



Figure 3: (a) and (b) show attention matrices of our model given a passage with two different target answers. (c) shows an attention matrix of seq2seq+AP given the same passage and the target answer as (a).

Answers	Exact Match (EM)	F1 score
ALL	22.72	31.58
NER	49.09	56.57

Table 4: Performance of the machine comprehension system which is trained only with synthetic data generated by our NQG model.

training part of data split-1 as target answers. Then, we pair those answers with corresponding passages. We also make sure that selected answers are not overlapped with answers in the original SQuAD dataset because our NQG model is trained with the target answer provided with SQuAD dataset. If answers are overlapped, our model may generate exact the same questions as the golden questions. then we pair those answers with corresponding passages.

To organize the dataset in the same way as SQuAD dataset, (*paragraph, question, answer position*) triplets, we trace the passage in data split-1 in the original paragraph and re-compute the answer position as well. We finally make a synthetic data with about 50k questions and train the machine comprehension system only with our synthetic data. As shown in Table4, the machine comprehension system achieves EM/F1 score of 22.72/31.58 in public SQuAD dev set. This result is far below the result 68.78/78.56 of the case when the model is trained with the original training set. However, considering our synthetic data only consists of target answers with single named entity, we further check EM/F1 score of partial dev set that only has a single named entity as the answer. We find that in the 10k dev set, about 40 percent of the data has an answer with a single named entity and the machine comprehension system achieves EM/F1 score of 49.09/56.57 with those parts of the data. Since the SQuAD dataset is a human-made dataset, this result sufficiently shows that our answer-separated seq2seq can generate valid questions that can be acceptable both by human and machine comprehension systems.

## Conclusion

In this paper, we investigate the advantages of answer separation in neural question generation. We observe that existing NQG models suffer from a serious problem: a significant proportion of generated questions include words in the question target, resulting in the generation of unintended questions. To overcome this problem, we introduce a novel NQG architecture that treats the passage and the target answer separately to better utilize the information from the both sides. Experimental results show that our model has a strong ability to generate the right question for the target answer in the passage. As a result, it yields a substantial improvement over previous state-of-the-art models.

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