Multimodal Coreference Resolution

Alejandro Santorum Varela
Svetlana Stoyanchev, Kate Knill

UNIVERSITY OF CAMBRIDGE

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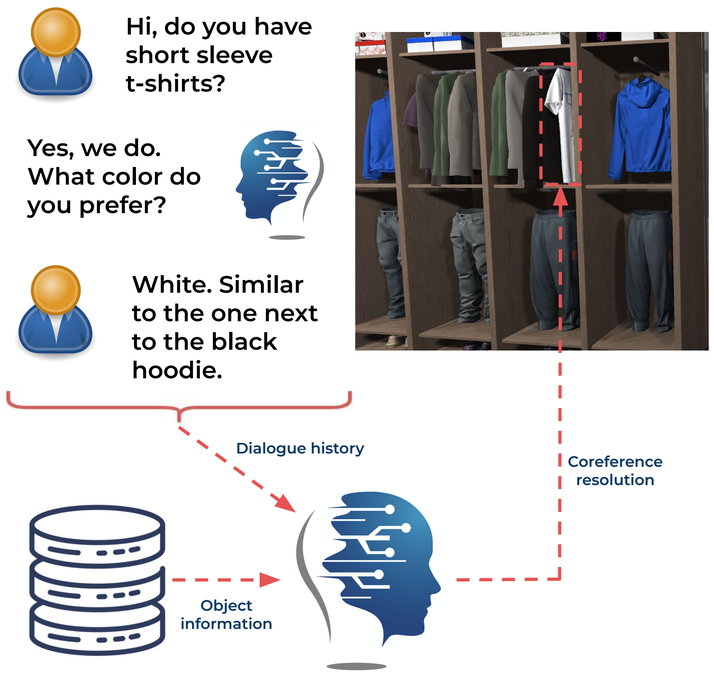
Introduction

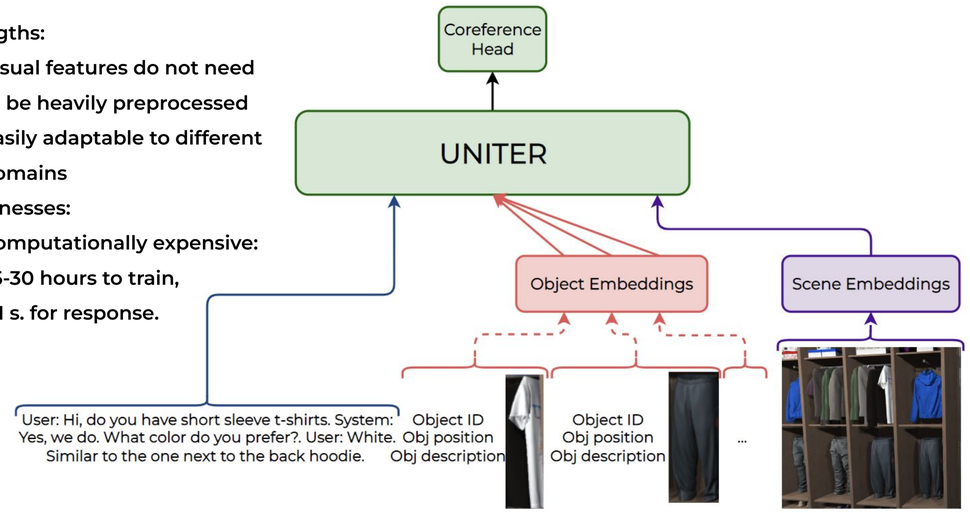


- Applications:
  - E-commerce virtual assistant: answer customer inquiries about objects.
  - In-site interpreter: improved translations using both scene and textual context.
  - Boost other natural language tasks, like question answering or generation.
- SIMMC2 dataset published by Facebook Research is used for investigation.
  - It contains dialogues, object descriptions and scene images.
- The 10th Dialog System Technology Challenge (DSTC10) partially focused on the multimodal coreference resolution task.
  - SIMMC2 dataset was used for the competition.
  - Best performing systems are studied as a enhanced baseline.

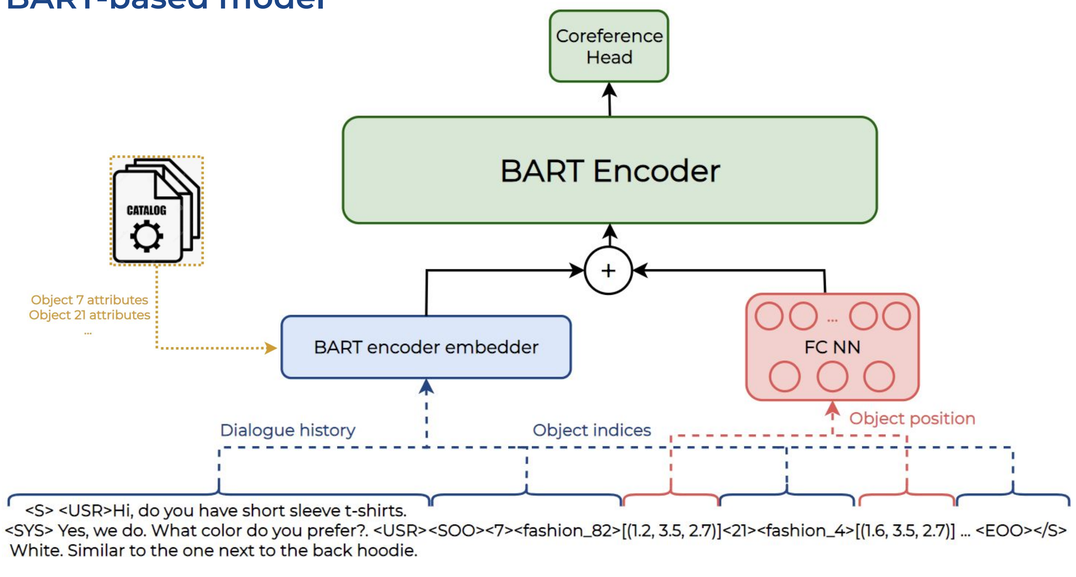
SOTA MMCR Systems

UNITER-based model

- Strengths:
  - Visual features do not need to be heavily preprocessed
  - Easily adaptable to different domains
- Weaknesses:
  - Computationally expensive: 25-30 hours to train, ~ 1 s. for response.



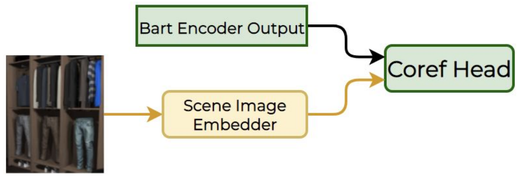
BART-based model



- Strengths:
  - Winner of DSTC10 on this task.
  - Computationally cheaper: around 5 hours to train, <0.5 seconds for response.
- Weaknesses:
  - Bad at handling objects not seen in training.
  - Scene images need to be described in natural language to be used.

Proposed improvements

- Include object descriptions in the input of the BART-based model.
- Provide image embeddings to improve the coreference head of the BART-based model.



- Suppress object IDs in UNITER-based model to make it scene-independent.

Results

Model	Object F1-Score
GPT-2 Baseline (Facebook Research)	36.6%
UNITER-based (New York Uni. Shanghai)	67.4.%
BART-based (KAIST & Samsung Research)	74.3%
BART using object descriptions (Ours)	**76.1%**

Multimodal Coreference Resolution performance on devtest split

References

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[2] Yichen Huang et. al. UNITER-Based Situated Coreference Resolution with Rich Multimodal Input. *Computing Research Repository*. 2021.

[3] Haeju Lee et. al. Tackling Situated Multi-Modal Task-Oriented Dialogs with a Single Transformer Model. *Association for Computational Linguistics*. 2021.

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