Annotating Reduced Argument Scope Using QA-SRL

Gabriel Stanovsky, Ido Dagan and Meni Adler
Contributions

1. Focus on **minimal** argument spans

2. Linguistic constructions characterizing minimality

3. Reliable crowdsourcing of minimal arguments annotation
Argument Span
Argument Span

*Obama, the 44th president, was born in Hawaii*

• Arguments are typically perceived as answering **role questions**
  • Who was *born* somewhere?
  • Where was someone *born*?
Argument Span: “Inclusive” Approach

- Arguments are full syntactic constituents

- PropBank
- FrameNet
- AMR
Argument Span: “Inclusive” Approach

- Arguments are full syntactic constituents

Who was born somewhere?

Where was someone born?

- PropBank
- FrameNet
- AMR
Can we go shorter?

Obama, the 44th president, was born in Hawaii

Who was born somewhere?

• More concise, yet sufficient answer
Motivation: Applications

• Sentence Simplification

Barack Obama, the 44th president, thanked vice president Joe Biden and Hillary Clinton, the secretary of state
Motivation: Applications

• Sentence Simplification

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Motivation: Applications

• Sentence Simplification

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• Knowledge Representation
• Question Answering
Motivation: Qualitative Evidence

• Having shorter arguments improved performance in
  • Open IE (Corro et al., 2013)
  • TAC-KBP Slot Filling Task (Angeli et al., 2015)
  • Text Comprehension (Stanovsky et al., 2015)
What is a minimal span?
Problem Formulation

• Given:
  • $p$ - predicate in a sentence
    • Obama, the newly elected president, flew to Russia
  • $a = \{w_1, \ldots, w_n\}$ - non-reduced “PropBank” argument
    • Obama, the newly elected president
  • $Q(p, a)$ - argument role question
    • Who flew somewhere?
Problem Formulation

• Find:
  $M(p, a)$- a set of minimally scoped arguments, jointly answering $Q$

Barack Obama, the 44th president, thanked vice president Joe Biden and Hillary Clinton, the secretary of state

• $Q_1$: Who thanked someone?
  $M(Q_1)$: Barack Obama

• $Q_2$: Who was thanked?
  $M(Q_2)$: Joe Biden; Hillary Clinton
Recently, He et al. (2015) suggested pred-arg annotation by explicitly asking and answering argument role questions.

Published a large predicate-argument corpus annotated by QA pairs
  • Utilized in our annotation as follows...
Expert Annotation Experiment

• Using **questions** annotated in QA-SRL
  • **Re-answer** with minimal arguments
  • Annotated 260 arguments in 100 predicates

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Our criterion can be **consistently annotated** by experts
Linguistic Characterization of Minimality

1. Removal of tokens from $a$
   => Omission of *non-restrictive modification*

2. Splitting $a$
   => Decoupling *distributive coordinations*
Restrictive vs. Non-Restrictive

• Restrictive
  • *She wore the necklace* that her mother gave her

• Non – Restrictive
  • *Obama, the newly elected president,* flew to Russia
Distributive vs. Non-Distributive

• Distributive
  • *Obama and Clinton* were born in America

• Non-Distributive
  • *John and Mary* met at the university
Distributive vs. Non-Distributive

- Distributive
  - *Obama* and *Clinton* were born in America

- Non-Distributive
  - *John* and *Mary* met at the university

- *Obama* was born in America
- *Clinton* was born in America
- *John* met at the university
- *Mary* met at the university
Impact on PropBank

<table>
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<td>19%</td>
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<tr>
<td>Distributive</td>
<td>5%</td>
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The average reduced argument shrunk by 58%

Our annotation *significantly reduces* PropBank argument spans
Non-expert Annotation
Does QA-SRL Captures Minimality?

- QA-SRL guidelines do not specifically aim to minimize arguments

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Non-experts **intuitively minimize** argument span
Can We Do Better?

- Ask **turkers** to re-answer the QA-SRL questions:
  - “Specify the shortest possible answer from which the entity is identifiable”

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Explicit guidelines yield **more consistent** argument spans
Conclusion

• Minimal argument scope
  • Motivated by applications

• Linguistic characterization of argument minimality
  • Removing non-restrictive modification (long paper in ACL)
  • Decoupling distributive coordinations

• Consistent and intuitive non-expert annotation

Thanks for listening!