Intent			
label	precision	recall	f1
restaurant_general	60	62.07	61.02
restaurant_ordering	72.5	85.29	78.38
restaurant_payment	95.24	68.97	80
restaurant_reservation	56.18	86.21	68.03
transport_arrive_time	95.12	67.24	78.79
transport_book_ticket	68.18	51.72	58.82
transport_bus	72	62.07	66.67
transport_bus_stop	85.71	85.71	85.71
transport_buy_ticket	85.71	62.07	72
transport_cancel_ticket	96.15	89.29	92.59
transport_check_in	63.89	79.31	70.77
transport_check_out	76.92	83.33	80
transport_customs	91.3	87.5	89.36
transport_depart_time	85.71	75	80
transport_flight	78.57	70.97	74.58
transport_general	47.83	37.93	42.31
transport_payment	62.5	86.21	72.46
transport_taxi	48.72	61.29	54.29
transport_traffic	89.66	96.3	92.86
transport_train	64.29	62.07	63.16

Slot			
label	precision	recall	f1
amount	30.53	90.91	45.71
baggage	15.13	94.44	26.09
business_name	19.74	48.39	28.04
business_type	20.81	85.19	33.45
currency_name	38.46	80	51.95
date	13.04	75	22.22
direction	7.06	71.43	12.85
drink_type	18.48	85	30.36
event	3.1	66.67	5.93
food_type	14.29	61.11	23.16
from_place_name	51.02	81.97	62.89
id	14.81	100	25.81
language	25	33.33	28.57
meal_type	21.74	83.33	34.48
menu_list	18.87	100	31.75
money_type	21.78	91.67	35.2
number	39.61	40.67	40.13
person	19.54	50	28.1
personal_info	9.09	45.16	15.14
place_name	20.06	36.05	25.78
symptom	18.36	100	31.02
thing_type	5.1	60	9.4
ticket_type	26.19	75.86	38.94
time	43.28	79.17	55.96
timeofday	38.98	76.67	51.69
to_place_name	68.4	75.27	71.67
transport_type	46.64	66	54.66
O	98.25	36.15	52.85

Table 4. Experimental results on the test set using a pre-trained BERT model on dataset

5. Conclusion and Future Work

In conclusion, our study demonstrates the efficacy of BERT-based encoders for sequence classification and multi-task learning in dialogue acts and joint intent-slot filling. The experimental results underscore BERT's superior capability in capturing intricate linguistic patterns, thereby enhancing the performance across all evaluated tasks. However, while BERT exhibits robust performance, the computational demands necessitate exploring more efficient models like DistilBERT, which, although slightly less accurate, provide a favorable balance between accuracy and resource consumption.

For future work, we aim to further optimize these models by integrating more sophisticated techniques such as knowledge distillation and model pruning to reduce computational overhead without significantly compromising performance. Additionally, we plan to expand our dataset to include more diverse and multilingual dialogue scenarios, thereby improving the generalizability of our models. Investigating the integration of contextual information and user-specific preferences into the learning process could also enhance the adaptability and personalization of dialogue systems. Finally, we will explore the potential of combining BERT with other advanced architectures, such as transformers and graph neural networks, to push the boundaries of performance in dialogue act recognition and joint intent-slot filling tasks.

Conflict of interest

The authors have no conflicts of interest to declare.

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