

## 学 位 授 与 申 請 書

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大阪府立大学長 様

大阪府立大学大学院 工学研究科 電気・情報系専攻

氏 名 高山 裕成

大阪府立大学学位規程第5条第1項の規定により  
修士（工 学）の学位の授与を申請します。

（注意）

1. この申請書は、2通提出すること。

右肩の日付けは西暦年表示。

（A4）

# BERT を用いた原文と要約文の分散表現の統合手法

## Integration Method for Distributed Representations of

## Source and Summary Sentences Using BERT

分野名	知能情報工学分野	氏名	高山 裕成
Department	Computer Science and Intelligent Systems	Name	Yusei TAKAYAMA

Recent advances in machine learning, particularly deep learning, have achieved high accuracy in Natural Language Processing (NLP) and Computer Vision (CV). In NLP, Transformer-based models have shown exceptional performance across various tasks, leading to the rise of Large Language Models (LLMs), which are pre-trained on massive text corpora. Therefore, constructing high-accuracy models requires effectively capturing sentence-level distributed representations and selecting an optimal processing method.

Pooling is a fundamental deep learning technique that reduces feature dimensionality, improving computational efficiency and robustness. However, in NLP, pooling methods remain less explored than in CV, and their effectiveness is not well understood.

Based on the above background, Yamato proposed CLS-Average Pooling (CAP), a pooling method that combines 2 widely used techniques in BERT, a type of LLM: the embedding representation of the [CLS] token and average pooling. Their study demonstrated that CAP is more effective than using either pooling method alone in text classification tasks. In CAP, 2 trainable non-negative parameters, whose sum is fixed to 1, are used to compute the weighted sum of the vectors obtained from these 2 pooling methods as the sentence's distributed representation.

In this study, I propose a novel pooling method that further incorporates the distributed representation of summary texts generated from

the original text using an LLM. By integrating this additional representation, the proposed method aims to improve classification accuracy in text classification tasks by enhancing semantic feature aggregation.

Figure 1 shows an overview of the entire model of the proposed method. It utilizes 2 independent pre-trained BERT models to extract [CLS] token embeddings—denoted as  $E_{[CLS]}$  and  $E'_{[CLS]}$ —and average pooling embeddings—denoted as  $E_{Avg}$ ,  $E'_{Avg}$ —for both the input original texts and its summary. Within the proposed pooling layer, multiple trainable weight parameters are introduced to compute the weighted sum of these 4 vectors, producing the final distributed representation of the sentence  $C$ . Then, I applied multiple configurations to the proposed pooling layer and conducted text classification experiments under each condition, following the prior work of Yamato.

As a result of the experiments, the proposed method achieved higher classification accuracy compared to previous methods.

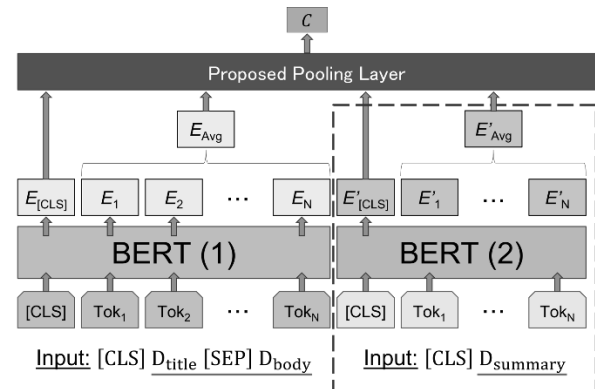


Figure 1: Overview of Proposed Model.