

collaborative with content from news, namely news categories that are changed with encoder labels and sentence vectors from news titles and contents. This model would then be evaluated using precision, recall, ROC, and hit ratio. The evaluation of the neural collaborative with the sentence BERT was then compared to the neural collaborative method. The results show that the neural collaborative method using sentences BERT produces precision, recall, and ROC curve values that are not much different from neural collaborative. While the evaluation using the hit ratio on ten items resulted in a higher value than neural collaborative. In the thirtieth epoch, the hybrid method has a hit ratio value of 72% compared to neural collaborative with 63%. The fiftieth epoch also shows that the value of the hybrid method has a hit ratio value of 74% compared to neural collaborative, which gives a value of 61%.

Future research can be developed from several things, such as using different sentence embedding or using different pre-trained models from sentences BERT by considering performance and time. In this study, hyper-parameter tuning has not been carried out. So that in the following research it can perform hyperparameter tuning of PyTorch lightning such as the Ray library using the available dragonfly algorithm or other metaheuristic methods. The evaluation using precision and recall has given good results. Future research can also fine-tune the precision-recall trade-off. Future research can also be applied to use datasets that read similar categories and do not read many categories because it will make sentence embedding more challenging to provide good recommendations with various reading topics.

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