Name: MR. KANIN WONGRINTRAMAYTEE
Student ID: 69130700906

Research Methodology Proposal

Higher-Order Interaction Modeling to Enhance Learning in Transformer-Based Models

Abstract

Transformer-based models can learn complex relationships between tokens through self-attention and multiple processing layers. However, it remains unclear whether explicitly modeling higher-order interactions among multiple tokens can further improve their performance. This research aims to develop mechanism that captures and uses these interactions to enhance existing Transformer architectures. The proposed approach will explore different ways to represent relationships among multiple tokens, distinguish relevant interactions based on context, and integrate the resulting features into the models. This may involve adding new interaction features or modifying how token representations are processed. Controlled experiments will first examine the mechanism's ability to capture and distinguish higher-order relationships. The proposed method will then be evaluated using models trained from scratch and pretrained foundation models on real-world tasks. Its effectiveness will be compared with standard Transformers and other relevant approaches under comparable experimental settings. The evaluation will focus on downstream task performance and generalization, while also considering learning efficiency and computational cost. The study aims to determine whether explicit higher-order interaction modeling can improve Transformer learning and identify the conditions under which it is most effective.