

Multilingual Generative Language Models for Zero-Shot Cross-Lingual Event Argument Extraction

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ACL 2022



Event Argument Extraction

- Goal: extract the participants for an event described in the given sentence
- Input: sentence, event trigger
- Output: (role, argument) pairs
- Challenge:
 - Dependency
 - Event structure

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses

Five Iraqi civilians, including a woman, were killed Monday when their houses were hit by a missile fired by the US - led coalition warplanes, witnesses said.

Trigger for a
Life:Die event

Zero-Shot Cross-Lingual Transfer

- Annotations are expensive, especially for low resource languages
- Training examples come from **source languages**
- Testing examples come from **target languages**
- Challenge:
 - Discrepancy between language properties (word order, grammar, etc.)

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses

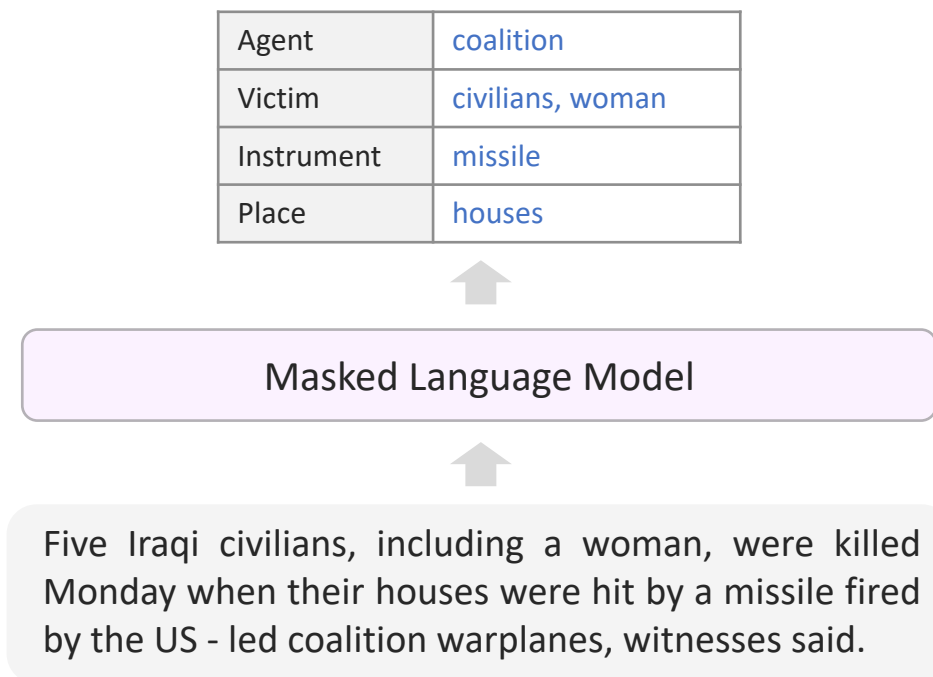
Five Iraqi civilians, including a woman, were **killed** Monday when their houses were hit by a missile fired by the US - led coalition warplanes, witnesses said.

Agent	以军
Victim	青年
Instrument	催泪弹, 子弹, 实弹
Place	None

巴勒斯坦人持续以石块攻击以色列的部队，以军则是还以催泪弹、橡皮子弹甚至是实弹，结果又造成两名巴勒斯坦青年**丧生**，10多人受伤。

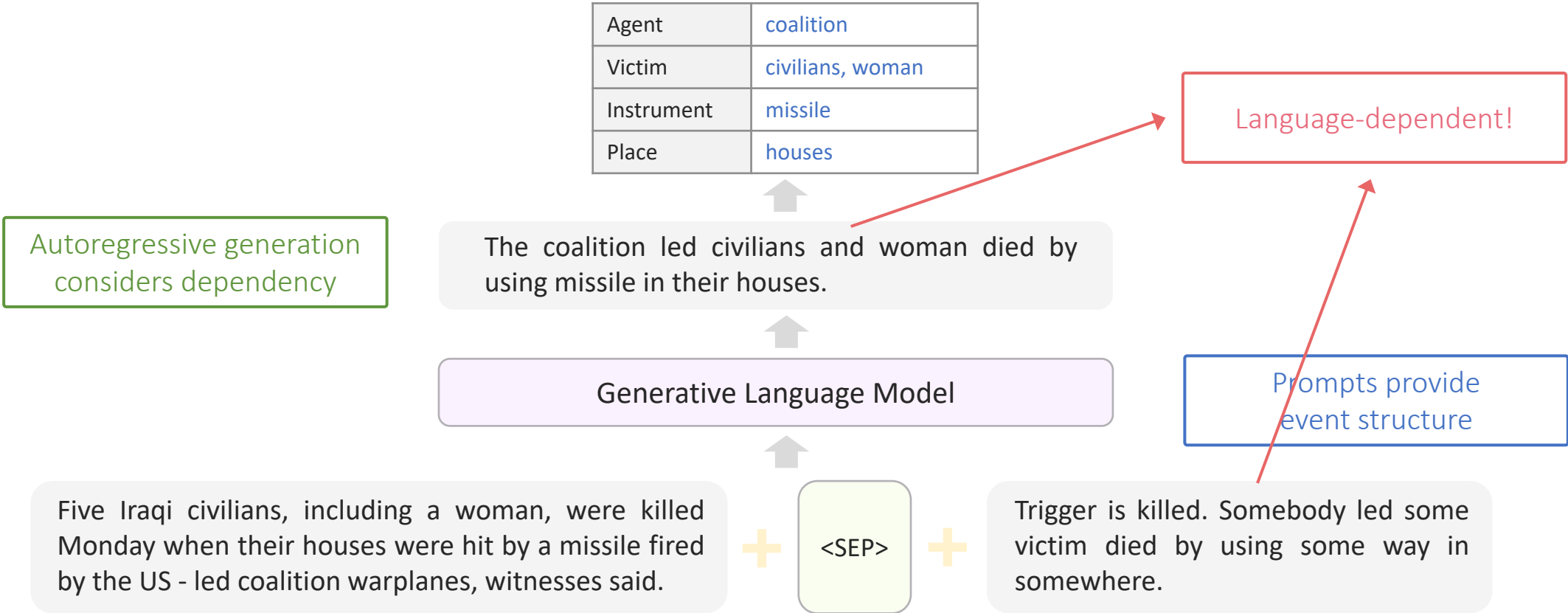
Previous Approaches

- Previous approaches for zero-shot cross-lingual information extraction
 - GATE [Ahmad+ 2021], CL-GCN [Subburathinam+ 2019]
 - Most of them are **classification-based models**



Generation-Based Models for Event Argument Extraction

- Generation-based models perform better than classification-based models
 - DEGREE [Hsu+ 2022], BART-Gen [Li+ 2021], TANL [Paolini+ 2021]



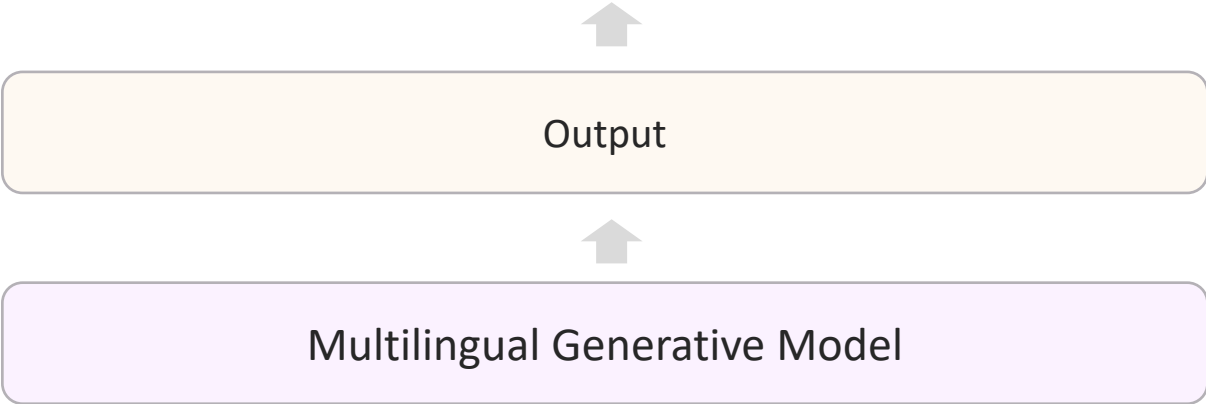
Our Goal

- We aim to explore the possibility of applying **generation-based models** for zero-shot cross-lingual event argument extraction

Proposed Method: X-Gear

- Generative framework

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses



Language-Agnostic Output Format

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses

Easy to decode the final predictions

They are special tokens and don't belong to any language

Language-agnostic format for language discrepancy

<Agent> coalition </Agent> <Victim> civilians [and] woman </Victim>
<Instrument> missile </Instrument> <Place> houses </Place>

Multilingual Generative Model

Five Iraqi civilians, including a woman, were killed Monday when their houses were hit by a missile fired by the US - led coalition warplanes, witnesses said.

+ <SEP> +

Prompt

Prompt Design

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses

<Agent> coalition </Agent> <Victim> civilians [and] woman </Victim>
<Instrument> missile </Instrument> <Place> houses </Place>

Multilingual Generative Model

Provide event structure and control signal

Five Iraqi civilians, including a woman, were killed Monday when their houses were hit by a missile fired by the US - led coalition warplanes, witnesses said.

+ <SEP> +

<Trigger> killed <Template> <Agent> [None] </Agent>
<Victim> [None] </Victim> <Instrument> [None]
</Instrument> <Place> [None] </Place>

Trigger for a Life:Die event

Copy Mechanism

Agent	coalition
Victim	civilians, woman
Instrument	missile
Place	houses

<Agent> coalition </Agent> <Victim> civilians [and] woman </Victim>
<Instrument> missile </Instrument> <Place> houses </Place>

Multilingual Generative Model

Five Iraqi civilians, including a woman, were killed Monday when their houses were hit by a missile fired by the US - led coalition warplanes, witnesses said.

+ <SEP> +

<Trigger> killed <Template> <Agent> [None] </Agent>
<Victim> [None] </Victim> <Instrument> [None]
</Instrument> <Place> [None] </Place>

Zero-Shot Cross-Lingual Inference

Agent	以军
Victim	青年
Instrument	催泪弹, 子弹, 实弹
Place	None

Language-agnostic format
for language discrepancy

<Agent> 以军 </Agent> <Victim> 青年 </Victim> <Instrument> 催泪弹
[and] 子弹 [and] 实弹 </Instrument> <Place> [None] </Place>

Autoregressive generation
considers dependency

Multilingual Generative Model

Prompt provides event
structure and control signal

巴勒斯坦人持续以石块攻击以色列的部队，以军则是还以催泪弹、橡皮子弹甚至是实弹，结果又造成两名巴勒斯坦青年丧生，10多人受伤。

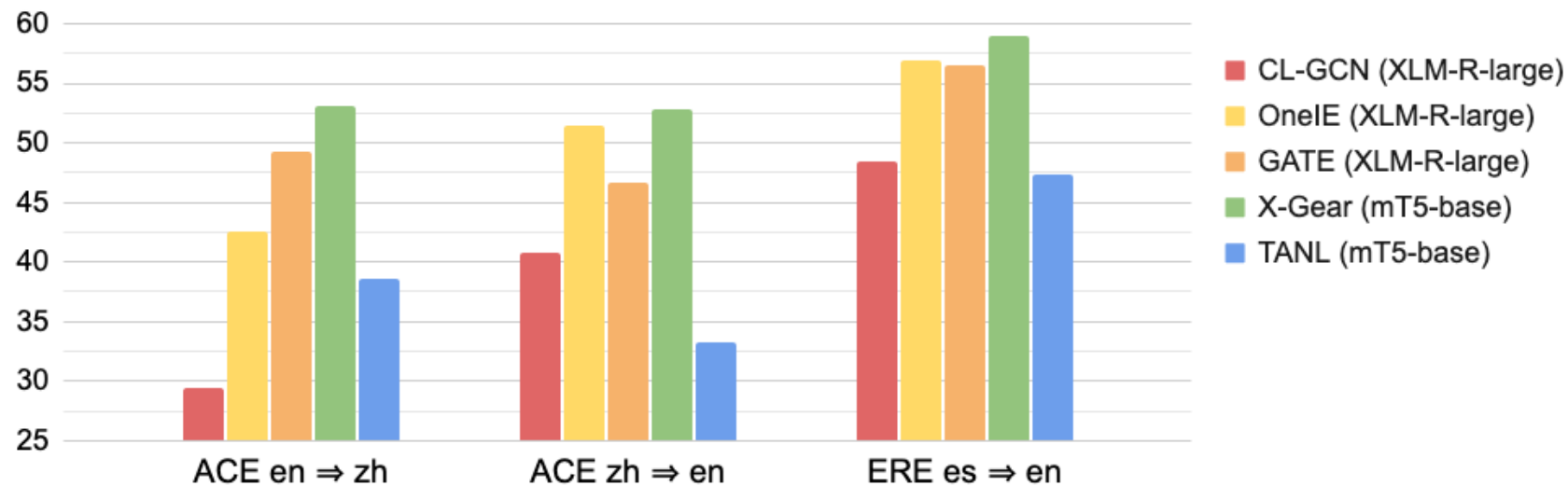
+ <SEP> +

<Trigger> 丧生 <Template> <Agent> [None] </Agent>
<Victim> [None] </Victim> <Instrument> [None]
</Instrument> <Place> [None] </Place>

Main Experiments

- Better argument classification F1 than baselines on ACE and ERE dataset
 - Classification: GATE [Ahmad+ 2021], OneIE [Lin+ 2020], CL-GCN [Subburathinam+ 2019]
 - Generation: TANL [Paolini+ 2021]

Argument Classification F1



X-Gear is better than TANL (generation-based baseline)

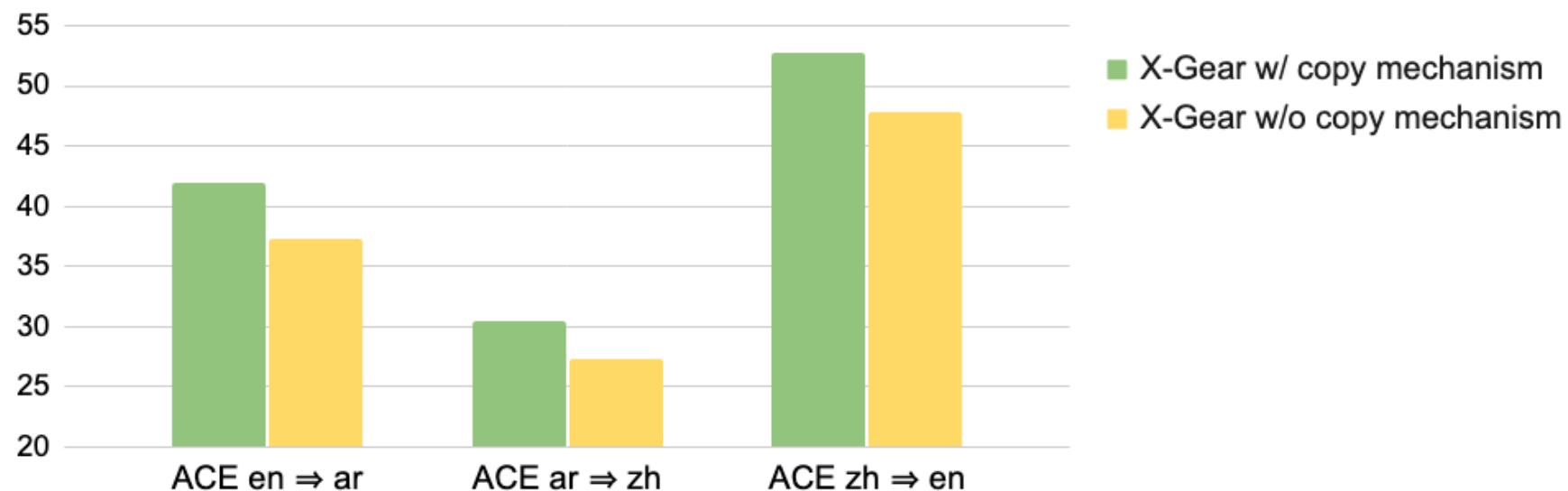
GATE and OneIE requires additional annotations

X-Gear does **not** require any entity labels

Ablation Study on Copy Mechanism

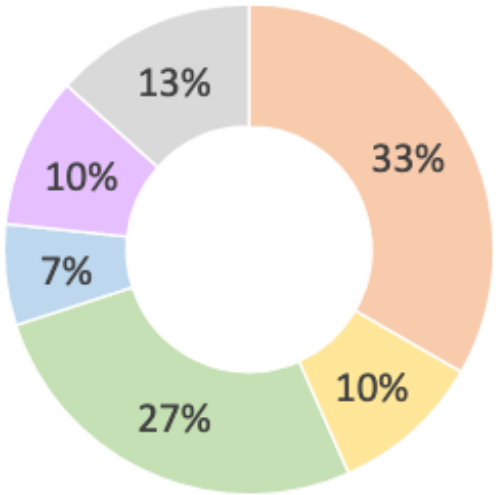
- Copy mechanism is important

Argument Classification F1



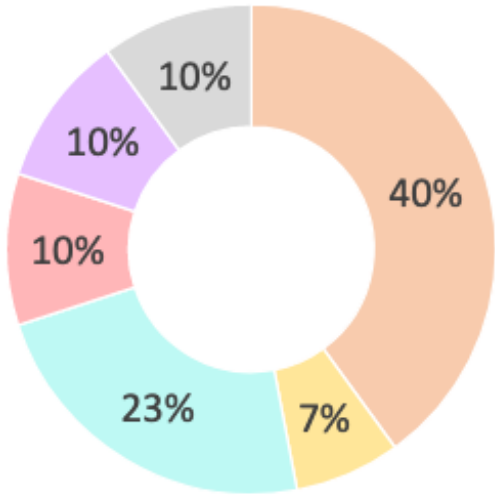
Error Analysis

Error Distribution for X-GEAR (ar \Rightarrow en)



- Errors on both monolingual and cross-lingual models
- Label disagreement on different language splits
- Over-generating
- Grammar difference between languages
- Annotation errors
- Others

Error Distribution for X-GEAR (zh \Rightarrow en)



- Errors on both monolingual and cross-lingual models
- Label disagreement on different language splits
- Generating words not appearing in the passage
- Generating correct predictions but in Chinese
- Annotation errors
- Others

Conclusion

- We propose X-Gear, a generation-based model for zero-shot cross-lingual event argument extraction
 - Inherit the benefits of generation-based models
 - Language-agnostic templates
 - Copy mechanism
- Significant improvements over previous baselines



Code is available at
<https://github.com/PlusLabNLP/X-Gear>

Poster session: May 25, PS6-1: Machine Translation and Multilinguality