Final Project Report: NLP Course

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Abstract

Final project report of project "Model Finetuning on a Custom "Question-Answer" Dataset in Tolstoy's Stylistic". Github repo: `https://github.com/semenishchev-ai/nlp_ft`.

Introduction

This project focuses on fine-tuning a large language model to respond to question-answer prompts in the unique stylistic of Leo Tolstoy. The work aims to explore the potential for creating stylized generative models that are lightweight enough to be deployed for interdisciplinary purposes, such as collaboration with philological faculties.

Team Contribution

- **Andrei's Contributions:**
  - Studied and integrated the `unsloth` library for efficient finetuning.
  - Implemented the `LoRA` technique during training.
  - Conducted training of the model.
- **Pavel's Contributions:**
  - Collected and formatted the custom dataset using the non-distilled model.
  - Performed inference testing.
  - Currently working on an interactive interface to demonstrate the model.

1 Related Work

We haven't found any open-source Tostoy-related LLM models.

2 Model Description

- **Model Selection:** We selected the model `DeepSeek-R1-Distill-Qwen-14B` for its balance of capability and efficiency.
- **Library and Techniques:** We explored the `unsloth` library to enable efficient finetuning and applied `LoRA` (Low-Rank Adaptation) to reduce computational resource requirements.
- **Training and Testing:** The model was trained using the above techniques and tested on custom prompts to evaluate its stylistic fidelity.

3 Dataset

Using the non-distilled model `DeepSeek-R1`, prompts were generated and completed in Tolstoy's stylistic tone to construct a custom question-answer dataset. There were 200 question-answer pairs. The dataset can be obtained on Kaggle via this link: `https://www.kaggle.com/datasets/andreysemenishchev/nlp-ft-dataset`

	Train
QA pairs	200

4 Experiments

4.1 Metrics

We used LLM-as-a-judge to evaluate the quality of responses of the fine-tuned model.

4.2 Experiment Setup

- **Important hyperparameters:**
  LoRA rank = 16;
  optimizer = "adamw_8bit";
  gradient_accumulation_steps = 4;

The complete configurations can be found in the repository. (training branch) The majority of configurations were inspired by original setup in `unsloth` documentation.

4.3 Baselines

The baseline is the chosen model before fine-tuning. Comparing it with the version after fine-tuning can tell the difference in the performance on our task.

5 Results

The fine-tuned model can answer in the chosen stylistic tone. Comparison with baselines is given in the table below:

	Distilled-Before-FT	Distilled-after-FT
LLM-as-a-judge output	21	29

Table 1: Number of outputs chosen as the best. As can be seen from there, fine-tuned model performs better, but it seems that provided data wasn't enough for total outperforming.

Conclusion and Future Work

This project successfully demonstrated the feasibility of fine-tuning a large language model to mimic a specific literary style, specifically that of Leo Tolstoy, in a question-answering format. Using `unsloth` and `LoRA`, we made the process efficient and resource-conscious. The next steps include completing the interface and deploying the model for experimental use.