

SEMANTIC ANALYSIS OF PHRASAL VERBS USING BERT FOR CONTEXTUAL MEANING DISAMBIGUATION

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Phrasal verbs remain a major challenge in natural language processing (NLP) due to their idiomatic, polysemous, and context-sensitive nature. Unlike literal expressions, their meanings are often non-compositional, making them difficult for transformer-based architectures such as Bidirectional Encoder Representations from Transformers (BERT) to interpret reliably. Previous research has applied BERT-based models to verb disambiguation but has rarely addressed phrasal verb semantics. Moreover, limited work has explored parameter-efficient fine-tuning methods specifically for semantics-related NLP tasks. This study bridges the above gap by adapting transformer models through parameter-efficient fine-tuning for improved phrasal verb understanding. The use of Quantised Low-Rank Adaptation (QLoRA) for supervised fine-tuning of BERT was investigated in this study to enhance phrasal verb disambiguation. A curated dataset of approximately 10,000 phrasal verb instances was constructed and split into 70% training, 15% validation, and 15% test sets. The base BERT model was first evaluated to establish baseline performance, followed by QLoRA fine-tuning. Model performance was assessed using multiple lexical and semantic evaluation metrics, including cosine similarity, Bilingual Evaluation Understudy (BLEU), Recall-Oriented Understudy for Gisting Evaluation–Longest Common Subsequence (ROUGE-L), Jaccard similarity, and Metric for Evaluation of Translation with Explicit ORdering (METEOR). Across all metrics, QLoRA fine-tuning yielded measurable improvements: cosine similarity increased from 0.5889 to 0.6189, BLEU from 0.2570 to 0.3150, and ROUGE-L from 0.4623 to 0.4901. These results demonstrate that lightweight supervised adaptation enhances BERT’s ability to capture phrasal verb semantics while reducing computational overhead. The findings show that a fine-tuned foundational transformer model can excel in this baseline setting, indicating potential scalability to larger language models. This work advances idiomatic language processing in NLP and highlights the broader promise of parameter-efficient fine-tuning for resource-constrained semantic understanding tasks.

Keywords: BERT, Context-aware, Fine-tuning, Phrasal verbs, QLoRA, Semantic classification