IRAC: A Domain-Specific Annotated Corpus of Implicit Reasoning in Arguments



Keshav Singh¹, Naoya Inoue^{2,4}, Farjana Sultana Mim¹, Shoichi Naitoh^{1,3,4}, Kentaro Inui^{1,4} ¹Tohoku University , ²Stony Brook University , ³RICOH Company, Ltd. , ⁴RIKEN



Overview

Implicit Reasoning in arguments

Implicit reasoning explain intermediate link between claim and premise; crucial for comprehending arguments.

• E.g., one may *understand why/how? premise support claim* by framing implicit reasoning via background knowledge

Motivation

- Current systems have limited capability in modelling reasoning over knowledge; ulletlimitations in explicating implicit reasonings.
- Innate domain-specific knowledge important factor for humans to make reasoning
- Previous works focused only on domain-general resources.

Claim: We should *ban surrogacy*. **Premise**: Surrogacy often creates *abusive and coercive* conditions for women.

Implicit Reasoning: *Banning surrogacy* causes *decrease* in number of women working as surrogates which suppresses abusive and coercive conditions for women.

> Framing implicit reasoning in semi-structured fomat

Proposal

- Create large implicit reasoning corpus with wide coverage of domain-specific knowledge.
- Design novel *semi-structured annotation method* that • utilizes background knowledge to frame implicit reasoning.



Annotating Semi-structured Implicit Reasoning

Crowdsourcing via Amazon Mechanical Turk (5 annotators/claim-premise)

STEP 1: Derive OUTCOME and then proceed to the following Question

"OUTCOME" Phrase

Abusive and coercive conditions for women

Sanity Check (Refer to Instructions if you are not sure how to derive "OUTCOME"):

confirm that "OUTCOME" Phrase follows from SUPPORTING STATEMENT with minimal modifications

Question:

Can you complete the Logical Flow by writing HIDDEN REASONING along with ACTION and OUTCOME?

✓ Choose your answer

- Yes, I can think of a Hidden Reasoning. --> Write Hidden Reasoning + Choose Connectors
- No, this argument is too bad to understand anything. --> Move to next example
- Unsure, since this argument is too good to find anything hidden. --> Move to next example

Sanity Check (Refer to Instructions if you are not sure how to complete Logical Flow):

I confirm that Hidden Reasoning appropriately explains the logical link (with external knowledge/information) between ACTION and OUTCOME.

Complete Logical Flow -

- 1. Banning surrogacy <cause> decrease in number of women working as surrogates
- 2. decrease in number of women working as surrogates <suppress> Abusive and coercive conditions for women
- I confirm that both statements above are logically correct.

Corpus and Experiment details

IRAC Statistics

- Source data of claim-premise : **IBM-rank3ok**
- # of topics and arguments: 6 topics w/ 952 claim-premise
- *#* of annotated implicit reasonings : **2636**
- % of claim-premise with at least 1 implicit reasoning (i.e., IRs \geq 1):95%
- Average # of implicit reasonings annotated per claim-premise :

Experiment

- **Baseline Model**: Out-of-domain setting
 - train and test instances w/o topic overlap
- Our Model: In-domain setting
 - train and test instances belong to same topic
- Generation model : BART
- Input (encoder) : <claim, premise>
- Output : <implicit reasoning>
- Metrics : B1-BLEU1, B2-BLEU2 and BS-BertScore

2.9

Quality Analysis

Results

Generation Examples

T	wo experts analyze 50 random implicit reasonings
•	Judge correct/incorrect based on three criteria:
	1. Keyword correctness
	2. Implicit causal knowledge correctness
	3. Logical correctness
•	34 and 38 implicit reasonings labelled correct respectively

Krippendorff's α : **0.64**

		Baseline			Our Model		
Торіс	B1	B2	BS	B 1	B2	BS	
	Out	-of-Don	nain	Ir	n-Doma	in	
Zoos	0.21	0.04	0.16	0.44	0.28	0.37	
Vhaling	0.16	0.03	0.20	0.40	0.24	0.37	
Cannabis	0.33	0.10	0.19	0.45	0.21	0.48	
oting	0.19	0.07	0.23	0.38	0.21	0.36	
chool niform	0.23	0.04	0.27	0.36	0.17	0.41	
apital unish- ent	0.16	0.02	0.18	0.17	0.03	0.16	

Claim	We should legalize cannabis.				
Premise	Legalizing cannabis can help people with certain health problems be relieved of their symptoms.				
Implicit Reasoning					
Gold	Legalizing cannabis causes easy access to the drug for the needy causes helping people with certain health problems be relieved of their				

	Legalizing cannabis causes extensive medic-
nain	<i>inal research on cannabis</i> causes relief in health problems.
	l en ren e an an an an an an an

Out-of-	Legalizing cannabis causes good medicina
domain	use causes relieve of patients symptoms.

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