Digital Transformation and the Service Economy:

Exploring the Societal Impact

Thursday, December 7th - 10 AM to 5.30 PM

Friday, December 8th - 9 AM to 5.30 PM

Saturday, December 9th / RESER General Assembly – 10 AM to 12 AM

https://conference2023.reser.net/

Hes·so

European Association for Research on Services
Sierre 2023
RESER

Hes·so VALAIS WALLIS
School of Management

Table des matières

22_Evaluating Generative-AI Usage for Knowledge Transfer: Fine-Tuning of LLMs On-Premises

Authors :

Andrei Kucharavy / Dimitri Percia David

HES-SO Valais-Wallis

ABSTRACT

OBJECTIVES:

In brief

This study endeavours to create and evaluate an innovative tool for transferring knowledge and enhancing university students' educational outcomes. The pioneering aspect of this research stems from harnessing generative language models (LLMs) that are refined in-house using reinforcement learning through human feedback (RLHF). This instrument will enable educators to adapt LLMs to varying lectures and topics, all while safeguarding data and minimizing bias in LLM-generated content.

Keywords

generative language models, prompt optimization, fine-tuning, RLHF, knowledge transfer, multimodal pretraining, AI learning assistant, privacy protection.

Background

Generative large language models (LLMs) stand as a distinct AI category, skilled at producing coherent natural language content from specified prompts. Their demonstrated prowess spans text condensation, answering queries, generating dialogues, and crafting creative pieces. While LLMs are revolutionizing societal communication, knowledge dissemination, and recreation, they also bring forth concerns about data security, ethical dilemmas, and societal implications.

In an educational context, LLMs hold immense potential as a robust aid to amplify students' learning experiences. They can offer tailored, evolving feedback, produce a wide array of captivating content, and foster seamless student-teacher collaboration. Nonetheless, the design and appraisal of LLMs need meticulous attention to ensure their efficacy, equity, and congruence with educational goals. This underscores the need for pioneering methods and tools to refine and direct LLMs for academic applications and knowledge transfer, coupled with a solid framework to assess any improvements in knowledge dissemination.

An innovative and experimental framework

The nature of this study is exploratory, delving into the realm of prompt adjustment and RLHF within the context of generative multimodal initial training – a field both fresh and demanding. Prompt adjustment offers a new trajectory for model refinement, having shown promise in both linguistic and visual initial training scenarios. It refines a select set of task-driven parameters without altering the foundational model, optimizing both computational and storage efficiency. RLHF, on the other hand, leverages human choices to formulate a reward signal directing the LLM's growth trajectory. This method holds promise in curtailing LLM biases and undesirable outcomes, amplifying their efficacy, inclusivity, and representation.

This undertaking bridges a pressing research gap and holds substantial relevance for scholars and the broader public. The existing research gap pertains to the scarcity of both efficient and ethically-grounded techniques to exploit LLMs in academic settings, especially in multimodal scenarios encompassing text, auditory content, and visuals. The project's relevance stems from its potential to uplift educational quality and knowledge dissemination by crafting bespoke, interactive learning journeys for learners and educators alike. Furthermore, this initiative can enrich the LLM research landscape, shedding light on novel paradigms and setting standards for prompt adjustment and RLHF methodologies.

METHODOLOGY

This study's objective is to create and evaluate an advanced tool for knowledge transfer and pedagogical enhancement, utilizing LLMs to amplify university students' academic results. This utility empowers educators to refine LLMs directly on their local systems by integrating their unique datasets and insights, guaranteeing data security, and offering bespoke adjustments of the models for diverse lectures and topics. Moreover, the tool integrates reinforcement learning augmented by human feedback (RLHF), an approach that elevates LLM output quality and equity through the assimilation of human inclinations and bias mitigation.

The research will be structured around four pivotal phases:

1. Gathering human-oriented feedback by inviting educators to evaluate various LLM outputs based on their validity and relevance to scholastic queries. This endeavour will culminate in a dataset illustrating human predilections for assorted responses and duties.
2. Establishing a reward framework using the amassed human feedback data, which will manifest a reward indicator highlighting the coveted attributes of LLM responses, encompassing precision, pertinence, lucidity, and variety.
3. Refining the LLMs through reinforcement learning methodologies like Proximal Policy Optimization (PPO) that weave in the reward indicator. This phase facilitates the LLMs' capacity to introspect upon their own productions and refine them in alignment with human perspectives.

4. Engaging in a cyclical routine of accruing human feedback followed by the recalibration of the LLMs until the benchmarked performance criteria are realized. This method ensures ongoing model enhancement, adapting to the evolving requisites and anticipations of both educators and learners.

EXPECTED RESULTS:

Goal	*Description*
Utilize LLMs to amplify knowledge transfer in educational settings.	An innovative tool harnessing LLMs to bolster tertiary level instruction.
Introduce custom AI-driven educational support systems.	A series of LLMs specifically refined for distinct lectures and topics, primed to provide accurate and unbiased answers to scholarly inquiries.
Formulate teaching-centric human feedback archives.	A repository of human feedback metrics and reward configurations, facilitating future explorations and refinements in LLM methodologies.
Assess the efficacy of AI-based academic support tools.	An in-depth appraisal of the tool's influence on academic results and the contentment levels of both educators and students.
Design LLMs prioritizing pedagogical assistance over direct solution provision.	Pioneering LLM models crafted to guide and personalize student learning experiences rather than directly furnishing answers.

Bibliography

- Kadaruddin, K. (2023). Empowering Education through Generative AI: Innovative Instructional Strategies for Tomorrow's Learners. *International Journal of Business, Law, and Education*, *4*(2), 618-625.
- Cooper, G. (2023). Examining science education in chatgpt: An exploratory study of generative artificial intelligence. *Journal of Science Education and Technology*, *32*(3), 444-452.
- Chang, C. H., & Kidman, G. (2023). The rise of generative artificial intelligence (AI) language models-challenges and opportunities for geographical and environmental education. *International Research in Geographical and Environmental Education*, *32*(2), 85-89.
- Bozkurt, A., & Sharma, R. C. (2023). Challenging the status quo and exploring the new boundaries in the age of algorithms: Reimagining the role of generative AI in distance education and online learning. *Asian Journal of Distance Education*, *18*(1).

- Winkler, C., Hammoda, B., Noyes, E., & Van Gelderen, M. (2023). Entrepreneurship Education at the Dawn of Generative Artificial Intelligence. *Entrepreneurship Education and Pedagogy*, 25151274231198799.
- Tack, A., & Piech, C. (2022). The AI teacher test: Measuring the pedagogical ability of blender and GPT-3 in educational dialogues. *arXiv preprint arXiv:2205.07540*.
- Kucharavy, A., et al. (2023). Fundamentals of Generative Large Language Models and Perspectives in Cyber-Defense. *arXiv preprint arXiv:2303.12132*.