Shaping the "Media Mind" of Large Language Models: From Model Fine-tuning to Media-Adaptive Optimization Applied Research Post-print

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Abstract

Objective: With the rapid development of artificial intelligence technology, large language models have achieved breakthrough progress in the field of natural language processing. This paper explores their application value in the media sector, starting from the fine-tuning methods and fine-tuning data preparation of large language models. Method: Summarize and analyze the international communication practical experience of *China Daily*. Results/Conclusion: Proposes fine-tuning and optimization schemes for large language models, providing ideas for the intelligent transformation of the media industry.

Full Text

Shaping the "Media Heart" of Large Language Models: From Model Fine-Tuning to Media-Adaptive Optimization Application Research

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Abstract

With the rapid advancement of artificial intelligence technology, large language models have achieved breakthrough progress in natural language processing. This paper explores their application value in the media sector by examining fine-tuning methodologies and data preparation strategies for large language models. Drawing upon China Daily' s practical experience in international communication, we propose a comprehensive fine-tuning and optimization scheme

for large language models, offering new pathways for the intelligent transformation of the media industry.

Keywords: large language models; model fine-tuning; international communication; intelligent transformation; artificial intelligence

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Large language models (LLMs), with their powerful natural language understanding and generation capabilities, present unprecedented challenges and opportunities for the media industry. While transforming media content production and dissemination, these models also offer new possibilities for the sector' s intelligent transformation. In the context of globalization and information diversification, effectively leveraging large language models to enhance the quality and efficiency of international communication has become an urgent research priority. This paper aims to explore fine-tuning methods and data preparation strategies for LLMs, analyzing their application value in the media domain. By integrating China Daily' s practical experience in international communication, we propose a tailored fine-tuning and optimization framework for the media industry, providing new insights and practical guidance for intelligent transformation.

1.1 Overview of Large Language Models

With the rapid development of deep learning technology, artificial intelligence has achieved breakthrough progress in natural language processing (NLP). Large language models, as language generation and understanding systems trained on massive datasets, have garnered widespread attention. The core of these models lies in learning complex linguistic structures and semantic relationships through pre-training on large-scale text corpora. After pre-training, the models acquire general language representation capabilities that enable excellent performance across various downstream tasks. Representative LLMs include BERT (Bidirectional Encoder Representations from Transformers) and the GPT series (Generative Pre-trained Transformer). BERT is a bidirectional encoder model proficient in understanding sentence-level semantics, widely used in text classification, named entity recognition, and other tasks [1]. GPT series models, such as GPT-3.5, employ a generative architecture emphasizing text generation capabilities, capable of producing coherent passages based on given contexts, thus demonstrating outstanding performance in text generation, machine translation, and dialogue systems.

Large language models exhibit strong generalization and transfer capabilities across various NLP tasks. Through appropriate fine-tuning, pre-trained models can adapt to specific domains or tasks, achieving a transformation from general linguistic knowledge to specialized task capabilities. For instance, in question-answering systems, models can generate accurate and informative responses based on user queries. However, LLMs also face several challenges. First, the "black box"nature of these models makes their internal decision-making processes difficult to interpret, potentially compromising the credibility and reliability of generated content. Second, if training data contains biases or inappropriate information, the models may reflect these issues in their outputs, raising ethical and social responsibility concerns. Therefore, applying LLMs requires enhanced monitoring and constraints to ensure output accuracy and appropriateness.

1.2 Model Fine-Tuning Pathways

Pre-trained models are typically trained on large-scale general corpora and cannot directly meet the specific requirements of particular domains or tasks. To fully leverage the potential of pre-trained models, fine-tuning has become an essential step. Through fine-tuning, pre-trained models can achieve excellent performance on specific tasks. Fine-tuning pathways primarily include full-parameter fine-tuning, parameter-efficient fine-tuning, prompt-based few-shot learning, and continual learning.

Full-parameter fine-tuning is the most direct approach, involving gradient updates to all parameters of the pre-trained model using task-specific data to achieve optimal performance on the target task. While this method can fully utilize the capabilities of pre-trained models, it faces enormous computational and storage demands as model scales expand. For models with tens of billions of parameters, full-parameter fine-tuning requires substantial memory and computing power, posing significant practical challenges.

To address the resource consumption issues of full-parameter fine-tuning, parameter-efficient fine-tuning methods have gained prominence. These approaches fine-tune only a subset of parameters while keeping the rest frozen. Typical methods include Adapter and LoRA (Low-Rank Adaptation). LoRA employs low-rank decomposition to approximate weight matrices, adjusting only the low-rank components. This significantly reduces computational and storage costs while achieving performance comparable to full-parameter fine-tuning on many tasks.

Prompt-based few-shot learning represents another important fine-tuning pathway. This method designs specific prompts that embed task requirements in natural language form within the input, guiding pre-trained models to produce expected outputs. Finally, continual learning enables models to adapt to dynamically changing task demands. In real-world applications, task requirements and data environments evolve over time. Retraining models from scratch for each change is neither realistic nor efficient. Continual learning allows models

to learn incrementally from new data, adapting to new tasks or domains while retaining existing knowledge.

In the media industry, facing diverse application scenarios and real-time content updates, flexibly selecting and combining these fine-tuning pathways will help maximize LLM capabilities and enhance industry intelligence.

1.3 Fine-Tuning Data Preparation

The quality of fine-tuning data directly impacts LLM performance on specific domains and tasks. For the media industry, data preparation requires high professionalism and rigor to ensure models can accurately understand and generate content that meets media requirements. Fine-tuning data preparation encompasses data collection, cleaning, annotation, splitting, and augmentation.

First, data collection forms the foundation of preparation. To adapt models to media-specific needs, large volumes of high-quality, representative corpora must be acquired. These should cover broad news reports, commentaries, editorials, and columns, including both historical reports and internal materials from media organizations as well as publicly available data from other authoritative sources. During collection, copyright and privacy protection laws must be observed to ensure data legality and compliance.

Second, raw data often contains noise, redundancy, and inconsistencies, such as duplicate content, formatting errors, spelling and grammatical mistakes, and irrelevant information. Data cleaning techniques must be employed, including deduplication, anomalous character filtering, stop-word removal, and normalization to eliminate interference. For multilingual data, language detection and encoding unification are necessary to ensure accuracy and consistency. Sensitive or private information requires anonymization to protect individual and organizational privacy.

Third, data annotation is crucial for enabling task-specific capabilities. According to media domain requirements, meticulous manual annotation is needed. For instance, to train models for news writing assistance, article structure, themes, key information, and sentiment orientation must be annotated. For accurate machine translation, high-quality Chinese-English parallel corpora must be constructed to ensure precise correspondence between source and target texts. Clear annotation guidelines and procedures should be established, with annotator training and quality control to avoid subjective discrepancies.

Fourth, data splitting is necessary for model evaluation. Fine-tuning datasets are typically divided into training, validation, and test sets for model training, parameter tuning, and performance evaluation. Splitting must ensure dataset independence to prevent information leakage and distorted evaluation results. Data distribution consistency is also essential for comparable and representative performance across datasets. In the media domain, stratified sampling across news categories, language styles, or audience groups ensures model performance

across all segments.

Finally, data augmentation is vital for expanding datasets and improving model generalization. When data is limited, various augmentation methods can generate new training samples, such as synonym replacement, sentence transformation, random insertion/deletion, and back-translation. For underrepresented categories, sampling or generative models can balance data distribution. Data augmentation not only increases training volume but also enriches model learning of diverse linguistic phenomena and expressions, enhancing robustness and adaptability.

2.1 Application Scenario Analysis

Driven by informatization and globalization, information dissemination has reached unprecedented speed and breadth. In this new wave of technological transformation, effectively differentiating audiences, implementing targeted strategies, overcoming cultural differences, and presenting an authentic and multifaceted image of China through objective, fair, and influential expression constitute major challenges for international communication. Meanwhile, rapid technological development is creating more possibilities for accelerating digital transformation and applying cutting-edge technologies like AI to innovate communication methods and enhance international audience engagement.

China Daily is embracing these trends by deepening AI application research in international communication. By combining advanced technologies with practical experience, the organization is exploring how large models can provide high-quality content and services [2], finding optimal integration points for intelligent production, creative expression, and cross-cultural communication to innovate international communication methods and achieve unity of mission and challenge.

2.2 The Necessity of Fine-Tuned Models

While general LLMs demonstrate powerful capabilities in NLP, they are primarily pre-trained on broad general corpora without optimization for specific domains or tasks. For the media industry, the key value of large models lies in further developing data resources, leveraging existing data assets, and empowering news media to continuously enhance core functions and values across traditional business boundaries [3]. China Daily faces unique needs and challenges in international communication that general models cannot fully address, requiring customized fine-tuning based on the organization' s historical data for international communication scenarios.

First, international communication involves accurate conveyance of national policies and positions. China Daily bears the responsibility of connecting China with the world and telling China' s stories effectively. General models may lack sufficient understanding of political terminology, potentially generating biased

or erroneous reports. Through fine-tuning, models can accurately grasp correct formulations and core viewpoints, ensuring proper representation of national positions and safeguarding national interests.

Second, news reporting has unique linguistic styles and expression norms requiring objectivity and accuracy. General models tend to produce colloquial, casual text with inconsistent style. Customized fine-tuning can guide models to master news writing conventions, using professional journalistic language to generate content that meets media standards.

Third, cultural background differences require models to possess profound understanding of Chinese culture. General LLMs are predominantly trained on global public texts, potentially English-centric, with limited comprehension of Chinese culture, history, and political context. This may lead to cultural misunderstandings or inaccurate information. Customized models must incorporate extensive Chinese cultural corpora to deepen understanding and accurately convey Chinese perspectives.

Finally, customized models help address the complexity of the international opinion environment. International communication requires understanding and responding to issues of global concern, with timely information dissemination and opinion guidance. Customized models can enhance sensitivity to international opinion dynamics by incorporating global hotspot-related corpora, improving understanding and response capabilities to assist media institutions in international discourse.

In summary, the necessity of customized models lies in their ability to compensate for general LLMs' deficiencies in policy orientation, cultural background, and language style, meeting China Daily' s special requirements in international communication. This holds strategic significance for driving China Daily' s intelligent transformation and enhancing international communication effectiveness.

2.3 Fine-Tuning Scheme Design

Addressing China Daily' s unique needs in international communication, the fine-tuning scheme design must comprehensively consider task objectives, data characteristics, model selection, and training strategies. The core goal is to enable excellent performance in news writing, multilingual translation, public opinion analysis, and intelligent question-answering tasks to improve content production efficiency and communication effectiveness.

The scheme must cover data preparation, model architecture selection, training methods, and evaluation mechanisms. For data preparation, high-quality, domain-relevant fine-tuning datasets must be constructed by collecting and organizing China Daily's historical news reports, editorials, columns, and in-depth coverage to build a large-scale corpus covering politics, economy, culture, and society. To enhance multilingual processing capabilities, Chinese-English and other major language parallel corpora must be collected, ensuring semantic con-

sistency and translation quality. Raw data must be cleaned to remove noise, redundancy, and irrelevant content while complying with laws and regulations through desensitization to ensure data security.

For model selection, appropriate pre-trained models must be chosen as the fine-tuning foundation based on task requirements and resource constraints. Considering the high demands for deep understanding of Chinese political culture alongside news writing and multilingual translation capabilities, a combination of open-source LLaMA series models at the 70B parameter scale and multiple commercial large models can serve as the base.

For fine-tuning methods, parameter-efficient fine-tuning approaches should be employed to maintain performance while reducing computational requirements. Additionally, prompt-based learning can be utilized by designing sophisticated prompt templates to guide models in generating expected content for news writing and translation tasks.

In training strategy, appropriate hyperparameters are critical for model performance. Based on task complexity and data scale, suitable learning rates and batch sizes should be selected to avoid overfitting while ensuring adequate learning. A phased training approach can be adopted, beginning with pre-training on large-scale general corpora followed by fine-tuning on domain-specific data to gradually refine capabilities. Furthermore, cross-validation, early stopping, and regularization techniques can enhance model stability and generalization.

For evaluation and optimization, scientific assessment mechanisms must be established with regular quality checks on model outputs. Combining manual review with automated evaluation using metrics like BLEU and ROUGE for translation and summarization tasks, and accuracy/recall for opinion analysis and question-answering, ensures performance measurement. User feedback should be collected to identify strengths and weaknesses for continuous improvement, ensuring the model consistently meets China Daily' s business needs and quality standards.

2.4 Fine-Tuning Strategy Implementation

Following the fine-tuning scheme design, specific implementation strategies are crucial. Implementation encompasses data preparation, model selection, method determination, training strategy formulation, and model evaluation.

2.4.1 Data Preparation

Data serves as the cornerstone of model fine-tuning, with high-quality data directly impacting model performance and adaptability. This preparation includes data collection, cleaning, annotation, and splitting.

For data collection targeting China Daily' s international communication needs, a multilingual, multi-domain corpus was constructed. Primary data sources include: (1) Party and state policies, incorporating government white papers,

policy documents, official statements, and laws to ensure the model deeply understands policy backgrounds and terminology; (2) China Daily' s historical coverage, including significant news reports, editorials, columns, and in-depth articles across politics, economy, culture, and technology that embody the newspaper' s linguistic style; (3) Chinese-English parallel corpora, including official documents and press releases to enhance translation capabilities with accurate semantic correspondence.

For data cleaning, several steps were taken: (1) Deduplication to remove repetitive texts; (2) Noise filtering to eliminate invalid content with garbled characters, anomalies, or advertisements; (3) Format standardization to unify text encoding, correct spelling and grammar, and standardize proper nouns; (4) Sensitive information processing to comply with regulations through desensitization of privacy-related content.

Data annotation was completed by professional editors and journalists to ensure accuracy and consistency, including: (1) News element annotation of 5W1H (Who, What, Where, When, Why, How) to help models understand core information; (2) Theme and sentiment orientation labeling (positive, neutral, negative) to support opinion analysis and classification; (3) Alignment of professional terms and proper nouns in parallel corpora to ensure translation accuracy.

Finally, the dataset was split into training, validation, and test sets at a 7:1.5:1.5 ratio, ensuring consistent distribution across domains and categories for reliable training and evaluation.

2.4.2 Model Selection

Model selection is a critical implementation step. Considering international communication, news production, and multilingual scenarios while balancing cost-efficiency and computational resources, the 70B-parameter open-source LLaMA series combined with multiple commercial large models were selected as base models. These models offer controllable computational costs while maintaining high performance. From a pre-training data perspective, selected models should be thoroughly trained on large Chinese and English corpora to ensure strong bilingual capabilities. From a scalability and community support perspective, these models provide community support and continuous updates for secondary development.

2.4.3 Fine-Tuning Methods

To reduce computational demands while ensuring performance, parameter-efficient fine-tuning methods combined with prompt-based learning strategies were employed.

Parameter-Efficient Fine-Tuning (LoRA): LoRA adds low-rank matrices to specific layers of pre-trained models, training only these new parameters while freezing original pre-trained weights. Implementation involves: (1) Selecting

fine-tuning layers by inserting trainable low-rank matrices in attention and feed-forward layers to minimize structural impact; (2) Setting low-rank parameters with appropriate rank size to balance expressive power and parameter count—a rank of 16 yielded good performance; (3) Freezing pre-trained parameters during fine-tuning to significantly reduce computational and storage requirements.

Prompt-Based Learning: To leverage pre-trained model capabilities, prompt templates were designed for news writing and translation tasks. News writing prompts include: (1) Structured prompts using 5W1H elements; (2) Style prompts specifying objective, impartial tone consistent with China Daily' s style; (3) Context prompts providing background information and terminology glossaries for translation tasks; (4) Format prompts specifying translation standards and consistency requirements. These methods enable models to utilize prompt information effectively, improving content relevance and quality.

2.4.4 Training Strategy

To ensure effective fine-tuning and performance improvement, a comprehensive training strategy was established, including hyperparameter settings, optimization methods, and overfitting prevention.

Hyperparameter Settings: A piecewise learning rate decay strategy was adopted, with initial learning rate of 1e-4 gradually decreasing to ensure stability. Batch size was set to 32 to balance efficiency and memory consumption. Training epochs were set to 3-5 based on validation performance to prevent overfitting.

Optimization Method: The AdamW optimizer was used for its excellent performance in large-scale model training, with weight decay coefficients to prevent excessive parameters and enhance generalization.

Overfitting Prevention: Early stopping was implemented when validation performance plateaued. Regularization terms were added to loss functions, and data augmentation through synonym replacement and sentence transformation increased diversity. Training loss and validation performance were monitored in real-time, with model parameters saved each epoch for selection and optimization.

2.4.5 Model Evaluation

Model evaluation validates performance and ensures business requirements are met through qualitative assessment, quantitative metrics, user feedback, and safety evaluation.

Qualitative Assessment: Experienced editors and journalists manually reviewed generated content for accuracy, fluency, logical coherence, and alignment with China Daily' s style, particularly for policy interpretation and international hotspot issues.

Quantitative Evaluation: Automated metrics assessed specific tasks: BLEU and METEOR for translation similarity; ROUGE for summarization matching; accuracy, recall, and F1 scores for opinion analysis and question-answering.

User Feedback: Input from journalists, editors, and readers identified real-world issues such as quality deficiencies in certain topics or limited understanding of specialized fields, informing continuous optimization.

Safety Evaluation: The model was tested for risks of generating inappropriate content, such as privacy violations, policy breaches, or misinformation. Blacklist vocabularies and content filtering rules were implemented to enhance safety.

2.5 Application Practice Cases

Building upon the fine-tuned large language model, exploring innovative applications through concrete cases in news writing assistance and public opinion monitoring is essential.

2.5.1 News Writing Assistance Agent

Large foundation models serve as the knowledge repository and logical reasoning engine for intelligent agents, supporting environmental perception, planning, decision-making, and action implementation [4]. Traditionally, journalists spend considerable time organizing news elements and drafting articles. Developing a journalist-style writing assistance agent based on the customized fine-tuned model proves highly beneficial. The agent generates draft articles conforming to journalistic standards based on input elements (Who, What, Where, When, Why, How), considering objectivity, accuracy, and China Daily' s distinctive style.

In practice, journalists simply input collected news elements into the agent interface, and the system generates a well-structured, fluent, and stylistically consistent draft within seconds, along with appropriate headlines. For headline generation, the fine-tuned LLaMA3.1-70B model achieved a 29% overall improvement over the base model. Specifically, for newspaper headlines, accuracy improved by 13%, relevance by 17%, creativity by 28%, and conciseness by 50%, yielding a 26% overall score increase. For new media headlines, accuracy improved by 26%, relevance by 28%, creativity by 20%, and conciseness by 55%, with a 32% overall score increase. These results demonstrate significant enhancements in content understanding, summarization, and creativity.

The fine-tuned model enables journalists to modify and refine generated drafts, substantially reducing writing time. The agent also prompts for missing information, ensuring report completeness. Supporting multilingual output, especially high-quality Chinese-English bilingual generation, this intelligent writing assistant improves efficiency, reduces human error risks, and enhances overall news quality.

2.5.2 Public Opinion Monitoring System

Timely grasping and analyzing international public opinion is crucial for media institutions to address discourse challenges and seize narrative initiative. The fine-tuned international communication LLM enhances China Daily' s proprietary public opinion monitoring system' s analytical and comprehension capabilities.

The system leverages the model' s powerful text processing and semantic understanding to classify, cluster, and perform sentiment analysis on multilingual text data. It automatically identifies international society' s focus on China-related issues, evaluates positive/negative tendencies, and generates reports for editors and decision-makers. For instance, when China-related negative public opinion escalates rapidly, the system automatically issues alerts, enabling timely responses. Through deep data mining, the system can also identify potential risks and opinion trends, providing forward-looking support for China Daily' s international communication efforts.

Beyond these applications, the international communication LLM demonstrates broad prospects in translation assistance and intelligent question-answering. For translation, the fine-tuned model provides high-quality suggestions, particularly for professional terminology and fixed expressions, ensuring consistency and reducing translation workload. In intelligent question-answering, the system offers timely and accurate information services to readers, understanding questions about Chinese policies, culture, and tourism, and generating professional, detailed answers based on China Daily' s content resources. This enhances reader interaction and strengthens connections with international audiences.

3. Conclusion and Outlook

The rapid development of large language models presents unprecedented opportunities for the intelligent transformation of the media industry. This paper thoroughly explored LLM fine-tuning pathways and data preparation methods, proposing a media-specific fine-tuning and optimization framework based on China Daily' s international communication practices. The customized international communication LLM not only improved content production efficiency and quality but also demonstrated tremendous potential in news writing assistance, public opinion monitoring, and other applications.

The introduction of fine-tuned models enables media institutions to more accurately convey national policies and positions, avoiding biases and misunderstandings that general models might introduce. Based on deep understanding of Chinese cultural background and political context, the model generates professional-standard content conforming to journalistic norms, significantly enhancing international communication effectiveness. Additionally, the model' s multilingual processing capabilities meet the needs of international communication and promote cross-cultural exchange.

However, while recognizing LLMs' application value, we must also acknowledge the challenges. First, model training and application require large amounts of high-quality data, with collection and annotation being time-consuming and requiring strict security and privacy protection measures. Second, models may generate inaccurate or inappropriate content, necessitating robust review and proofreading mechanisms to ensure credibility and legality. Furthermore, the "black box" nature of models makes their decision-making processes difficult to interpret, potentially raising ethical and responsibility concerns.

Looking ahead, as AI technology continues to evolve, LLM applications in the media sector will become more profound and extensive. To fully realize their potential, media institutions should continuously optimize fine-tuning methods by: (1) exploring more efficient parameter fine-tuning techniques and model structure optimization based on latest research; (2) strengthening data resource construction by building high-quality, diverse corpora, especially enriching Chinese-characteristic materials; (3) improving technical application norms and standards by developing industry standards and ethical guidelines for LLM applications in media, clarifying content review, privacy protection, and security management requirements; and (4) actively exploring new application scenarios by integrating cutting-edge technologies like virtual and augmented reality to innovate media product formats and provide richer audience experiences. By developing intelligent interactive platforms for personalized content recommendation and services, media institutions can enhance competitiveness and influence.

Large language models, as a major breakthrough in artificial intelligence, are profoundly transforming media industry production and dissemination. Media institutions should seize this historical opportunity to actively explore and apply LLM technology, driving digital and intelligent transformation. Through deep integration of technology and content, we can continuously improve international communication quality and effectiveness, tell China' s stories well, spread China' s voice effectively, and achieve high-quality development in the media industry.

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Note: Figure translations are in progress. See original paper for figures.