the knowledge you wrote down for question 3.1. If this is the case, consider if the information you find expressed in the graph reflects a connection that you or someone else may consider as a plausible connection between premise and conclusion. If multiple such connections are reflected in the graph, then only consider the one you consider to be the best.
In the following when we refer to *your answer to Question 3.1* synonymously to an *answer to Question 3.1 that you or someone else might have given*.

ii) *Granularity*: The graph is limited to a specific set of relation types. Thus, we can not expect the triplets of the graph to express information, or knowledge, in exactly the way you would have written it down. Check if a single triplet (or multiple triplets) expresses information that corresponds to / is equivalent to / is consistent with an expression for implicit commonsense knowledge you have identified, or – in case there is no fit – whether you can interpret the triples in the graph in a way that can be understood as an alternative plausible connection.
Multiple triplets could be connected in a path *(concept_1, relation_1, concept_2, …, relation_n-1, concept_n)* which shows an implicit connection between *concept_1* and *concept_n*. Other connections such as triangles *(concept_1, relation_1, concept_2, relation_2, concept_3, relation_3, concept_1)* or stars (a central concept with multiple relevant triplets) can be important too. However, triplets do NOT necessarily have to be connected to each other. Perhaps one part of the graph reflects one half of the implicit CSK, while another part reflects the remaining implicit CSK.

iii) *Focus on relevant information*: In most cases the graph will specify more information than the implicit CSK you have identified as relevant. Ignore the additional information when answering this question. I.e., only the parts of the graph that contribute to expressing implicit CSK that links premise and conclusion should impact your answer to this question.

iv) *Detail of implicit CSK*: The connection between premise and conclusion can be arbitrarily detailed in principle. Thus, you will find cases where *some* implicit CSK is not reflected in the graph.
Answer option “1” means that the graph reflects the implicit knowledge *completely*. However, graphs which reflect the complete CSK you wrote down in Question 3.1 with *minor omissions that you do not consider being crucial, should* also be classified as option “1”.

Is the implicit commonsense knowledge you identified for the argument in Part 1 *reflected*

by the graph?
Possible Answers:

1: completely (i.e. the graph completely reflects the implicit knowledge)
2: partially (i.e. the graph partially reflects the implicit knowledge)
3: not at all (i.e. the graph does not show any implicit knowledge)
x: CAN NOT DECIDE

For example (consider the graph shown above):

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 ("We should fight urbanization")
Q2 (is C plausible?): yes
Q3 (connected by implicit CSK?): yes
Q3.1 (state CSK): Job growth reduces unemployment.
Reduced unemployment means more people have work.
People having work is positive for society.
Q4 (implicit CSK in graph?) 2

The graph reflects that opening businesses causes more people to get employed *(opening business; Causes; more people get employed)*. However, it does not reflect that job growth causes *opening businesses*, nor that *more people get employed* is a positive thing for society. Thus, the graph only partially reflects the implicit CSK.

Question 5: Which triplets contribute to representing the implicit commonsense knowledge?

You will be presented with a list of triplets from the graph. For each triplet you have to decide if it is
1) Positive: The triplet contributes to reflecting the *implicit CSK*.
2) Neutral: The triplet's information is *contextually related* to the argument / the implicit CSK, but is not part of the implicit CSK. Information which is contextually related, but not part of implicit CSK, could be for example information which is explicitly stated or information which goes beyond the argument. However, it has to be compatible with the argument, i.e. it can NOT contradict the argument.
3) Unrelated: The triplet is NOT contextually related to the argument / the implicit CSK, e.g. because the argument comes from a different topic.
4) Negative: The triplet is contextually related, but contradicts the argument / the implicit CSK.

Consider the context of the graph when deciding how to annotate each triplet.

Does the triplet contribute to representing the implicit commonsense knowledge?
Possible Answers (for each triplet):

1: positive
2: neutral
3: unrelated
4: negative

x: CAN NOT DECIDE

For example (consider the graph shown above):

Premise: *Urbanization encourages job growth.*
Conclusion: *Urbanization is a positive for society.*
Q1 (Topic): 4 (“We should fight urbanization”)
Q2 (is C plausible?): yes
Q3 (connected by implicit CSK?): yes
Q3.1 (state CSK): Job growth reduces unemployment.
Reduced unemployment means more people have work.
People having work is positive for society.
Q4 (implicit CSK in graph?) 2
Q5 (triplets):
changing society UsedFor good of people: 1
changing society UsedFor reform: 1
reform IsA improvement: 1
improvement IsA condition: 2
urbanization IsA condition: 2
urbanization IsA social process: 1
civilization IsA social process: 1
industry AtLocation civilization: 1
industry UsedFor making profit: 1
opening business UsedFor making profit: 1
opening business Causes more people get employed: 1

The triplet “*opening business Causes more people get employed*” partially reflects the CSK written down in the answer to Question 3.1. The triplets relating to “*making profit*” do not fit in the connection given in the answer to Question 3.1. However, one could make the connection “*job growth --> making profit --> increase in welfare --> positive for society*”. The triplets with “*making profit*” partially reflect this connection, and therefore are classified as 1 (positive). Similarly, as *urbanization* is a kind of *reform,* the premise can also be partially connected to the conclusion with the knowledge *changing society is used for reforms* and a *reform is an improvement*. All other triplets are contextually related, but do not reflect implicit CSK. Thus, all other triplets are classified as 2 (neutral).
Please refer to example 7 below for examples of triplets belonging to class 3 and 4.

Only answer this question for triplets which you rated with “4” in question 5.

Question 6: Is the negated negative triplet positive?

In the previous question you annotated a triplet as being negative, meaning that it contradicts the argument or the assumed implicit knowledge. We are interested to know if by *negating* the triplet it would turn from a *negative* triplet to a *neutral* or a *positive* triplet.
Negating the triplet means that instead of the original triplet *(concept_1, relation, concept_2)* you *assume its negation*: *not (concept_1, relation, concept_2)*, which in case of a binary relation will turn it to the opposite (its inverse). For example, the negation of the triplet *(cloning, IsA, unethical_thing)* would result in *not (cloning, IsA, unethical_thing)*. Since the

non-negated triplet contradicts the rationale or the assumed implicit connection of the argument, negating the triplet could potentially turn it into a positive triplet *for the given argument*, even though it may contradict commonly held belief. If this (now negated) triplet is *crucial* for the assumed CSK linking the conclusion to the premise, assuming the negation of the triplet might finally make the representation of the argument as a whole *valid* – even if you personally might not accept the argument.

Note: A negated triplet may contradict common sense and be factually incorrect. Since we are dealing with arguments, we will consider, if necessary and for the sake of the argument, whether a negated triplet helps to reconstruct the argumentative rationale.

Is the *negated* triplet *positive*, *neutral*, *unrelated* or *negative* according to the definitions in Question 5?

Possible answers:

1: Positive
2: Neutral
3: Unrelated
4: Negative
x: CAN NOT DECIDE

Only answer this question if you rated at least one triplet with “1” in question 6.

Question 7: Is the implicit commonsense knowledge you identified for the argument in Part 1 reflected by the graph with the negated triplet?

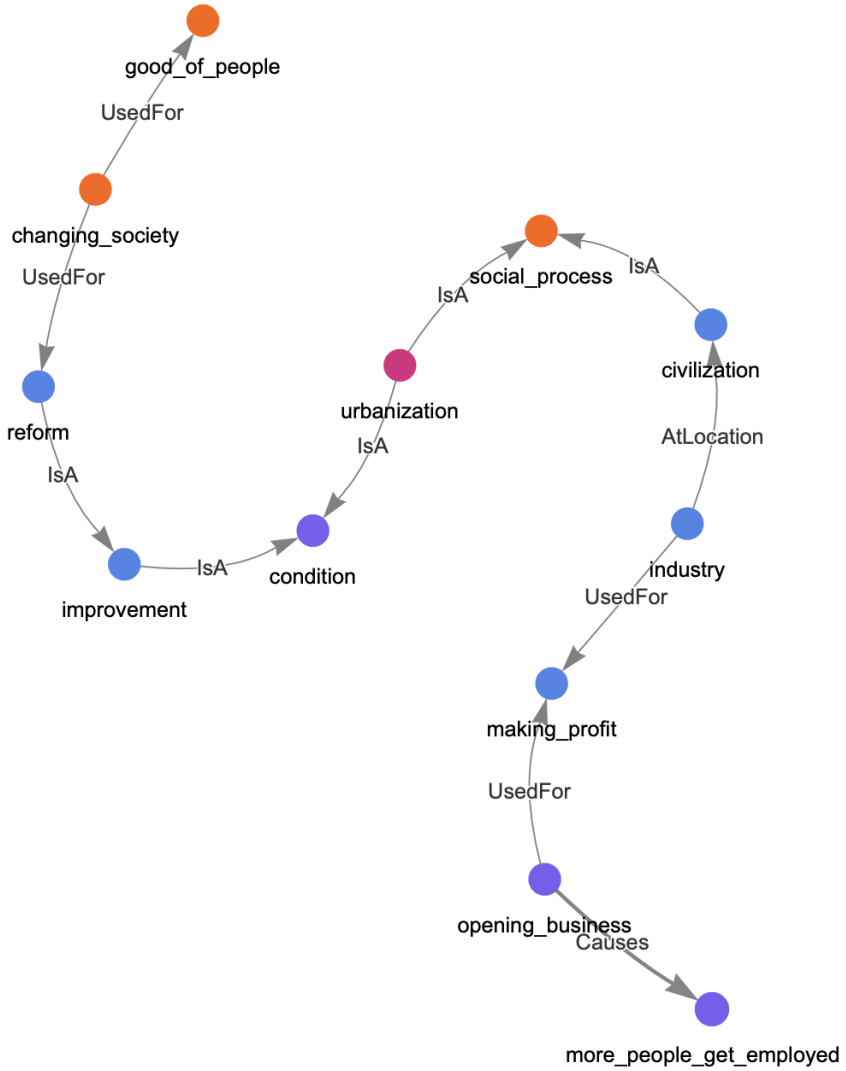
This question revisits Question 4 (*Is the implicit commonsense knowledge you identified for the argument in Part 1 reflected by the graph?*). Please answer the same question again, but consider the negated positive triplet(s) instead of the original non-negated negative triplet(s).

Possible Answers:

1: completely (i.e. the graph completely reflects the implicit knowledge)
2: partially (i.e. the graph partially reflects the implicit knowledge)
3: not at all (i.e. the graph does not show any implicit knowledge)
x: CAN NOT DECIDE

The following shows a few examples for questions 4 to 7.

6. Premise: *Urbanization encourages job growth.*
   Conclusion: *Urbanization is a positive for society.*
   Graph:



Implicit CSK (answer to Question 3.1):

Job growth reduces unemployment.
Reduced unemployment means more people have work.
People having work is positive for society.

Q4 (implicit CSK reflected?): 2
Q5 (triplet rating):

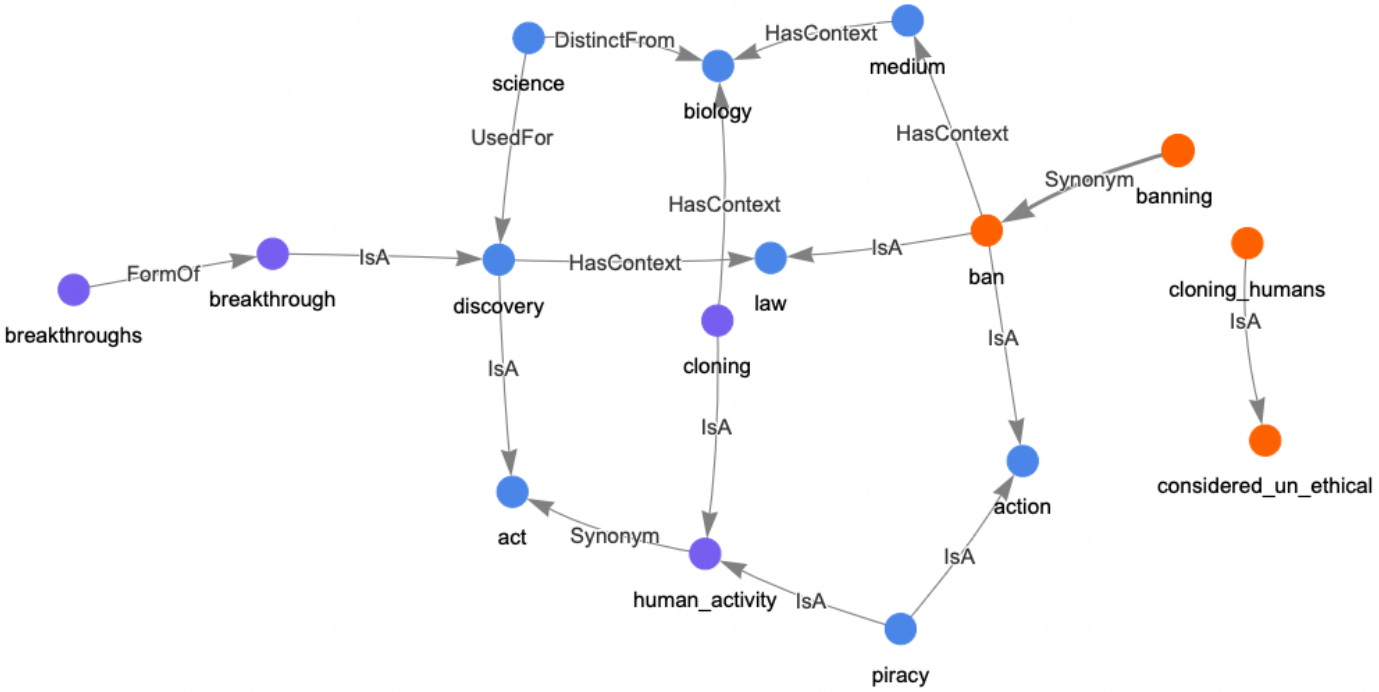
changing society UsedFor good of people: 1
changing society UsedFor reform: 2
reform IsA improvement: 2
improvement IsA condition: 2
urbanization IsA condition: 2
urbanization IsA social process: 1
civilization IsA social process: 1

industry AtLocation civilization: 1
industry UsedFor making profit: 1
opening business UsedFor making profit: 1
opening business Causes more people get employed: 1

Q6 (negated triplets):

[no triplet was annotated with “4” in Q5]

7. Premise: *Without human cloning there would not be as many breakthroughs.*
   Conclusion: *human cloning should not be banned.*
   Graph:



Implicit CSK (answer to Question 3.1):

Breakthroughs cause medical advancement.
Medical advancement saves lives.
Saving lives is good.
Good things should not be banned.

Q4 (implicit CSK reflected?): 1

[While the stated CSK refers to specific advances in medicine, and mentions specifically saving lives, the information from the graph references more globally science, which is sufficient to relate "cloning" and "breakthroughs". However, the graph does not have a statement that discoveries are good, and that good things should not be banned. However, while "discovery" can be considered neutral (there can be good or bad discoveries), breakthrough has a positive connotation. This is a non-crucial, minor omission. Thus, the graph is classified as 1 (completely).]

Q5 (triplet rating):

breakthroughs FormOf breakthrough: 2
breakthrough IsA discovery: 1

[not part of the provided explanation for Q3.1, but could be part of an explanation]

discovery IsA act: 2
science UsedFor discovery: 1

[not part of the provided explanation for Q3.1, but could be part of an explanation]

science DistinctFrom biology: 2
discovery HasContext law: 1

[not part of the provided explanation for Q3.1, but could be part of an explanation]

act Synonym human activity: 2

cloning IsA human activity: 2

cloning HasContext biology: 1

[not part of the provided explanation for Q3.1, but could be part of an explanation]

law IsA ban: 1

[not part of the provided explanation for Q3.1, but could be part of an explanation]

piracy IsA human activity: 3

piracy IsA action: 3

ban IsA action: 2

medium HasContext biology: 2

[growth mediums are used in biology to grow cells]

ban HasContext medium: 3

banning Synonym ban: 2

cloning human IsA considered unethical: 4

[this triplet relates to the argument, but contradicts the conclusion. This it is a *negative* triplet and has to be classified with "4"]

Q6 (negated triplets):

cloning human IsA considered unethical: 1

[The negated triplet, i.e. *not (cloning human IsA considered unethical),* means that cloning humans is not considered unethical. This information can be used for a connection between the premise and the conclusion, as things which cause breakthroughs and are ethical should not be banned.]

Q7 (implicit CSK reflected with negated triplet?): 1