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Improving Large Language Model Responses Using Shot-Oriented Learning

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Abstract: ***All shot-based learning techniques are very much useful for train the models just with a small number of datasets. The models are trained by large datasets always producing a better result but it is very challenging, tough or expensive task to collecting the large datasets. So, with the help of prior knowledge and small datasets, all these learning approaches providing benefits to different domains like Natural Language Processing (NLP), robotics and image recognitions. All these learning approaches faced a lot of challenges because of the complexity of their learning process with a small dataset and it leads to in accurate results and it is also toughest job to generalize unseen data. So, this research work aims to educate the end users with different query formats while their interaction with ChatGPT and also enhancing the model's accuracy by adopting techniques like transformers and fine-tuning. Each shot-based approach provides different types of levels of accuracy that is totally depending upon user's request, but N-shot learning approach always produced better result consistently when compared to other learning approaches. By utilizing well-structured query formats helps to the end users to get more effective and accurate responses from AI models like ChatGPT with N-shot learning approach.***

Keywords: Shot-based learning approaches, Query formats, Fine-tuning, ChatGPT, N-shot learning approach.

I. INTRODUCTION

In terms of training a new model by using a small amount of data set for each category or task then shot-based learning approaches [1] are very much useful and give the best result. Sometimes collecting a large dataset is very difficult task or expensive or time-consuming process in that case these learning approaches are very useful for training purpose of the models. Based on the pre-training and prior knowledge of the models, shot-based learning approaches can identify new patterns with just a few examples. These approaches are very much useful in many areas like natural language processing, image recognition and robotics.

All these learning approaches are much important because they allow the machines to learn from a very little amount of data. Sometimes it is not possible to collect the large datasets, in that case it is very useful approach to train the models. It is observed that we can save the time and resources because of these models can learn quickly from the limited set of data. These learning approaches are very much helpful especially tasks like object recognition [2], personalize recommendations or problem solving in a new environment. These learning approaches make AI is more flexible for tasks of real-world applications.

In addition to usages, all these learning approaches are facing some of the difficult challenges because the learning procedure from a very little amount of data is very complex task. The data is not enough so that the predictions [3] are not more accurate and it leads to producing errors. It is also very tough to the model to classify or generalize the new data or unseen data when it has only pre-train or learn from a small amount of data sets. Additionally, find out the correct way to train the model with a limited set of data can more tough task and time-consuming process and these complex things make shot-based learning approaches are harder to use in certain situations.

The objectives of this research work are to help the end users who are interact with AI models such as ChatGPT, more efficiently by using different types of query formats like zero-shot, one-shot, few-shot [4] and N-shot learning approaches. The main aim is to give guidance to the end users in choosing right format of query based on their purpose or need, so that they can get more effective and structured responses. This work also improving the accuracy of the model's result by applying different types of training methods such as fine tuning [5] and transformers. In addition to that, it assesses the efficiency of the output of the model and highlighted that N-shot learning approach always generates the accurate and best result.

In this paper the literature survey would be comprehensive to describe the importance of different types of shot-based learning approaches and its impact on real time applications. In the sub-sequence sections, we described the proposed methodology and elaborated its functionality and efficiency with a neat diagram, finally in the conclusion section it describes the summarization of all the findings which are derived from the proposed research work.

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II. LITERATURE REVIEW

Liao, W. et al. [6] were introduced a new methodology to enhance few-shot learning approach in Natural Language Processing (NLP). This methodology builds on BERT model but it solves the problems of applications which needs a large amount of data. It was inspired by how human beings focused when reading the key information, and in BERT model, Mask-BERT was filtered the unimportant text. This model tests on different datasets like DBpedia 14 and AG News shows that Mask-BERT works more efficient compared to other methods.

Shangguan, Z., et al. [7] were explored a new approach called Few Shot Object Detection (FSOD), the main aim of this approach is to detect objects in scenes with a very few labelled examples. It faces a lot of challenges like identifying unseen objects and limited data. The entire process involved in two steps the first one is fine-tuning on new classes and second one is pre-training on well-labelled classes. In this methodology they used two methos one is one-stage network for speed and second one is two-stage network for accuracy. For improving the performance of the model, they used meta-learning and transfer learning.

Zarei, M. R., et al. [8] were reviewed Few Shot Learning (FSL) methods and highlighted the importance of these models for easy understanding. Generally, FSL methods are two different categories one is metric-based which used for classification purposed and second one is optimization based which used for adopting quickly with a small amount of data. They were discussed the various FSL method's functionality and which parameters needs to be considered to improve the performance of the models. Finally, this paper stated that what are the semantic attributes need to make FSL methods more accurate and easy understanding.

Choi, W. J., et al. [9] were presented a new approach to classifying Atypical Parkinsonian Syndromes (APS). For this identify the iron patterns in the brain through medical imaging but due to limited data collecting the medical images and labelling them is costliest process. So, to overcome this this paper used FSL which works well with a small dataset. This methodology also used hyperbolic geometry and hierarchical grouping for finding the relationships between diseases and at the same time improving the accuracy and also is expanding its approach to identifying all types of APSs in future.

Zhou, C., et al. [10] were proposed a new methodology to FSL by using pre-trained Language Models (LMs) and prompts. FSL helps to the models to identify new categories with a very few examples. This paper also suggests that with the help of pre-trained LMs, which can well generalize and also adopting the data by learnable prompts by this FSL can improve its performance. This model also used a few techniques called self-distillation for improving its predictions.

Kuritcyn, P., et al. [11] were discussed applications of AI in histopathology mainly focused on handling the limited labelled data by using transfer learning and FSL for training. It introducing other networks called prototypical networks for efficient classification and also used data augmentation to improve the robustness of the model. This research work also addressing different types of challenges like data variability and limited annotated images, which highlighted successful FSL applications in cancer classification and also accentuates the need for an interface it works as a user-friendly.

Hertling, S., et al. [12] were examined the use of Large Language Models (LLMs) in ontology matching. This research work also highlighted how LLMs can enhance the matching accuracy through textual descriptions rather than specific domain knowledge. This paper also discussed a few challenges like model selection and prompt generation, compare this methodology with traditional systems, showing that this model performs more efficiently with minimum amount of data. Finally, this paper also suggested that this approach is very much useful for ontology matching in future research.

Zhao, H., et al. [13] were introduced a new method called P2TAG for improving node classification in text attributed graphs with limited labelled data. This method can also use Graph Neural Networks (GNN) to capture the structure of the graph and associated text. For improving efficiency, it freezes parameters of GNN and uses a separate prompt graph. Instead of this work, it also proposed a new prompt design by implanting the label texts. Finally, this methodology performs well compared to previous approaches in few-shot node classification.

Huotala, A., et al. [14] were explored the usage of LLMs such as GPT-4 and earlier versions to automate systematic reviews which takes much amount of time in its title-abstract screening phase. LLMs can reduce the screening time but they aren't performed well like a human being in accuracy. This methodology tested different types of prompting techniques but by using few-shot learning approach with the integration of chain of thought is the most effective. This paper also highlighted the need of LLMs integration to maintain the accuracy in systematic reviews.

Belfathi, A., et al. [15] were explored rhetorical role prediction in legal case by using GPT3.5-Turbo and also focusing on prompt engineering, the effectiveness of LLMs and impact of the selected example. This paper also highlighted the importance of chain of thought reasoning for improve the performance of the model and cited those prior legal applications of generative models. It also highlighted the importance of textual context in predicting rhetorical roles.

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Sivarajkumar, S., et al. [16] were analyzed the application of rapid engineering in clinical NLP emphasizing problems in clinical information extraction, including the scarcity of annotated data and domain expertise. It examines zero-shot learning approach's information extraction, and also utilizing massive pretrained models devoid of task-specific training data, and the significance of in-context learning. This literature work reveals drawbacks in prompt engineering research pertaining to clinical NLP, especially for actual clinical notes. Finally, this research presents two innovative prompting methodologies—heuristic and ensemble prompts—and advocates for detailed instructions to improve prompt design in clinical environments.

Torres, L. H. M., et al. [17] were investigates the application of machine learning, GNNs and transformers, in forecasting nuclear receptor binding activities. It highlighted the difficulties posed by structural similarities among receptors and the class imbalance present in datasets. It was also highlighted multi-task and meta-learning methodologies to improve the predictive accuracy with constrained data. The suggested Meta-GTNRP model integrates GNNs and transformers, adeptly tackling these obstacles and surpassing conventional approaches, presenting a viable instrument for NR-based drug development.

Yuan, X., et al. [18] were introduced a model that improves few-shot learning through the incorporation of hierarchical semantic structures. This approach combined both the text and image's data to enhance classification especially in zero-short learning procedure. This approach emulates human cognitive functions by linking object categories across many semantic levels. In contrast to alternative techniques, this research work integrates attention mechanisms informed by semantic data. In addition to that ablation investigations demonstrate that the model's efficacy relies on precise hierarchical semantic guidance, underscoring the significance of semantics in few-shot learning.

Ruan, Z., et al. [19] were addressed the issues in video comprehension and few-shot action recognition, highlighting the necessity of extracting both temporal and spatial data. It presented a prototypical attentive matching module (PAM) to mitigate overfitting and enhance generalization. This proposed work also suggested that there are some computational requirements are needed for evaluation on particular networks. Finally, this study should investigate cross-modal integration, such as employing CLIP, to enhance feature representation and also handle the scarcity of the labelled data in future research work.

Tian, Y., et al. [20] were mainly focused on recent studies in Tuberculosis (TB) diagnosis which highlighted Deep Learning (DL) and medical imaging and also revealing that CT scans offer higher accuracy compared to previous approaches called conventional techniques. However, the estimating the progress form miliary tuberculosis to tuberculosis meningitis is a challenging task. So, this research work presented a few-shot learning algorithm which utilizing CT-scans for the early screening of diagnosis and potentially decreasing the high mortality rate.

III. METHODOLOGY

In the present scenario while the usage of AI is increasing gradually and also at the same time the most popular AI tool that is ChatGPT users can also increasing day by day for their works. But most of the users doesn't have awareness how to interact with this AI model that means they don't know how to use it in a more efficient way. So, for this purpose we proposed a new approach which is more useful to interact with the model. The architecture of proposed methodology in shown in fig 1. Generally, when the user interacts with the model with a query but most probably the query is generalized query. So, based on the user request the model would analyze and display the response in an un-structured format.

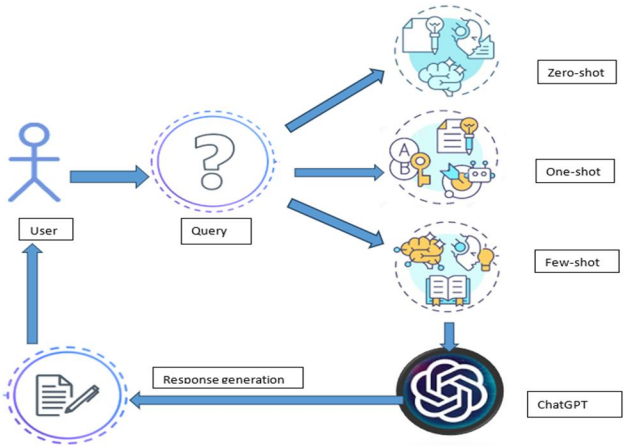


Fig1. Architecture of proposed methodology

The proposed architecture will help to the end users how to interacts with the model. For this, first end user can understand how many ways to ask the query. Basically, the queries are different categories like zero-shot, one-shot, two-shot and few-shot. So, before interacts with the model end user can aware of the question formats. Whenever the end users interact with model by using these formats of queries, they will get accurate result.

There are different types of query formats, among all the query formats first end user can know what type of data he needs in which format and in which area or domain before interact with the model. This new proposed methodology is more useful for text generation, classification, tabular data, data analysis and many more and it provides the data in a structured format.

(a) Input

The input format for this approach is only query. So, based on the query format the model will react and generate the responses. Different types of query formats are shown in table 1.

Table 1. Different categories of queries

S. No	Query format
1	Zero-shot
2	One-shot
3	Two-shot
4	Few-shot
5	N-shot

(b) Processing

The processing of the given queries is completely based question format given by the end user and the processing or analyzing operations are completely depends upon the training methods of the model like transformer architecture, pre-training on large datasets, masked language modeling, next-token prediction, fine-tuning, response generation, reinforcement learning and human-in-the-loop learning.

(c) Output

The output of the model is completely depending upon the formats of queries which were given by the end user. If end user asked the question in zero-shot format then it will generate a response without prior examples, if end user asked the question in one-shot format, then it generates the response based on the learned pattern from the single example, if end user asked the question in two-shot format then it generates the response based on learned patterns from the two examples, if end user asked the question in few-shot format then the model used a few examples to learn the pattern and generate a response by applying it to the new task.

Table 2. Types of assessment levels

S. No	Efficiency of result	Describe Levels
1	Low to Moderate	0 – 3
2	Moderate	3 – 5
3	Moderate to high	5 – 7
4	High	7 – 8
5	Very high	8 -10

(d) Result Comparison

Each shot-based approach gives different types of accuracy. When the end user is interacting with the model that is totally depends upon his need and the data's format. So, based his request the model generate the responses, here all shot-based approaches are important but the usage is different from user to user. In fig 2 shown the accuracy of each shot-based approach, it shows that N-shot approach is always generate a better result compared to remaining all the shot-based approaches and the efficiency of the result and it's described levels are list table 2.

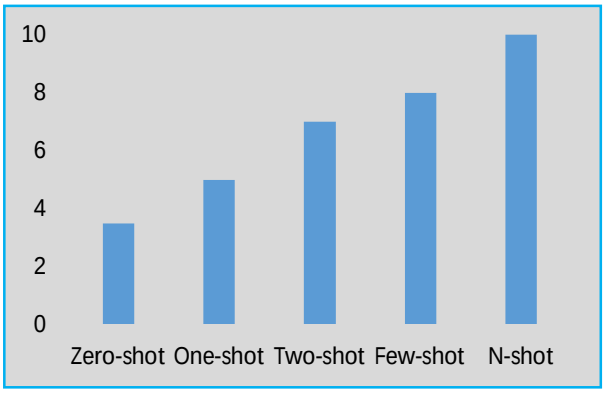


Fig 2. Accuracy comparison of shot-based approaches

IV. CONCLUSION

The concluding section presented a newly recommended methodology that provides a standardized format for end users to engage more successfully with AI models such as ChatGPT. The end users can realize several learning methodologies, including zero-shot, one-shot, few-shot, and N-shot, they can customize their inquiries and attain more efficient, precise, and pertinent solutions from ChatGPT. This research work suggested a new methodology which guarantees that end users can receive structured outputs across several domains, including categorization, text production, and data analysis, contingent upon the syntax of their queries. The final findings suggest that the N-shot learning strategy consistently achieves the maximum accuracy, highlighting the significance of the query structure for effective and precise interactions with AI models such as ChatGPT.

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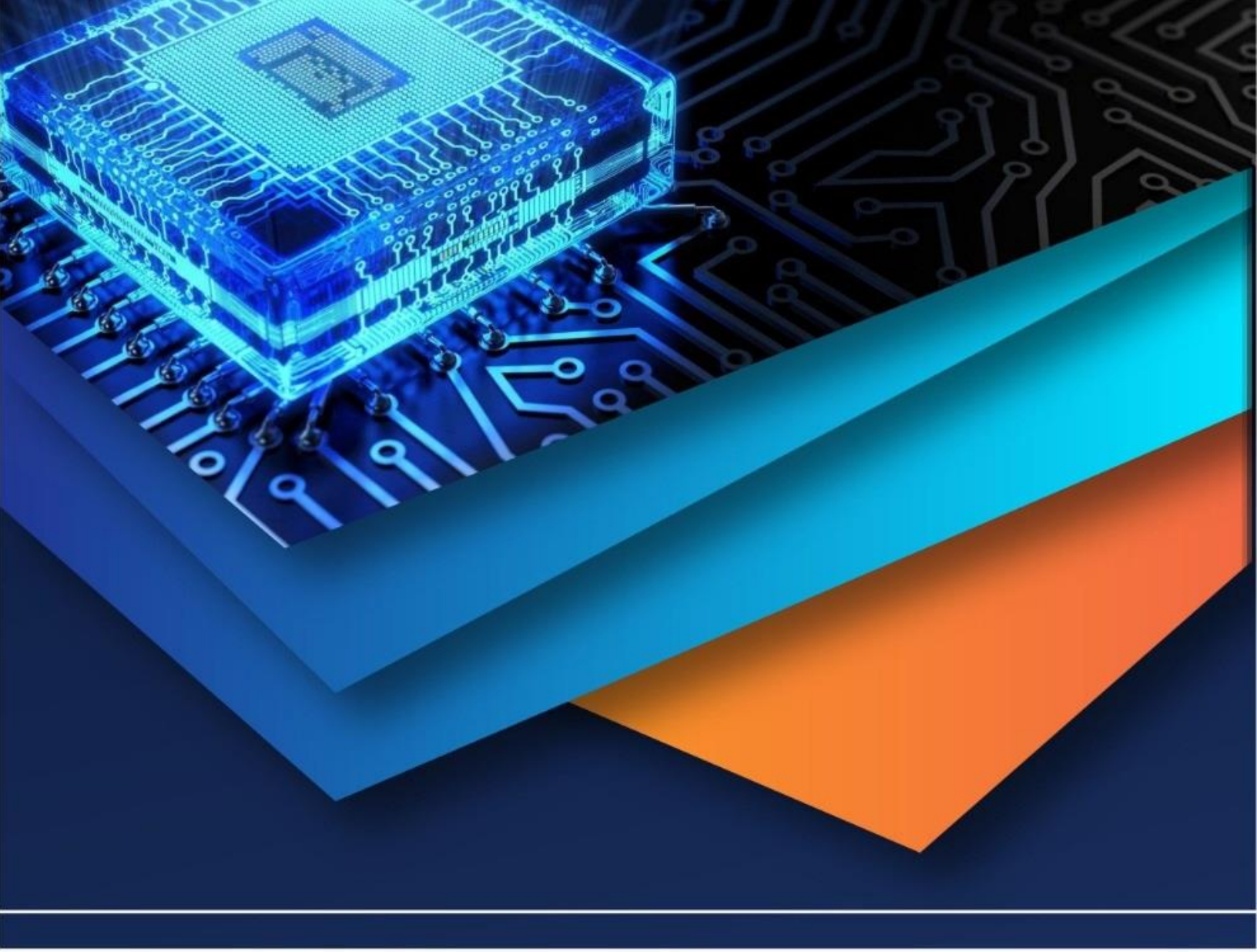
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