Improving Dialogue State Tracking by Joint Slot Modeling

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Background: Multi-domain DST

User: Hi, I'm looking for a train that is going to **cambridge** and arriving there by **20:45**, is there anything like that?

....

User: Thanks so much. I would also need a place to say. I am looking for something with **4 stars** and has **free wifi**.

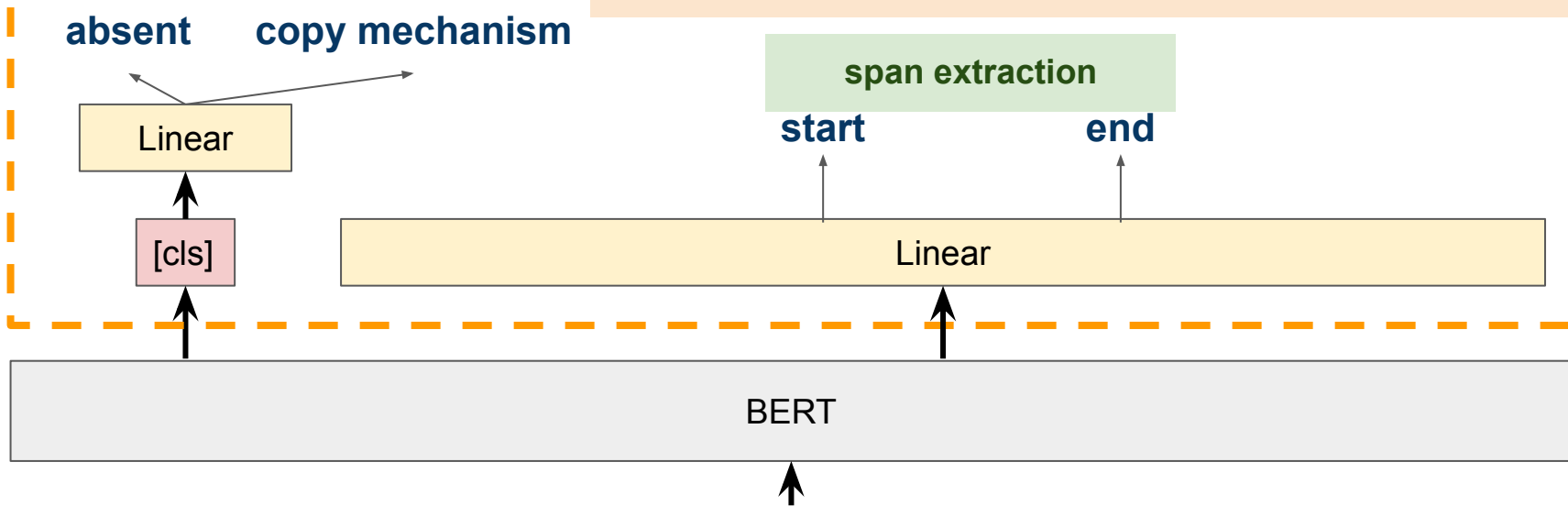**System:** How about the cambridge belfry? ...

Slots:
- Train domain
  - **destination: cambridge**
  - **arrive-time: 20:45**
- Hotel domain
  - **stars: 4**
  - **has-wifi: true**

Background: Previous SoTA - TripPy

For each of the slots

Slots are modeled conditionally independently!

absent   **copy mechanism**

span extraction

start   **end**

Linear

[cls]

Linear

BERT

User: Hi, I'm looking for a train that is going to cambridge and arriving there by 20:45, is there anything like that? … **User:** Thanks so much. I would also need a place to say. I am looking for something with 4 stars and has free wifi. **System:** How about the cambridge belfry? ...
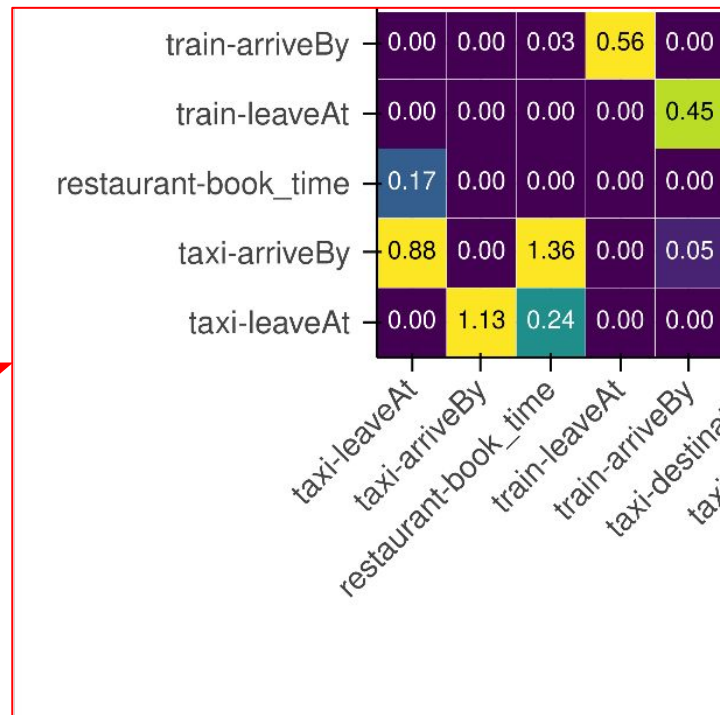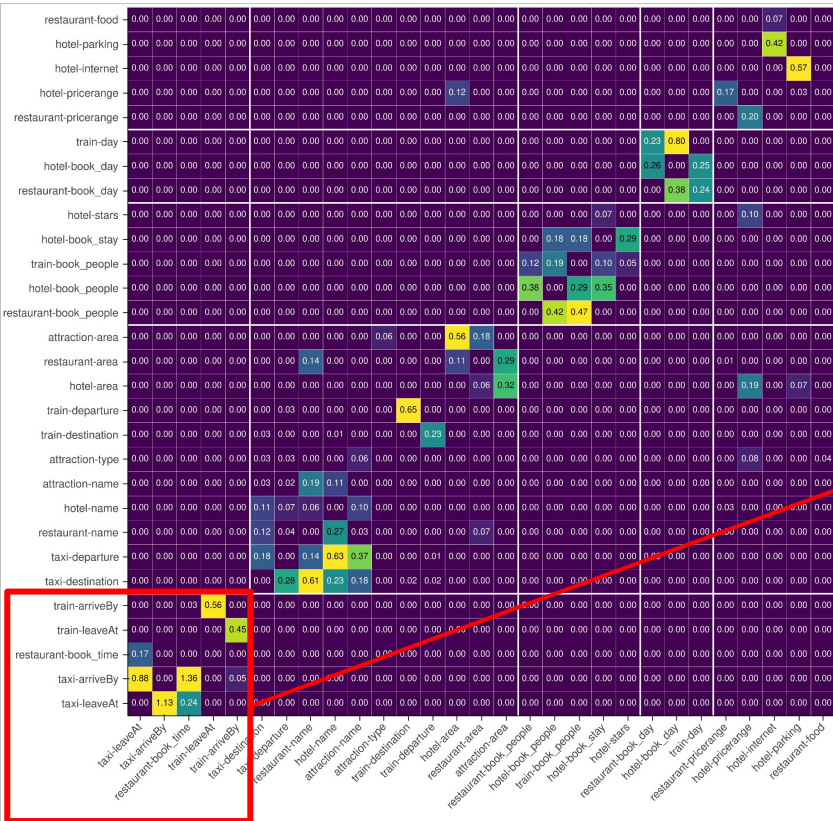
But slots are NOT independent to each other...

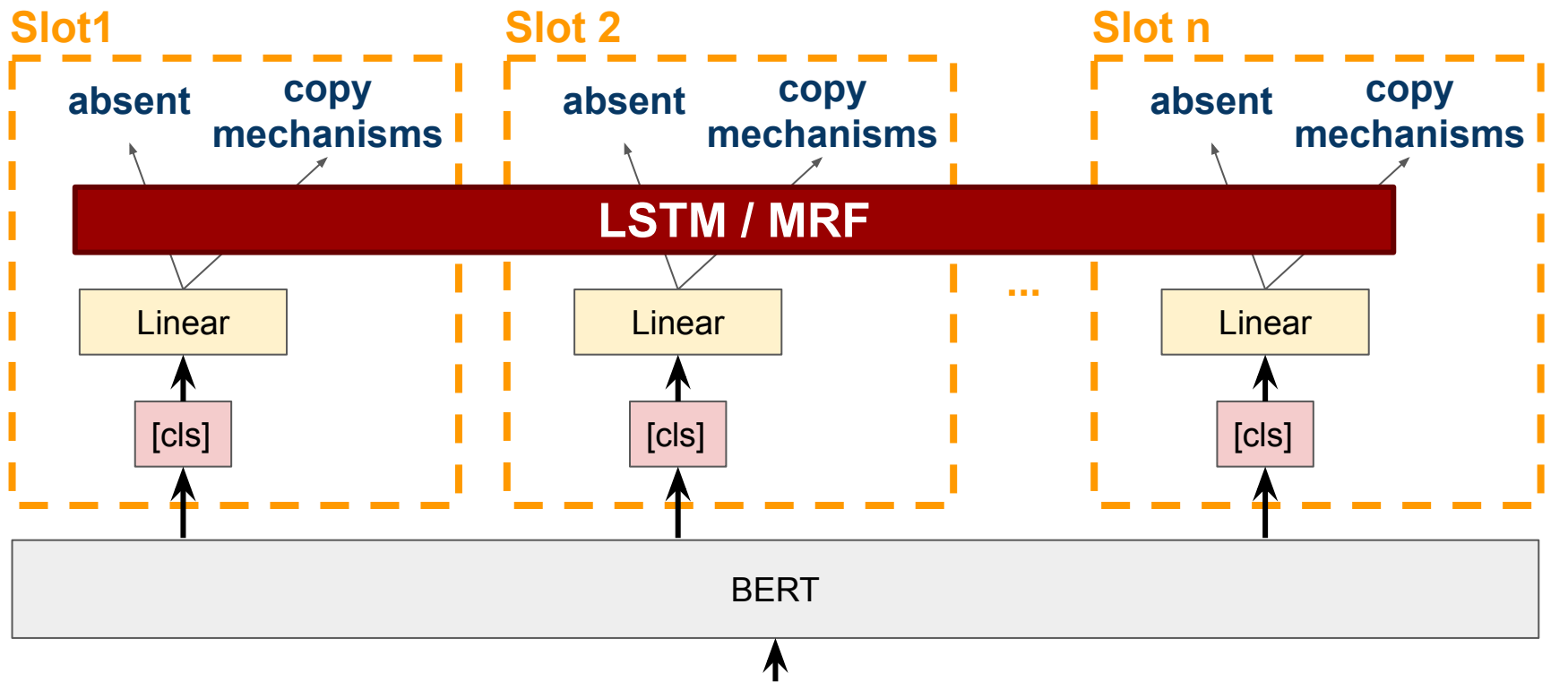> **User:** Hi, I'm going to **cambridge** and arriving there by **10:00**.

- If the slot type of **cambridge** is **taxi**-destination
  then the slot type of **10:00** should be **taxi**-arrive-time.
- If the slot type of **cambridge** is **train**-destination
  then the slot type of **10:00** should be **train**-arrive-time.

TripPy may make some mistakes since it does not consider this relation.

How often does the model attach a wrong slot type?

Solution: Joint Slot Modeling

User: Hi, I'm looking for a train that is going to cambridge and arriving there by 20:45, is there anything like

Performance (Joint Goal Accuracy)

Model	Dev.	Test
TripPy (Mehri et al., 2020)		58.7
TripPy (reproduced)	61.3	58.0
+ MRF	59.3	60.1
+ LSTM	62.8	61.3

Modeling the joint probability is important.

Conclusion

- We identify TripPy's incapability of modeling slots jointly.
- We propose a method that boost the state-of-the-art performance.

Please check our paper for more details!