

Sentence Embeddings for Interpretable Dialog Modeling?

Dialog2Flow: Pre-training Soft-Contrastive Action-Driven Sentence Embeddings for Automatic Dialog Flow Extraction

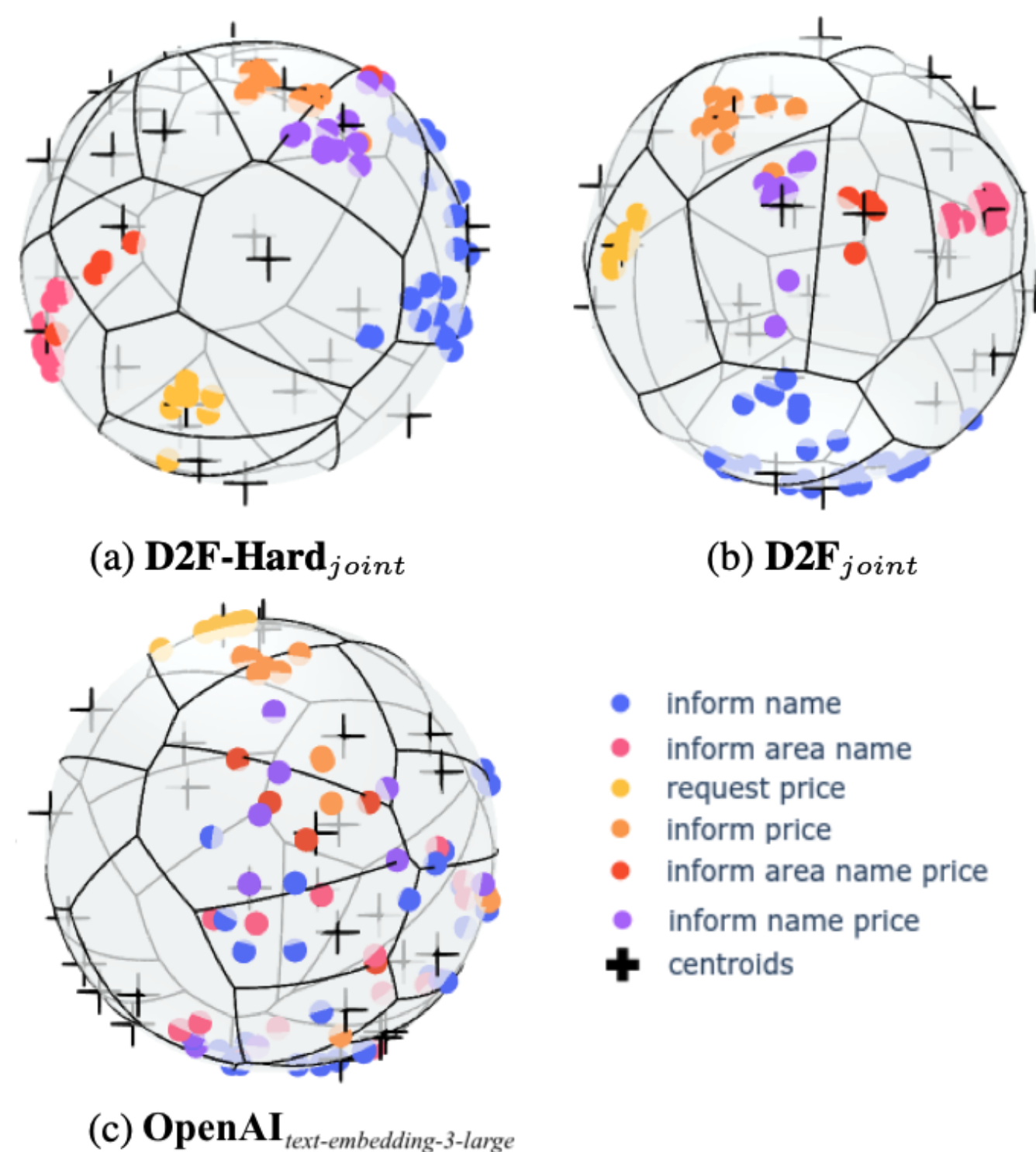
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Exploring the underexplored terrain of automatically extracting dialog flows from collections of conversations...

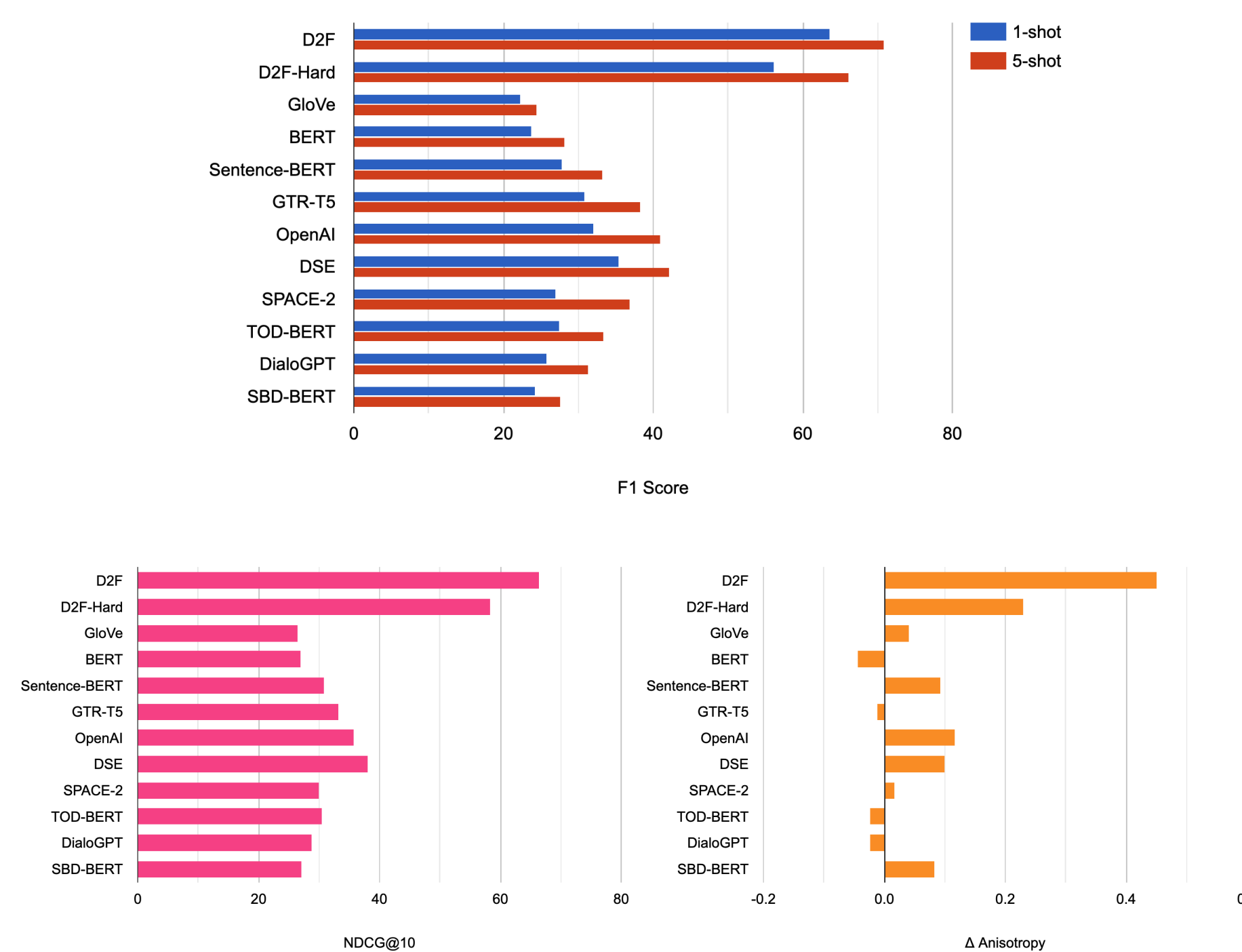
Highlights

- Dialog2Flow embeddings:** we introduce and release, to the best of our knowledge, the first sentence embedding model pre-trained specifically for dialog flow extraction.
- Soft Contrastive Loss:** we introduce a novel soft contrastive loss that leverages label semantics to guide the representation learning process, outperforming standard supervised contrastive loss.
- Dataset:** we consolidate 20 task-oriented dialog (TOD) datasets to create, and release, a unified TOD dataset with standardized annotation for 3.4 million utterances across 52 domains.

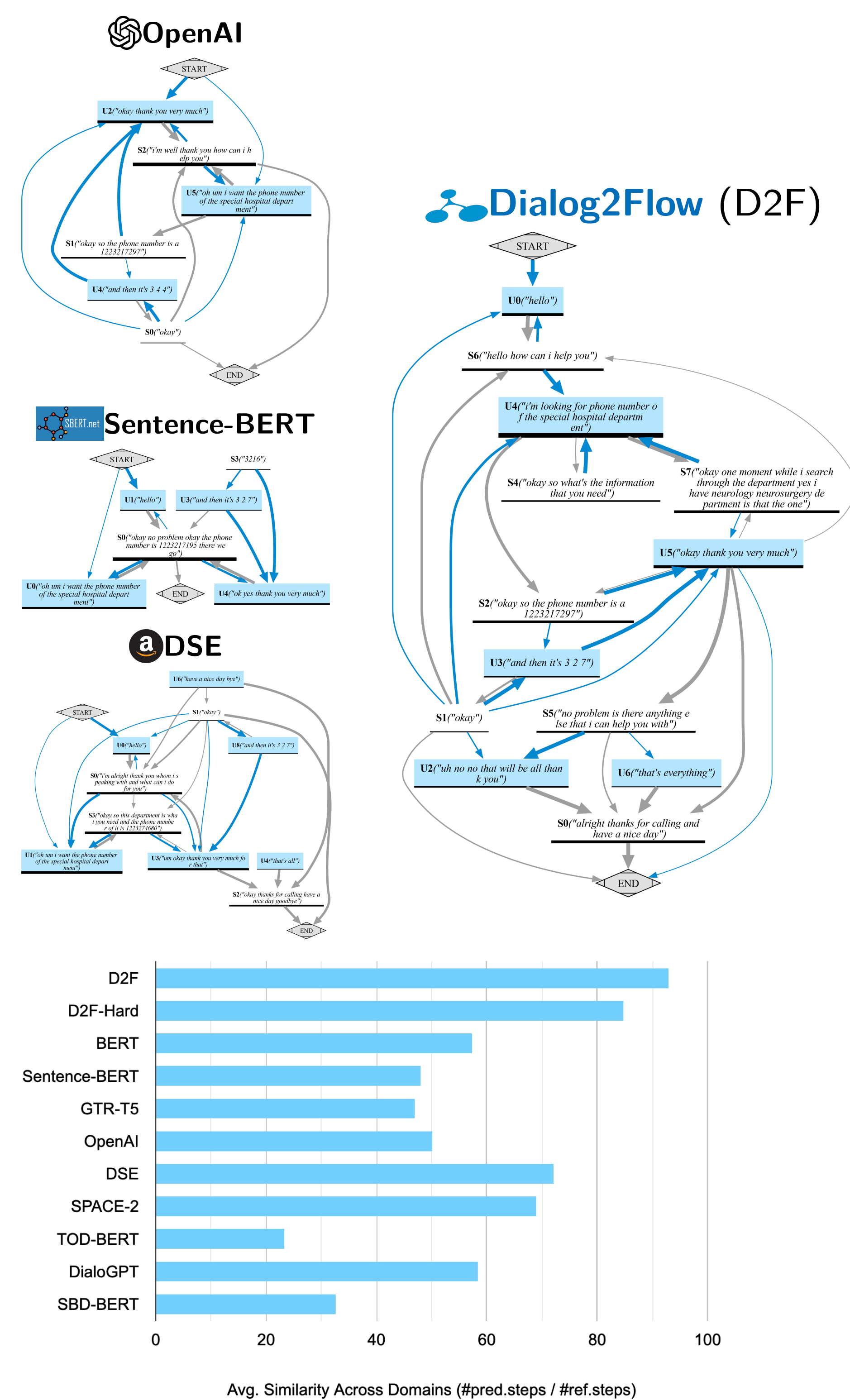
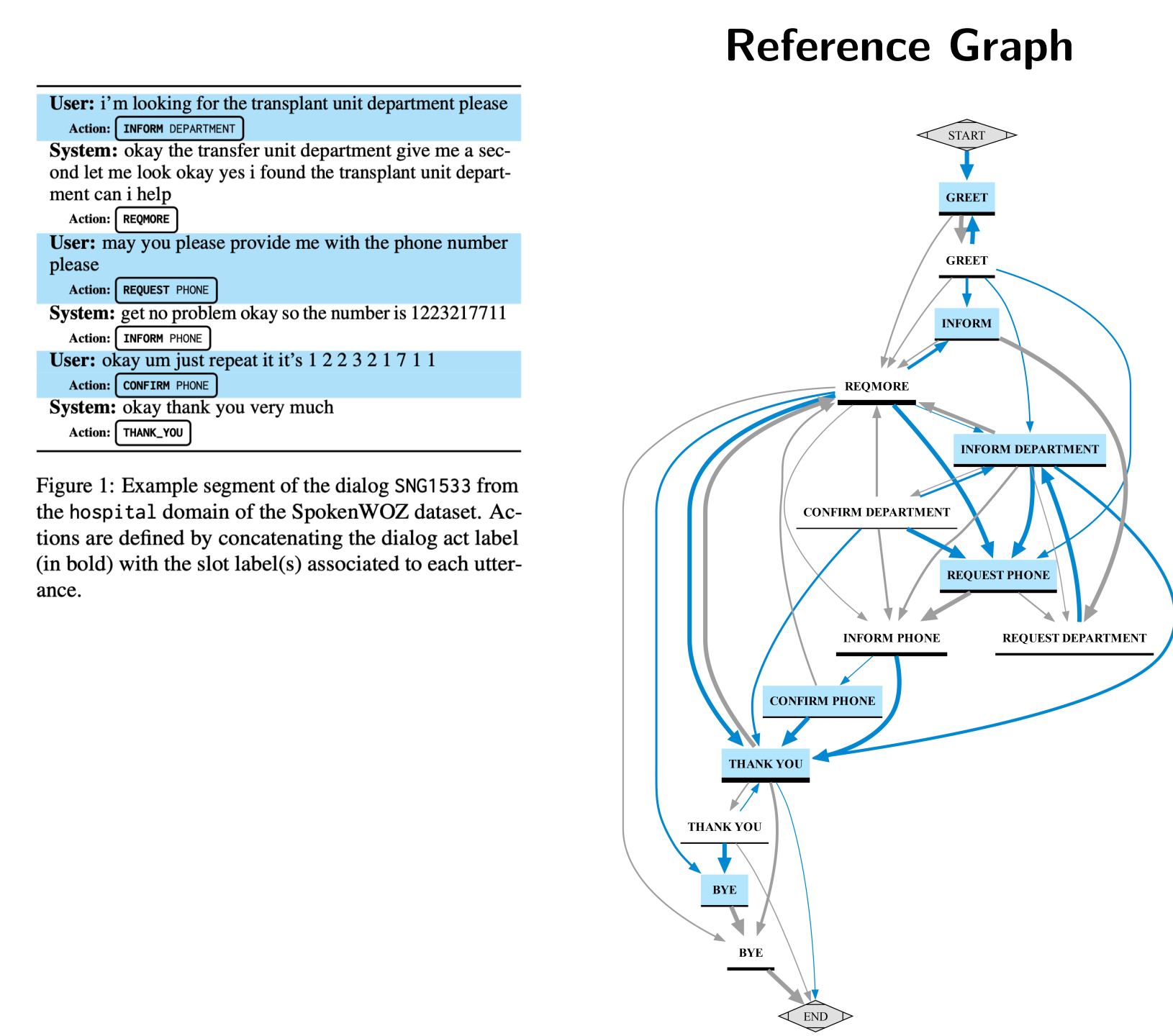


Rank	DSE	Sentence-BERT	D2F _{single}
1.	-ok my phone number is 74	-okay may i have your phone number please	-please get their phone number
2.	-okay okay now please get your number	-may i get your phone number	-okay may i have your phone number please
3.	-okay may i have your telephone number please	-okay may i know your telephone number please	-okay may i know your telephone number please
4.	-thank you on the phone number	-okay can i please get your id number	-may i get your phone number
5.	-okay may i know your telephone number please	-okay may i have your phone some in case for cooking the table	-may i please have their phone number
6.	-okay your email please have your contact number	-okay so may i have the phone number with me	-okay i'm also need phone number
7.	-my number is 21	-okay and may i have your number please	-no problem um but for the information can i have your phone number
8.	-the number is you see	-okay and may i have your number please	-thank you on the phone number
9.	-okay and may i have your number please	-okay and may i have your number please	-okay can i get your phone number please to make that booking
10.	-okay and may i have your number please	-okay and may i have your number please	

Table 5: Top-10 retrieved utterances on SpokenWOZ for the query "your phone please" with action label {request phone_number}. Errors are highlighted in red with wrong action marked as: *{inform phone_number}; *{inform plate_number}; *{request id_number}; *{request name}; *{request plate_number}; *{request phone}.



Dialog Flow Extraction



Proposed soft-contrastive loss

$$\ell_i^{soft} = - \sum_{j=1}^N \frac{e^{\delta(y_i, y_j) / \tau'}}{\sum_{k=1}^N e^{\delta(y_i, y_k) / \tau'}} \log \frac{e^{\mathbf{z}_i \cdot \mathbf{z}_j^+ / \tau}}{\sum_{k=1}^N e^{\mathbf{z}_i \cdot \mathbf{z}_k^+ / \tau}}$$

where $\delta(y_i, y_j)$ is a semantic similarity measure between labels y_i and y_j , and τ' is a temperature parameter controlling the "softness" of labels.

Original supervised contrastive loss:

