

# Compositional Translation: A Novel LLM-based Approach for Low-resource Machine Translation

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## Abstract

The ability of generative large language models (LLMs) to perform in-context learning has given rise to a large body of research into how best to prompt models for various natural language processing tasks. Machine Translation (MT) has been shown to benefit from in-context examples, in particular when they are semantically similar to the sentence to translate. In this paper, we propose a new LLM-based translation paradigm, *compositional translation*, to replace naive few-shot MT with similarity-based demonstrations. An LLM is used to decompose a sentence into simpler phrases, and then to translate each phrase with the help of retrieved demonstrations. Finally, the LLM is prompted to translate the initial sentence with the help of the self-generated phrase-translation pairs. Our intuition is that this approach should improve translation because these shorter phrases should be intrinsically easier to translate and easier to match with relevant examples. This is especially beneficial in low-resource scenarios, and more generally whenever the selection pool is small or out of domain. We show that *compositional translation* boosts LLM translation performance on a wide range of popular MT benchmarks, including FLORES 200, NTREX 128 and TICO-19. Code and outputs are available at <https://github.com/ArmelRandy/compositional-translation>.

## 1. Introduction

Large Language Models (LLMs) have demonstrated strong performance across a wide variety of tasks (Chowdhery et al., 2023; Dubey et al., 2024). They use In-Context Learning (ICL; Brown et al., 2020) to solve problems at inference with the help of a few examples within their context. Multi-

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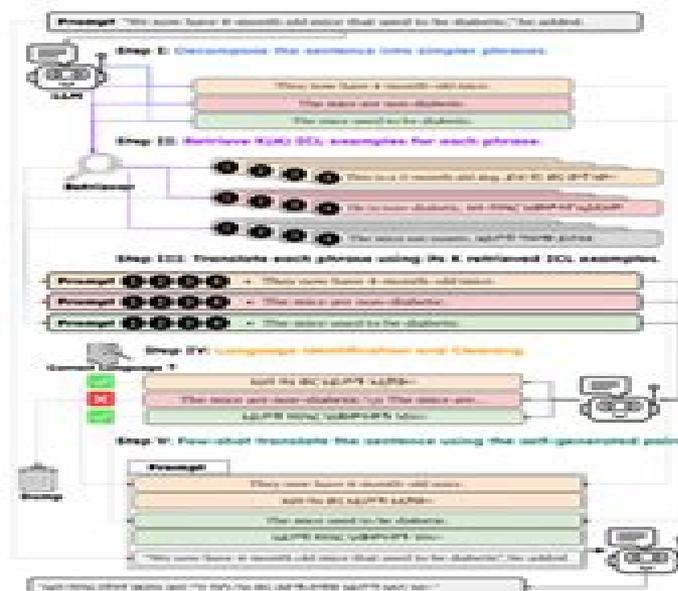


Figure 1. An overview of **Compositional Translation (CompTra)**. Given a sentence, our method prompts the LLM to decompose it into several phrases that use its words. For each phrase, we retrieve relevant in-context demonstrations (here four) through similarity search and use them to translate it in a few-shot setup. The phrase-translation couples obtained are then cleaned and provided to the LLM to help it translate the main sentence.

ple strategies have been introduced to expand the range of complexity of problems that can be addressed using ICL, with a particular emphasis on reasoning tasks (Wei et al., 2022; Kojima et al., 2022; Yao et al., 2023). In machine translation (MT), most works have focused on choosing the best in-context examples. The prevailing intuition is to choose them based on their word-level similarity to the

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