Task-Oriented Dialog Systems

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INTRODUCTION

- Open-domain dialog systems
- Task-oriented dialog systems
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- Pipeline
- End-to-end methods

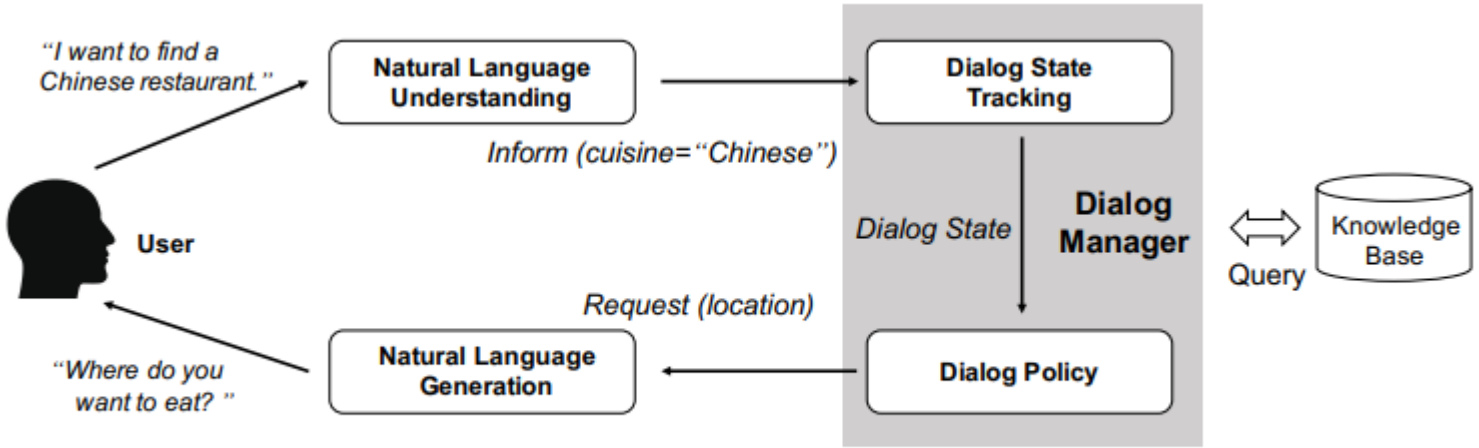


Figure 2 General framework of a pipeline task-oriented dialog system.

DATASET

Knowledge Base (KB)

Address	Distance	POI type	POI	Traffic info
5672 barringer street	5 miles	certain address	5672 barringer street	no traffic
200 Alester Ave	2 miles	gas station	Valero	road block nearby
899 Ames Ct	5 miles	hospital	Stanford Childrens Health	moderate traffic
481 Amaranta Ave	1 miles	parking garage	Palo Alto Garage R	moderate traffic

Dialogue

Driver	Address to the gas station.
Car	Valero is located at 200 Alester Ave.
Driver	OK , please give me directions via a route that avoids all heavy traffic.
Car	Since there is a road block nearby, I found another route for you and I sent it on your screen.

Mihail Eric, Lakshmi Krishnan, Francois Charette, Christopher D. Manning
Key-Value Retrieval Networks for Task-Oriented Dialogue.
SIGDAIL, 2018

CHALLENGES

- Data Efficiency
- Multi-turn Dynamics
- Ontology Integration

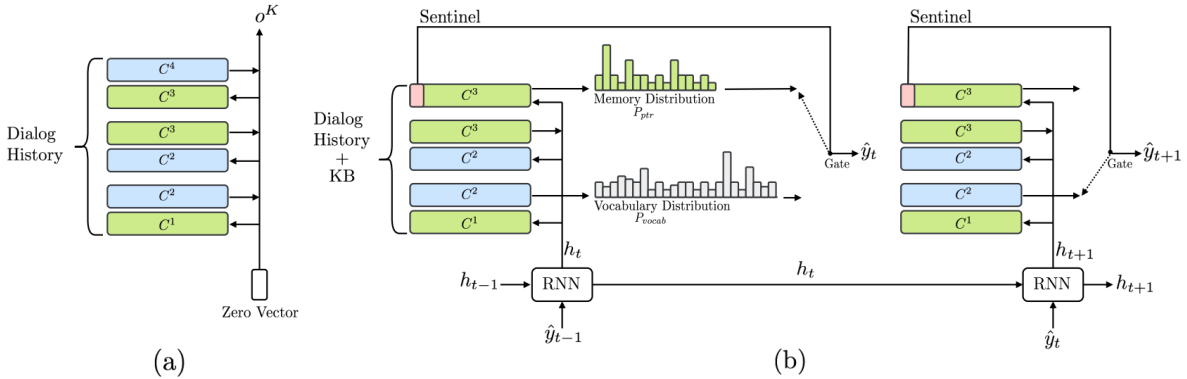
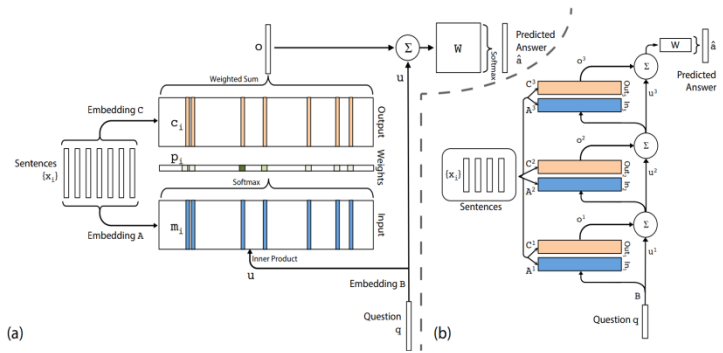


Figure 1: The proposed Mem2Seq architecture for task-oriented dialog systems. (a) Memory encoder with 3 hops; (b) Memory decoder over 2 step generation.



$$p_i^k = \text{Softmax}((q^k)^T C_i^k),$$

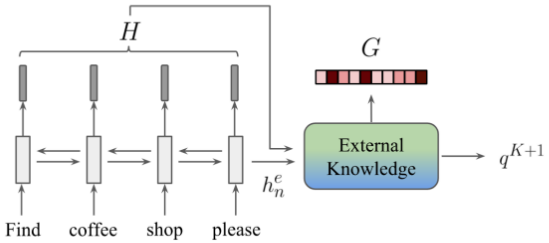
$$o^k = \sum_i p_i^k C_i^{k+1}.$$

$$q^{k+1} = q^k + o^k.$$

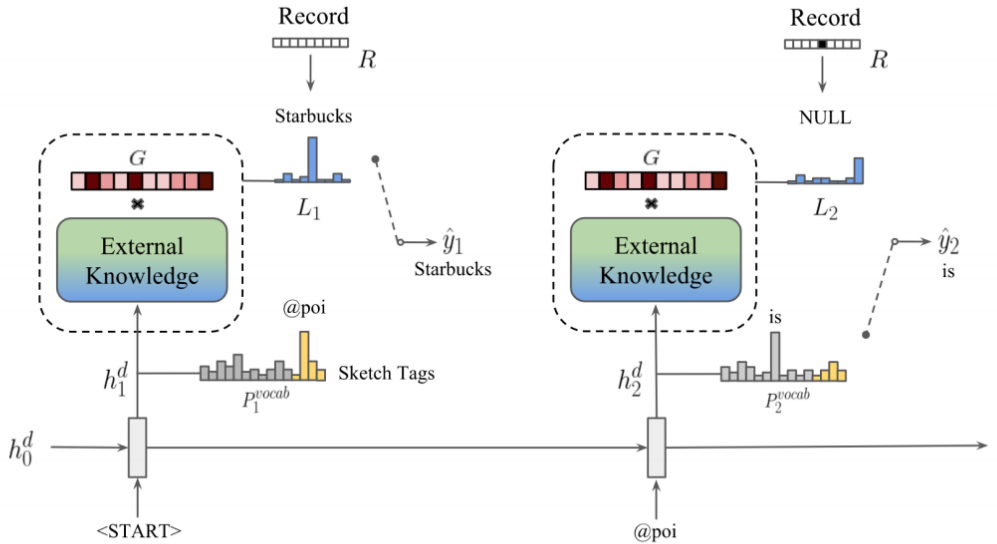
$$h_t = \text{GRU}(C^1(\hat{y}_{t-1}), h_{t-1});$$

$$P_{vocab}(\hat{y}_t) = \text{Softmax}(W_1[h_t; o^1])$$

Andrea Madotto, Chien-Sheng Wu, Pascale Fung
Mem2Seq: Effectively Incorporating Knowledge Bases into End-to-End Task-Oriented Dialog Systems.
ACL, 2018

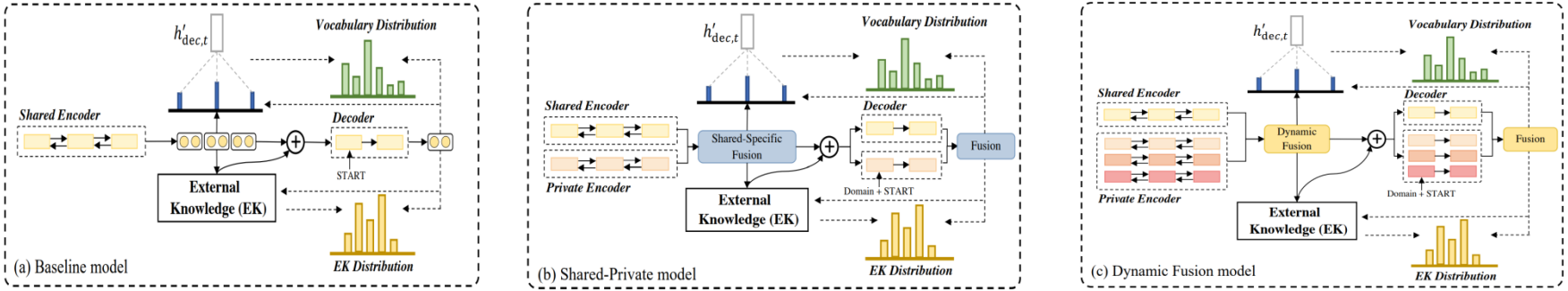


(a) Global memory encoder



(b) Local memory decoder

Chien-Sheng Wu, Richard Socher, Caiming Xiong
Global-to-local Memory Pointer Networks for Task-Oriented Dialogue.
ICLR, 2019



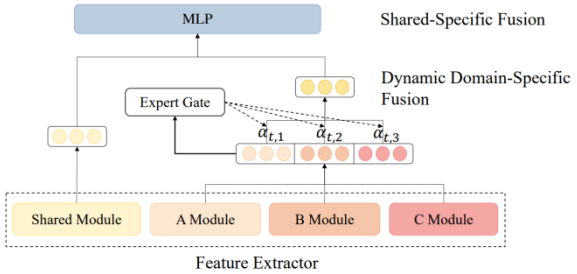


Figure 4: The dynamic fusion layer for fusing domain-shared feature and domain-specific feature.

Libo Qin, Xiao Xu, Wanxiang Che, Yue Zhang, Ting Liu
Dynamic Fusion Network for Multi-Domain End-to-end Task-Oriented Dialog.
ACL, 2020

Model	SMD				
	BLEU	F1	Navigate F1	Weather F1	Calendar F1
Mem2Seq (Madotto et al., 2018)	12.6	33.4	20.0	32.8	49.3
DSR (Wen et al., 2018)	12.7	51.9	52.0	50.4	52.1
KB-retriever (Qin et al., 2019b)	13.9	53.7	54.5	52.2	55.6
GLMP (Wu et al., 2019a)	13.9	60.7	54.6	56.5	72.5
Shared-Private framework (Ours)	13.6	61.7	56.3	56.5	72.8
Dynamic Fusion framework (Ours)	**14.4***	**62.7***	**57.9***	**57.6***	**73.1***