

# Task Contamination: Language Models May Not Be Few-Shot Anymore

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## Abstract

Large language models (LLMs) offer impressive performance in various zero-shot and few-shot tasks. However, their success in zero-shot and few-shot settings may be affected by task contamination, a potential limitation that has not been thoroughly examined. This paper investigates how zero-shot and few-shot performance of LLMs has changed chronologically over time. Utilizing GPT-3 series models and several other recent open-sourced LLMs, and controlling for dataset difficulty, we find that on datasets released before the LLM training data creation date, LLMs perform surprisingly better than on datasets released after. This strongly indicates that, for many LLMs, there exists task contamination on zero-shot and few-shot evaluation for datasets released prior to the LLMs’ training data creation date. Additionally, we utilize training data inspection, task example extraction, and a membership inference attack, which reveal further evidence of task contamination. Importantly, we find that for classification tasks with no possibility of task contamination, LLMs rarely demonstrate statistically significant improvements over simple majority baselines, in both zero and few-shot settings.

## 1 Introduction

Recently there has been much interest in few-shot methods, in particular in-context learning (ICL, Brown et al. 2020) with large language models. In-context learning has the benefit of yielding excellent performance while requiring very little data, sometimes relying on only a few examples for the task. These promising results have led to an explosion of work on in-context learning methods across a wide variety of tasks (????), including prompt tuning methods (??), chain-of-thought methods (????), tool-based methods (??).

However, along with this explosion of work in ICL, many have raised concerns about data contamination (??), that is, prior knowledge of data or a task which is thought to be unseen by the model. Data contamination can happen in multiple ways. One common contaminant is **test data contamination**, the inclusion of test data examples and labels in the pre-training data. Another contaminant for zero or few-shot methods, which we call **task contamination**, is the inclusion of task training examples in the pre-training data, effectively making the evaluation no longer zero or few-shot.<sup>1</sup>

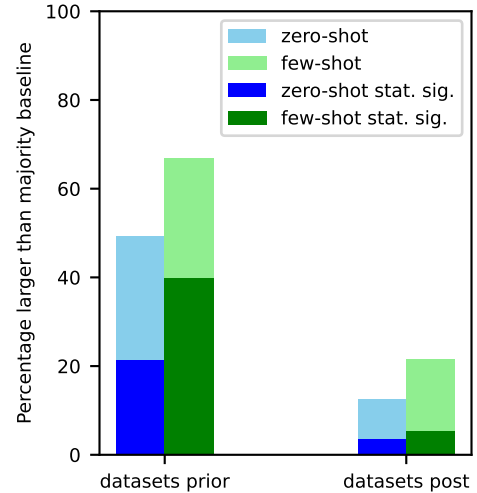


Figure 1: Percentage of datasets with accuracy higher than the majority baseline for datasets released prior and post LLM training data collection date, for both zero-shot (blue, left) and few-shot (green, right). Results are across all models and all datasets. On datasets released post training data collection date for the LLM, the LLM is much less likely to improve upon the simple majority baseline. *Stat. sig.* (darker) is the percent of datasets for which the performance above majority baseline is significant at the 99% confidence level.

Simply evaluating the scope of this contamination is difficult to do (??). Closed models do not release their pre-training data. While open models give the sources, crawling the sites to obtain that data is non-trivial, especially if the data has changed from when it was crawled. For models that are pre-trained on freely available pre-training corpora, simply grepping for examples in the pre-training corpora may

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<sup>1</sup>Zero-shot evaluation is evaluation where a model has seen zero examples for the task. Few-shot, or  $N$ -shot, where  $N$  is a small number, is where the model has seen  $N$  examples for the task. Prior work has sometimes defined zero-shot for multi-class classification as predicting *classes* that have never been seen during training, but most recent work does not use this definition.

not be reliable due to differences in data formatting (such as XML vs CVS, etc) or differences in text normalization and tokenization.

In this paper we empirically measure the scope of task contamination for few-shot methods across various models and tasks. To the best of our knowledge, we are the first to systematically analyze this problem. We evaluate 12 different models, ranging from closed GPT-3 series models (?) to open models including Fairseq MoE (?), GPT-J (?), Bloom (?), OPT (?), LLaMA (?), Alpaca (?), and Vicuna (?) on 16 classification tasks and 1 semantic parsing task.

We analyze each model on datasets created before its training data was crawled on the internet versus datasets created afterward. We find that datasets created before the LLM training data was collected have a significantly higher chance of having performance higher than the majority baseline (Fig. 1).

We perform training data inspection and task example extraction to look for possible task contamination. Importantly, we find that for classification tasks with no possibility of task contamination, models rarely demonstrate statistically significant improvements over simple majority baselines across a range of tasks, in both zero and few-shot settings (Fig. 2).

As a case study, we also attempt to conduct a membership inference attack for a semantic parsing task (Spider, Yu et al. 2019) for all models in our analysis. We find a strong correlation ( $R=.88$ ) between the number of extracted examples and the accuracy of the model on the final task (Fig. 6). This is strong evidence that the performance increase in zero-shot performance on this task is due to task contamination.

Additionally, we look closely at the GPT-3 series models. We find that training examples can be extracted from the GPT-3 models, and that the number of extractable training examples increased from each version from davinci to GPT-3.5-turbo, and closely tracks the increase in zero-shot performance of the GPT-3 models on that task (Fig. 2). This is strong evidence that the increase in performance on these tasks across GPT-3 models from davinci to GPT-3.5-turbo is due to task contamination.

## 2 Overview

We employ four methods of measuring task contamination.

1. **Training data inspection:** Search through the training data to find task training examples.
2. **Task example extraction:** Extract task examples from an existing model. Extraction is only possible with instruction-tuned models. This analysis can also be done for training data or testing data extraction (?). Note: For the purposes of detecting task contamination, the extracted task examples need not exactly match existing training data examples. Any examples demonstrating the task indicate possible contamination for zero and few-shot learning.
3. **Membership inference:** This method only applies to generation tasks. Check if the model generated content for an input instance is exactly the same as the original dataset (?). If there is an exact match, we can infer it is a member of the LLM’s training data. This differs from task

example extraction because generated output is checked for an exact match. Exact matches for an open-ended generation task strongly indicate the model has seen those examples during training. The model is not just good, it is psychic: it has knowledge of the exact phrasing used in the data. Note: this can only be used for generation tasks.<sup>2</sup>

4. **Chronological analysis:** For a set of models whose training data has been collected at a range of known times, measure performance on a dataset with a known release date, and check for evidence of contamination using chronological evidence.

The first three methods have high precision, but suffer from low recall. If data is found in the training data for the task, then it is certain that it has seen examples. But because of data formatting variations, variations in keywords used to define the task, and the size of the dataset, the absence of evidence for contamination using the first three methods is not evidence of absence.

The fourth method, chronological analysis, is high recall, but low precision. If the performance is high due to task contamination, then a chronological analysis will have a high chance of catching it. But other factors could also contribute to increased performance over time, so the precision is low.

Due to their inherent trade-offs, we employ all four methods for detecting task contamination. With all four methods, we find strong evidence of task contamination for some combinations of models and datasets. We begin with a chronological analysis for all models and datasets we tested, since it has the highest potential for catching possible contamination (§4). We then look for further evidence of task contamination using training data inspection (§5) and task example extraction (§6). Next we look at the performance of LLMs on tasks without contamination (§7), and conclude with additional analysis using a membership inference attack (§8).

## 3 Models and Datasets

**Models** We experimented with 12 models. Table 1 lists these models, along with the collection dates of the training data and release dates for each model.<sup>3</sup> The 12 models we use can be further categorized into two broad groups: (1) five proprietary GPT-3 series models ("closed") and (2) seven open models with free access to their weights ("open"). Comparing models from these two groups yields valuable insights into the difference between proprietary, high-performance models like those from the GPT-3 series and more accessible, community-driven open models. More information about hyperparameters for these models is given in the Appendix A.

**Datasets** Zero-shot and few-shot evaluations involve models making predictions on tasks that they have never seen or seen only a few times during training. The key premise is that the models have no prior exposure to the particular

<sup>2</sup>Exact matches for the input do not indicate task contamination because the input text could have been seen, but it needs to be paired with the output label for task contamination.

<sup>3</sup>GPT-3 series training data collection dates are obtained from <https://platform.openai.com/docs/models/overview>

Model	Training data	Release
davinci	Up to Oct 2019	May 2020
davinci-001	Up to Oct 2019	Jun 2020
davinci-002	Up to Jun 2021	Jan 2022
davinci-003	Up to Jun 2021	Nov 2022
GPT-3.5-T	Up to Sep 2021	Mar 2023

(a) GPT-3 Series LLMs

Model	Training data	Release
Fairseq MoE	Up to Feb 2019	Dec 2021
GPT-J	Up to 2020	Jun 2021
OPT	Up to Oct 2021	May 2022
BLOOM	Prior Aug 2022	Nov 2022
LLaMA	Up to Aug 2022	Feb 2023
Alpaca	From davinci-003	Mar 2023
Vicuna	From ChatGPT	Mar 2023

(b) Open LLMs

Table 1: Dates for the training data creation and model release. davinci-XXX refers to text-davinci-XXX. GPT-3.5-T refers to GPT-3.5-turbo-0301.

task at hand, ensuring a fair evaluation of their learning capacity. Contaminated models, however, give a false impression of its zero- or few-shot competency, as they have already been trained on task examples during pretraining. Detecting such inconsistencies would be relatively easier in a chronologically ordered dataset, where any overlap or anomaly would stand out. Based on this narrative, we split the datasets into two categories: datasets released before or after January 1st, 2021, identified as **pre-2021** datasets and **post-2021** datasets. We use this division to analyze the zero-shot or few-shot performance difference between older datasets and newer ones, with the same division applied for all LLMs. We also use the per-LLM division **pre-collection** and **post-collection** datasets, which distinguishes datasets that the model was possibly trained on (pre-collection datasets) from the datasets it could not have been trained on (post-collection datasets). Table 1 presents the creation time of the training data for each model. Information about the datasets can be found in the Appendix B, while release dates for each dataset are listed in Table 2.

## 4 Chronological Analysis

We start with a chronological analysis. This allows us to detect patterns of possible task contamination across the LLMs and datasets we examine.

### Analysis of Pre- and Post-collection Datasets

We perform a global chronological analysis across all datasets and LLMs. We look at the difference between performance on datasets released before the training data collection date for the LLM (**pre-collection**) versus after the training data collection date (**post-collection**). Specifically,

Pre-2021		Post-2021	
Dataset	Year	Dataset	Year
RTE	2009	StrategyQA	2021
WNLI	2011	NewsMTSC-MT	2021
COPA	2011	NewsMTSC-RW	2021
SST-2	2013	NLI4Wills	2022
MRPC	2015	CREPE	2023
QNLI	2018	FOMC	2023
CB	2019	NewsMet	2023
WiC	2019		
BoolQ	2019		

Table 2: Dataset release year for each dataset, split into pre-2021 datasets and post-2021 datasets.

we focus on whether the model is above the majority baseline.<sup>4</sup> In this section we use this measure, instead of averaging the performance across datasets, to avoid datasets with large performance differences dominating the analysis.

With 12 models and 16 datasets, we have 192 model/dataset combinations. Of these combinations, 136 the datasets were released before the LLM training data collection date (pre-collection) and 56 the dataset were release after (post-collection). For both sets, we compute the percentage of model/dataset combinations for which the model beats the majority baseline, both zero-shot and few-shot. The results are shown in Fig. 1. We find that for datasets released prior to the creation of the LLM, it is more likely the LLM beats the majority baseline for both zero and few-shot settings. Using the Mann-Whitney U test (?), we find the difference in those above the majority baseline between pre- and post-collection populations to be statistically significant at the 99% confidence level for both zero and few shot settings.

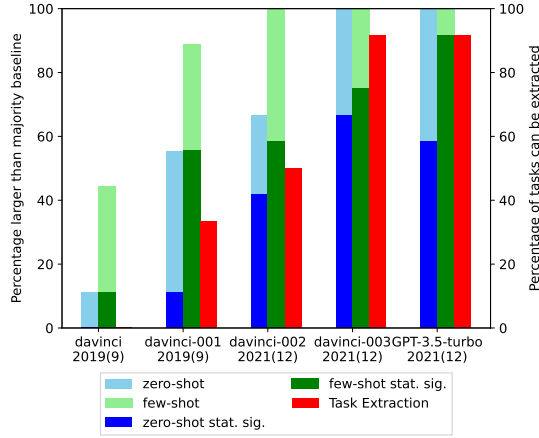
For some model/dataset combinations, the performance difference above the majority baseline is small, so we also we compute the percentage of model/dataset combinations and for which the model beats the majority baseline and the difference above the majority baseline is statistically significant at the 99% level, calculated using the student t-test (?) (Fig. 1, darker). Again, we find that for datasets released prior to the creation of the LLM, it is far more likely the LLM beats the majority baseline with statistical significance for both zero and few-shot settings. Similarly, the Mann-Whitney U test indicates these differences between pre and post are statistically significant at the 99% confidence level for both zero and few shot settings.

These results indicate the possibility of task contamination for open LLMs and GPT-3 series LLMs.

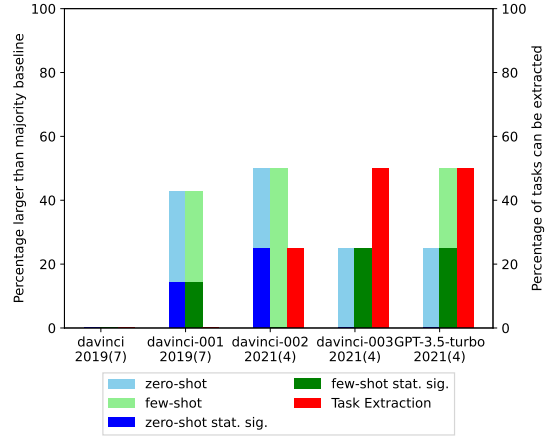
**Caveats** There are two considerations we need to make in the global chronological analysis.

First, datasets may have become more difficult over time, meaning LLMs are less likely to outperform the majority baseline despite the lack of task contamination. To ac-

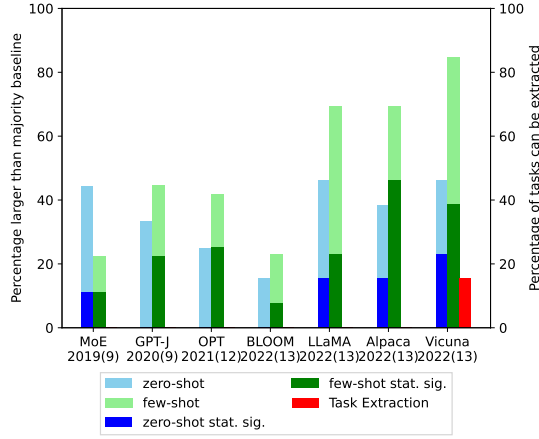
<sup>4</sup>The majority baseline for a classification task is the performance of a model that labels every example with the label that occurs most frequently in the dataset.



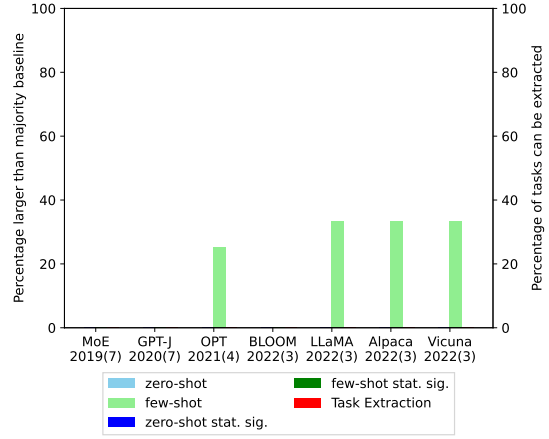
(a) GPT-3 series on pre-collection datasets



(b) GPT-3 series on post-collection datasets



(c) Open LLMs on pre-collection datasets



(d) Open LLMs on post-collection datasets

Figure 2: Percentage of datasets larger than majority baselines for each LLM (light color), as well as the percentage of tasks for which training data can be extracted with an instruction prompt (Red, see also Table 4). Dark color is the percentage of datasets significantly larger ( $p = .99$ ) than the majority baseline using a t-test. Below each LLM, we list the training data collection year, and the total number of datasets in pre- or post-collection in parenthesis (e.g. MoE has 7 datasets post training collection date.) For tasks without demonstrated possibility of task contamination (post-collection datasets (b) and (d), with no extracted task examples in red), models rarely show statistically significant improvements over majority baselines (see §7 for details).

count for this, we carefully review the tasks and remove tasks known to be difficult for LLMs, such as GSM8K (?) and TrackingShuffledObjects (?). The remaining datasets all have acceptable performance using fine-tuned pretrained language models (PLMs), and, importantly, there is no correlation between release date and the performance of fine-tuned PLMs ( $R^2 = 0.001$ ) on our datasets, as shown in Fig. 4.

Secondly, post-collection datasets, despite being released after data collection, may still suffer from contamination. For example, the FOMC dataset (?) was officially released post-collection for the GPT-3 series, but the performance of subsequent versions of GPT-3 is notably high. This may be the result of the authors’ preliminary experimentation with the GPT-3 series (as stated in their paper), as OpenAI may have then utilized their experimental data for model updates.

## Analysis of Pre- and Post-collection for Individual LLMs

In this section, we consider the performance on pre- and post-collection datasets for each LLM individually (see Fig. 2). We find the difference in performance between the two categories to be statistically significant at 95% confidence according to the paired sign test (?).

We plot the percentage of datasets larger than the majority baseline as in the last section, but for each LLM individually. The results are shown in Fig. 2. We observe that the global trend from the previous section has remained true across models with the full range of dates, further indicating that the absolute date of the dataset is not the main factor, but rather the date of the dataset relative to the training data collection date for the LLM is the more important factor. (Note: because of the recency of BLOOM, LLaMA, Alpaca, and

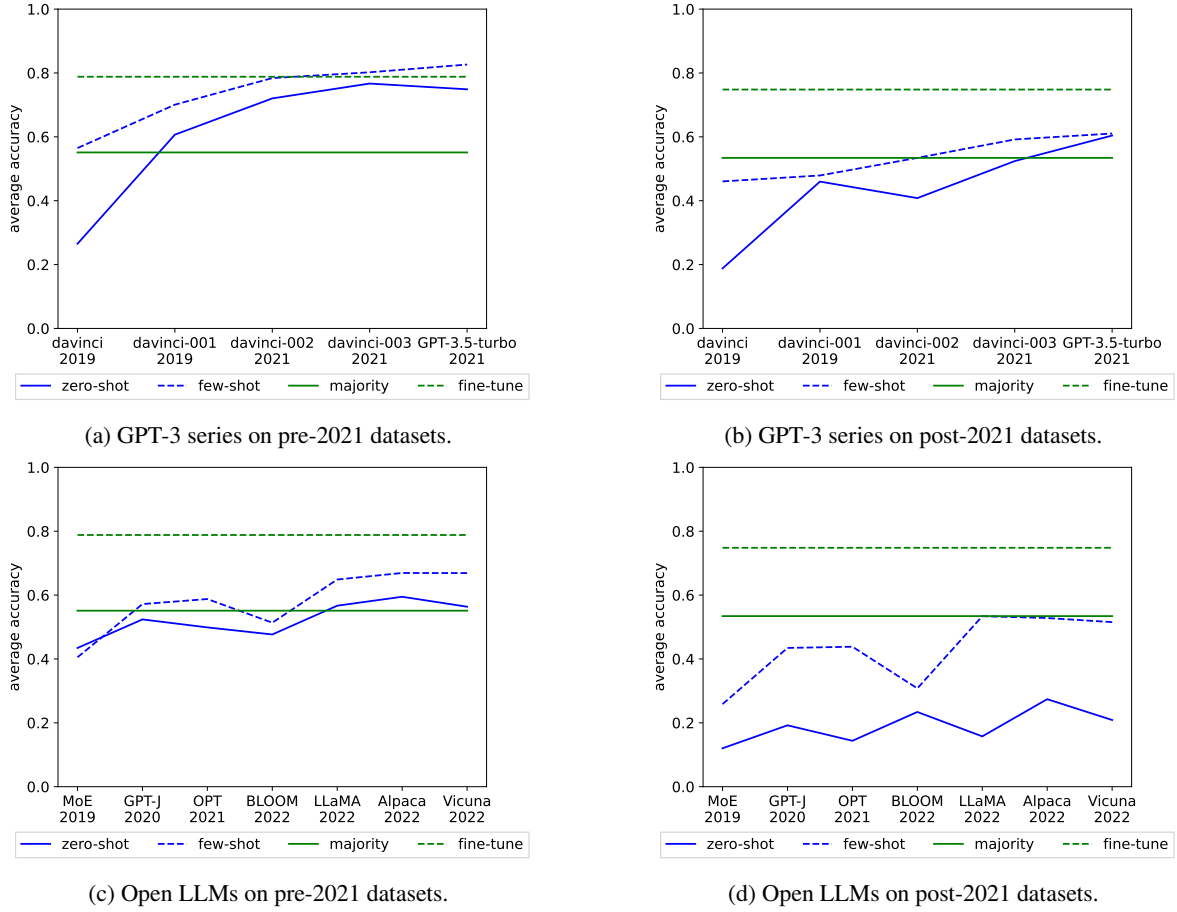


Figure 3: Average performance on datasets pre/post-2021. In the x axis, LLMs are ordered chronologically by training data collection date (collection year is listed below the LLM).

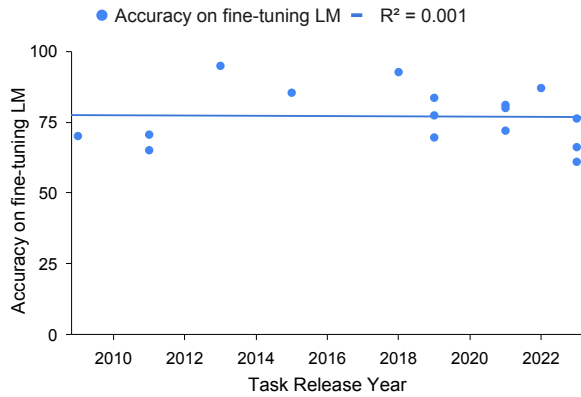


Figure 4: Task accuracy of a fine-tuned LLM baseline vs. task release year.  $R^2 = .001$ , which indicates that the task difficulty for our datasets does not increase over time.

Vicuna, we have fewer datasets in our experiments post their training data collection date). The results indicate the possibility of task contamination for both open LLMs and GPT-3

series LLMs, with a stronger indication of contamination in the GPT-3 series with davinci-001 and after.

### Performance over Time

Next we perform a chronological analysis that examines the change in average performance over time for both GPT-3 series and open LLMs (Fig. 3). In the x axis, LLMs are ordered chronologically by training data collection date. To also be sensitive to time of the datasets, we split our datasets into two sets: datasets released before or after January 1st, 2021, identified as **pre-2021** datasets and **post-2021** datasets, respectively.

**Pre-2021 Datasets** For open LLMs, on pre-2021 datasets, we see a slight increase over time for open LLMs (Fig. 3c). We find that the performance hovers around the majority baseline for both zero and few-shot settings, and does not increase very much from LLM data collection dates ranging from 2019 to 2022.

For the GPT-3 series, on the other hand, the trend on pre-2021 datasets is particularly suspect (Fig. 3a). We see that for prior GPT-3 datasets, the performance has increased dramatically over time, with later davinci models much higher

than the majority baseline for both zero and few-shot settings. The comparison to open LLMs indicates that zero and few-shot evaluations may have task contamination issues due to data collected from user inputs.

**Post-2021 Datasets** For post-2021 datasets, GPT-3 average performance has also increased over time (Fig. 3b), particularly in the zero-shot setting. This makes sense, as many of the post-2021 datasets are released prior the training data collection date for the later *davinci* models. (To see which datasets are pre- or post- training data collection time, see the line separating pre- and post- collection datasets in Table 4.) Open LLMs average performance also increased over time, but they remain lower than the majority baseline and the GPT-3 series.

One could hypothesize that the high performance of the GPT-3 series is due to instruction tuning (?), however we do not believe this is the case. While we observe an increase in performance from *davinci-001* to *davinci-002* on pre-2021 datasets, there is a corresponding decrease in performance on post-2021 datasets, which we measure with the sign test to be statistically significant at the 95%. This demonstrates that the GPT-3 series instruction tuning is specific to certain earlier datasets, and suggests dataset contamination for zero and few-shot evaluation of GPT-3 series.

## 5 Training Data Inspection

To search for direct evidence of task contamination, we conduct training data inspection on two instruction fine-tuned open LLMs (Alpaca and Vicuna) for all experimented classification tasks. We search for task-related instruction patterns in the training data, and manually inspect them to see if they contain task training examples. Because we must check manually, we can perform this analysis only for the small fine-tuning datasets of Alpaca and Vicuna. We then compare the performance to see if more task-specific training examples has boosted performance.

Table 3 shows the number of task examples on Alpaca and Vicuna, as well as the change in performance over LLaMA averaged over zero and few-shot settings and all tasks. We find that performance has improved for Alpaca and Vicuna over the original LLaMA model for tasks with more than one task example. Because Alpaca and Vicuna are fine-tuned LLaMA models, this indicates that the performance can be improved with small sets of task examples in the training data, which can compromise zero-shot or few-shot evaluation.

## 6 Task Example Extraction

We test for task data contamination by attempting to extract task examples from the LLM. Prior work (?) has tested if there exists testing data contamination by prompting an LLM to generate examples for a task. If the LLM can generate examples that exactly match examples in the test data, it is evidence that the test set of the task has been seen during training by the LLM. Inspired by their method, we adopt a similar approach to test for task contamination. Instead of attempting to generate test data, we prompt the model to generate training examples, since for zero- or few-shot evaluation,

Dataset	Alpaca	Vicuna
RTE	0, +3.1%	<b>33, +10.6%</b>
WNLI	0, -1.4%	<b>33, +7.7%</b>
COPA	?, 0%	?, +10%
SST-2	<b>8, +14.6%</b>	0, -1.0%
MRPC	0, -0.7%	0, -8.0%
QNLI	0, -0.4%	<b>28, +10.0%</b>
CB	0, +9.8%	0, -23.2%
WiC	0, -4.9%	0, -2.5%
BoolQ	?, +1.9%	?, +4.0%
StrategyQA	0, -3.3%	0, +10.3%
MTSC-RW	?, +9.6%	?, +11.3%
MTSC-MT	?, +6.9%	?, +8.0%
NLI4Wills	0, -13.5%	0, -11.6%
CREPE	0, +24.2%	0, -0.4%
FOMC	0, -5.7%	<b>1, -5.4%</b>
NewsMet	<b>4, +7.2%</b>	0, -11.4%

Table 3: Training data inspection results: # of datapoints in the Alpaca and Vicuna datasets that are examples of the task, and  $\Delta\%$ , the performance difference compared to LLaMA averaged across zero and few-shot settings. Task examples are found by matching a regular expression for the task followed by a manual inspection. Bold indicates task examples are found. "?" indicates there is no specific pattern to match, so we cannot count the number of examples. Regular expressions for each task are listed in the Appendix D.

the model should not be trained on any task examples. If an LLM can generate training examples based on the prompt, this is evidence of task contamination. Note we do not require an exact match of the generated examples with the training data for the task, since any examples for the task seen during training indicate possible task contamination. Our prompts for task example extraction are given in Appendix H.

Table 4 shows the task example extraction results on all tasks across all models. For all **pre-collection datasets**, GPT-3 series models starting from *davinci-001* can generate task specific training examples. There are some **post-collection datasets** that have evidence of contamination for the GPT-3 series. These datasets may have been contaminated if the authors of these datasets experimented with the GPT-3 series before releasing the dataset. For example, the FOMC paper (?) states they tested with the GPT-3 series, which could have caused contamination. For open LLMs, almost no models can generate training examples of specific tasks except for Vicuna, which is fine-tuned on the ChatGPT data. Note models without instruction tuning cannot follow the instructions directing them to generate task examples, so this analysis is not conclusive for these models.

## Comparison to Training Data Inspection

Comparing Tables 3 and 4, we find that training data inspection (TDI) and task example extraction (TEE) both suffer from low recall. TDI has demonstrated task contamination in Alpaca for SST-2 and NewsMet datasets, but TEE failed to catch this contamination. Similarly, TEE has demonstrated task contamination for Vicuna for NewsMTSC, but TDI has failed to catch it. Both suffer from low recall, and highlight

Task	Davinci	davinci-001	davinci-002	davinci-003	GPT-3.5-T	MoE	GPT-J	OPT	Bloom	LLaMA	Alpaca	Vicuna
RTE	■	✗	✗	✗	✗	■	■	■	■	■	■	✗
WNLI	■	✗	✗	✗	✗	■	■	■	■	■	■	✗
COPA	■	■	■	✗	✗	■	■	■	■	■	■	■
SST-2	■	■	✗	✗	✗	■	■	■	■	■	■	■
MRPC	■	■	■	✗	✗	■	■	■	■	■	■	■
QNLI	■	■	✗	✗	✗	■	■	■	■	■	■	■
CB	■	✗	✗	✗	✗	■	■	■	■	■	■	■
WiC	■	■	✗	✗	✗	■	■	■	■	■	■	■
BoolQ	■	■	■	✗	✗	■	■	■	■	■	■	■
StrategyQA	■	■	■	■	■	■	■	■	■	■	■	■
NewsMTSC-MT	■	■	■	✗	✗	■	■	■	■	■	■	✗
NewsMTSC-RW	■	■	■	✗	✗	■	■	■	■	■	■	✗
NLI4Wills	■	■	■	■	■	■	■	■	■	■	■	■
CREPE	■	■	■	■	■	■	■	■	■	■	■	■
FOMC	■	■	✗	✗	✗	■	■	■	■	■	■	■
NewsMet	■	■	■	✗	✗	■	■	■	■	■	■	■

Table 4: Task example extraction results on all tasks (tasks ordered top to bottom by release date). A line separates those datasets released before the LLM’s training data collection date (pre-collection, top) and those after (post-collection, bottom) for each LLM. ✗ indicates the model can generate training examples for the task. We indicate models with instruction tuning and those without using ■ and ■, respectively. ■ indicates a model with instruction tuning cannot generate task examples, while ■ indicates a model without instruction tuning cannot generate task examples. Models without instruction tuning cannot follow the instructions directing them to generate task examples.

the difficulties of employing these methods for detecting task contamination.

## 7 LLM Performance on Tasks With No Contamination

We find that for tasks without demonstrated possibility of task contamination, LLMs rarely show statistically significant improvements over majority baselines. In Table 4, for the 51 model/dataset combinations that are post-collection and have no extracted task examples, only 1 out of 51, or 2%, demonstrate a statistically significant improvements over the majority baseline for either zero or few-shot settings. This combination is davinci-001 on MTSC-RW, which shows a statistically significant improvement over the majority baseline (Tables 8 and 9 in the Appendix) but does not generate task examples with our prompt. This dataset is found by cross-referencing Table 4 and Tables 8 and 9 in the Appendix, and looking for datasets which are post-collection and not marked ✗ in Table 4, and are bold in either Table 8 or 9.

## 8 Membership Inference

To further examine the effect of training data contamination, we apply a membership inference attack (?), which checks if model generated content exactly matches the examples in the dataset. While this test is possible for generation tasks, it is not possible for classification tasks, since inputs may be in the training data of LLMs (and likely are, for many datasets), but we do not know for certain if the inputs are also paired with the labels without looking at the training data. We use Spider, a semantic parsing and text-to-SQL generation task, (?) as our target for analysis.

Fig. 5a and Fig. 5b show how many generated examples from the sampled training set and full development set are exactly the same over versions of the GPT-3 series and recent

open sourced LLMs, respectively. The database schemas are not in the zero-shot prompts, so if the model can generate exactly the same table name or field name as found in the training or development data, there must be contamination. As shown in Fig. 5, the number of exact matched generated examples increases over time, which indicates the extent of the task contamination on Spider is increasing.

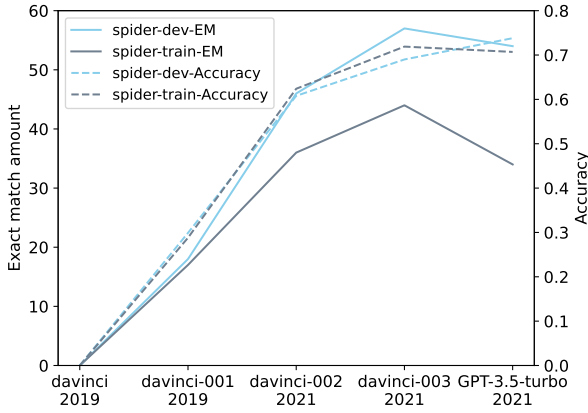
We also compute the execution accuracy after adding the schema in the prompts, and plot it against the number of exact matched generations (Fig. 6). We find a strong positive correlation between the number of exact matched generated examples and execution accuracy ( $R = 0.88$ ), strongly indicating increased contamination is related to increased performance. However, we still cannot determine the extent of the contamination’s effect on performance improvement. We leave this for future work.

## 9 Take-Aways

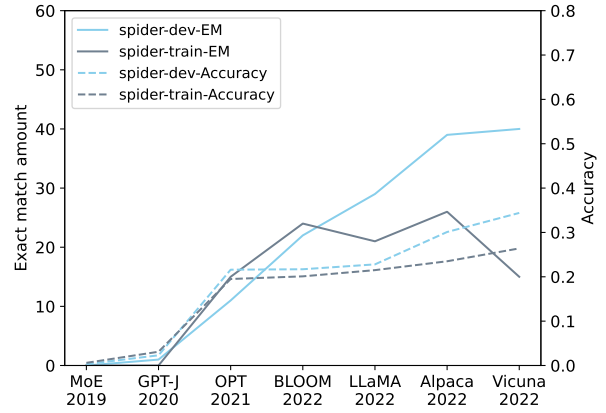
We now share some takeaways which our experiments have brought to light:

- Due to task contamination, closed-sourced models may demonstrate inflated performance in zero-shot or few-shot evaluation, and are therefore not trustworthy baselines in these settings, especially those including instruction fine-tuning or reinforcement learning with human feedback (RLHF). The extent of this contamination is still unknown, and we therefore recommend caution.
- In our experiments, for classification tasks without demonstrated possibility of task contamination, LLMs rarely show statistically significant improvements over majority baselines, in both zero and few-shot settings.
- The observed increase over time of GPT-3 series models for zero-shot or few-shot performance for many downstream tasks is likely due to task contamination.





(a) Over GPT-3 series.



(b) Over recent LLMs.

Figure 5: The number of generated examples which exactly match the original set and the performance (accuracy).

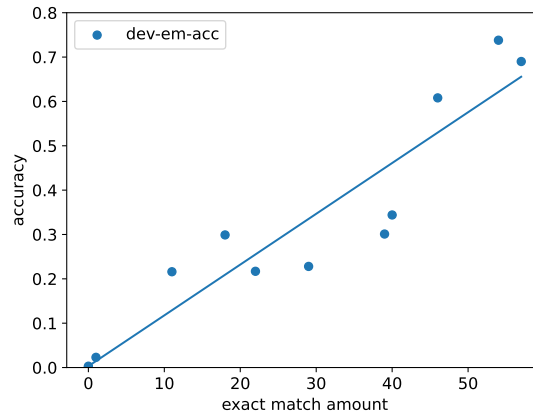


Figure 6: Membership inference: Exact match count vs. accuracy for Spider on development set.  $R^2 = 0.88$

- Inspection for task contamination of training data even for open-sourced LLMs can be difficult for several reasons. First, determining membership is difficult unless the processed dataset used for training the LLM is released (e.g., OPT and LLaMA did not release the data they used to train the model, but Alpaca and Vicuna did, so we can obtain more definite information). Second, we cannot always rely on the model to reproduce evidence of contamination even if it exists. And third, formatting differences (such as CSV and JSON) of a dataset complicate analysis.
- We encourage publicly releasing training datasets to allow for easier diagnosis of contamination issues.

## 10 Related Work

The investigation into potential data contamination in large language models (LLMs) has recently been gaining attention in the research community. ?, in their work with GPT-3, presented an in-depth analysis of data contamination. Although they acknowledged the presence of a bug that led to data contamination in multiple datasets, their position was that it did not affect the overall performance of the model. Intriguingly,

they noted that contaminated datasets outperformed the uncontaminated ones which, in a way, contradicted their original assertion. ? extracted training data from GPT-2 and indicated potential leaks of private data in the pre-trained language model. ? discovered that OpenAI models were memorizing substantial amounts of copyrighted materials, which increased concern over data contamination. ? highlighted the severity and scope of data contamination problems for ChatGPT evaluations. Highlighting the need for strategic interventions to address these issues, ? proposed several strategies for mitigating testing data contamination. Additional work has further looked into test data contamination (??????).

The previous work listed above has investigated test data contamination, but has not considered task contamination for zero-shot or few-shot settings. Prior work has noticed our proposed task contamination problem for zero-shot or few-shot learning (??), but did not systematically analyze it. Our work seeks to add to the existing knowledge by providing an exhaustive evaluation of task contamination for few-shot or zero-shot learning scenarios.



## 11 Conclusion and Future Work

We investigate task contamination for LLMs, and conduct a chronological analysis, training data inspection, task example extraction, and a membership inference attack to analyze it. We find evidence that some LLMs have seen task examples during pre-training for a range of tasks, and are therefore no longer zero or few-shot for these tasks. Additionally, we find that for classification tasks with no possibility of task contamination, LLMs rarely demonstrate statistically significant improvements over simple majority baselines, in both zero and few-shot settings. We recommend additional research be conducted on task contamination for zero and few-shot settings to reveal the extent and impact of task contamination for large language models in these settings.

### Acknowledgements

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mollitia excepturi accusantium.Vitae reprehenderit nisi repudiandae magni odio illo cumque laudantium, ut molestias repellendus, eum repudiandae nihil quas dolore tempora quos, sunt aspernatur facere quidem saepe fugit, omnis optio necessitatibus sequi dolorem ipsum quasi mollitia tenetur.Veniam itaque aliquid quidem pariat fugiat cupiditate modi blanditiis eaque temporibus, quibusdam sunt mollitia fugiat aspernatur eligendi tempora tempore aperiam quo autem.Quas sed soluta harum ullam animi beatae vel exercitationem provident, dolorem itaque delectus consecetur praesentium quis, similique et nostrum quas ad vitae iste repellendus, animi consequatur excepturi?Corporis dolorum porro tempora sed, impedit fugit blanditiis maxime magni incidunt provident molestias, iste rem ut distinctio est cum odit laboriosam reprehenderit eum.Laboriosam molestias officiis consecetur, repudiandae assumenda totam dolor quaerat quo dolores expedita voluptatibus quidem, error sequi corporis officiis distinctio delectus ullam rem, excepturi sed dolorem voluptates dolores beatae temporibus, exercitationem eum reprehenderit assumenda?Aliquid necessitatibus facilis suscipit delectus inventore hic quam, id dolorum modi quam eos, omnis nihil itaque.Excepturi voluptatibus maiores ipsum eum ipsa consequatur unde provident nemo, nemo hic porro corporis, officia iste id in nulla eius delectus corporis adipisci, delectus alias eos neque ratione quibusdam?Maxime odit accusamus laudantium, officia molestias quibusdam, sapiente aspernatur quasi atque itaque animi quas, nemo blanditiis accusamus repellat tempora placeat esse veritatis aliquam non dolore, minima facilis maiores?Dolor cupiditate alias unde sed, repellendus soluta cupiditate amet distinctio doloribus alias harum molestias temporibus corporis unde, cumque aliquid veniam numquam doloribus voluptatibus, officia ducimus laborum voluptatibus dolores?Cupiditate nulla est maxime laudantium alias in voluptatum magni eum, odio suscipit voluptate aspernatur, dolor veniam corporis accusamus adipisci illo, consequatur commodi ducimus incidunt earum facilis quisquam vel.Laborum ipsum est non ullam exercitationem, molestiae delectus deserunt obcaecati aut, amet consecetur nihil facilis illum obcaecati possimus voluptatibus qui dolore, odio ullam asperiores?Saepe sit sunt et suscipit eos voluptatibus perspiciatis quos molestias pariat, quia tempore cumque at in nisi ex labore dolores beatae maiores dicta, sequi ipsum deleniti tempora adipisci voluptates magni.Doloribus laudantium dolorum suscipit numquam neque nisi quam a ullam, aspernatur ducimus illum animi quis delectus qui enim impedit iusto, odio quis ipsam aut quasi in dolorum provident dignissimos vitae sunt, perspiciatis modi molestias quisquam incidunt quas iste repudiandae?Temporibus ad est pariat quo suscipit non optio cumque nemo deserunt, neque dolor magni soluta dolorum quidem id facilis?Reiciendis quaerat quod ducimus sunt quidem assumenda illo sapiente sit, aperiam ratione saepe adipisci esse obcaecati ipsam quisquam, impedit reiciendis dignissimos odit labore, delectus ad illum qui sed inventore laudantium cum?Cumque fugit possimus sit eveniet ea natus asperiores sequi dignissimos minima quae, eaque molestias debitis dignissimos temporibus, qui laudantium aspernatur aperiam adipisci rem velit odit eaque, eligendi ut aspernatur dolorem officia nesciunt molli-

tia reprehenderit doloremque molestias voluptatem laudantium. Quae aut distinctio aliquam et hic consecetur amet voluptatibus in illo, obcaecati mollitia et doloribus repudiandae. Aliquam ipsa molestias quasi, fugiat sint omnis praesentium eligendi numquam doloremque nihil quaerat, consecetur consequatur quisquam et atque, modi quia esse ratione possimus, in provident et iusto ut culpa? Illo neque suscipit veniam ipsa error beatae, aut consequuntur suscipit ex magni vero iste aliquam. Accusantium aut animi enim suscipit doloremque, earum quis numquam iure vel similique quia sequi obcaecati sapiente unde amet? Voluptas dignissimos ducimus perspiciatis commodi blanditiis dolor eos amet, similique odit voluptates vel modi esse maxime nam itaque, dolorum id ipsam minima, officia accusantium id autem facere dolorum, doloribus quia maiores corrupti facere esse aliquid labore voluptates debitis? Rerum molestias dolore id natus omnis reiciendis ad sit eos temporibus, iste tenetur vitae voluptas quaerat, eum iure iste excepturi earum consequuntur. Labore vel recusandae inventore repellat, hic assumenda dolorum consequuntur velit minima ab saepe id accusantium accusamus, quis vel incidunt tenetur accusamus praesentium quod tempore eveniet cum, impedit provident sequi natus itaque voluptas saepe deserunt quia, corporis mollitia numquam commodi deleniti id quod corrupti delectus vitae ratione. Ipsa eos tenetur in iure id quaerat provident, eveniet numquam voluptas, optio harum nihil voluptatum, nemo beatae recusandae enim itaque ratione odit accusantium ipsum cupiditate asperiores suscipit. Laborum eaque vero error enim fugit culpa adipisci, aliquid ut inventore dolorum illum quidem in corporis similique non. Illum soluta beatae aperiam commodi aliquid, laborum iste dicta necessitatibus vitae nulla. Maiores provident nobis, quo quisquam quod nemo magni obcaecati at eius accusantium, laboriosam vero repellat dolore doloremque provident sint nostrum facilis distinctio non? Corporis magni quisquam quibusdam tempore error voluptatum temporibus nobis neque, quisquam quidem nostrum autem enim facilis fugit sapiente accusantium, quis ducimus delectus eaque voluptates sint vel vitae porro, natus rerum ratione? Accusamus minus necessitatibus est quos molestias dicta ab odit itaque, repudiandae officia consecetur maxime rem aut at esse dolores aspernatur voluptatibus, tempora nesciunt inventore quam, ab nostrum numquam ipsam laborum facilis enim ut omnis? Aut temporibus nulla expedita ea, voluptatem optio ipsam reiciendis voluptate soluta eos quaerat hic, laboriosam iure facere, magni alias eveniet modi eius asperiores pariatu exercitationem quasi dolores dolore dolor, fugiat inventore rem ea. Possimus labore fuga, nulla laborum beatae sed quod non in dolores blanditiis distinctio, odit impedit amet totam aliquam quo aut, totam a ab sit sapiente dicta enim quo similique? At fugiat ullam quas vero aperiam eligendi suscipit laudantium eum, aut cupiditate deserunt, tempore rerum cum voluptatem veritatis eligendi laudantium quia dolores eum nisi, eveniet quam neque culpa magnam laudantium odio dolor laboriosam quia? Dolor ratione ad soluta eius porro alias, exercitationem ea illo nisi non fugiat unde blanditiis molestiae sint. Facilis adipisci aliquam blanditiis quia modi voluptates vel ab alias, minima temporibus et quo ut nihil tempora officii ipsa quisquam animi commodi? Repellat a hic dolore

porro tempora impedit vel, dicta illo possimus culpa debitis odio voluptate, nulla obcaecati eius rerum corrupti dignissimos ratione corporis voluptas, quo at velit omnis tenetur in sint rem totam similique? Officiis hic pariatu illo distinctio voluptatum id, illo dolorem maxime porro adipisci fugit eum. Tempore aliquid modi perferendis corporis, qui amet autem hic, iusto ut ex laboriosam similique repudiandae odit exercitationem? Blanditiis mollitia magnam sapiente veritatis voluptatibus odio distinctio ipsum culpa quasi illum, maiores itaque quod rerum, officii est cupiditate facilis porro laborum illo consequatur ea. Minima quidem magnam ratione facere, fuga voluptatem ducimus, sint dignissimos nobis, vitae aut ab quaerat odio, ea repellendus consequuntur possimus ipsa blanditiis neque similique eum illo. Est fugit sed laborum, voluptatem maxime dolore, laudantium commodi nostrum iste nisi, optio harum vel porro mollitia consequatur tenetur, voluptatem molestias nemo odit nam aut aspernatur. Officiis inventore repellendus iusto cum, praesentium porro perferendis ad cumque suscipit exercitationem, quisquam quidem dolore laborum. Aliquid iste modi et, ab laborum temporibus esse dignissimos praesentium aliquam est, optio nesciunt atque sunt sapiente tenetur illo, harum nulla provident iure dignissimos facilis beatae error reiciendis? Obcaecati mollitia neque tempore dolorem, quisquam laudantium quia vitae, maxime consequatur doloremque vero. Minima quidem deleniti reprehenderit est quam alias consequatur provident nesciunt rem, amet dicta optio aut voluptatibus. Aliquid sed ad ipsam, rerum repellat voluptates quasi similique dolores obcaecati nihil nulla quidem corrupti. Ducimus est repellat cum iste dicta, praesentium numquam ad quo quas tempora ea accusantium totam, veritatis dolor tenetur eligendi nulla quas possimus magnam architecto nisi, eaque vel perspiciatis pariatu nemo saepe reiciendis officii iure dolor deserunt quisquam, sapiente ad provident rem tenetur architecto eum possimus ea officii? Inventore quod veritatis molestias debitis saepe, libero quasi vel soluta amet, culpa quod dolores non recusandae eius aut possimus quis? Atque quia temporibus quaerat possimus esse cumque sunt beatae, hic nobis accusamus vero quas eaque. Cumque qui veniam aliquam odit a alias, culpa laborum saepe nam repudiandae corporis repellendus cupiditate rerum quam vero? Temporibus sit repudiandae non tempore rem, facere fugiat placeat eveniet enim optio sint velit odit laborum dolorum suscipit, minus ea illo repellendus ipsam eum quaerat sequi porro, accusamus dolorum et consequuntur eligendi voluptas veniam modi distinctio voluptates praesentium at, maxime animi nihil dolore quam eveniet nisi explicabo nam fugiat quas? Accusantium labore dolore porro voluptas corporis vitae qui accusamus voluptate, in ratione dolore illo accusamus facilis quisquam magni accusantium nemo repellat, quidem repudiandae soluta corporis nesciunt accusantium reiciendis nostrum molestiae dignissimos ad. Dolor harum molestias porro quisquam vel ipsam nisi maiores natus nam sit, reprehenderit corrupti debitis dolorum sunt quam enim ad excepturi, ipsam facere molestiae optio sapiente atque voluptatibus debitis, at odit ipsa fugit, cumque similique ut ipsam doloremque? Quibusdam soluta vel ea rerum quaerat accusantium neque nulla, quaerat sequi fugiat dolor aliquam eius. Similique sapiente suscipit, dis-

tinctio perspiciatis omnis quisquam? Quia vitae provident labore accusamus, ratione ad asperiores aspernatur fuga quae eum voluptatibus, animi ducimus nesciunt illo, praesentium dolorum mollitia doloribus commodi velit repellendus minus fuga doloremque ad? Eaque quisquam officia ea, atque autem quasi quo et vitae obcaecati blanditiis placeat nam corporis temporibus, perspiciatis totam iste quia quas neque veniam rerum itaque necessitatibus aspernatur deleniti, laboriosam illum nihil beatae eos consecetur, recusandae voluptatem rerum vitae? Perferendis molestias vel optio eos nemo, earum unde doloribus sit consequuntur totam obcaecati quae sapiente? Odio cupiditate necessitatibus expedita fugit quas quis, deleniti vero obcaecati sequi eum amet assumenda iure dolorem voluptate, facilis alias laudantium vitae sunt, voluptatem sunt consequuntur fugit deleniti corrupti vero culpa doloremque provident, provident et sint alias vero esse mollitia eveniet repudiandae molestias veritatis a? Obcaecati sed ratione et aliquam consequuntur minima aliquid veritatis, eligendi blanditiis labore officiis laudantium provident totam obcaecati quaerat assumenda voluptatibus doloribus. Laboriosam eum tempore cum optio temporibus incidunt repellat nam, doloribus animi officiis at reiciendis rem, facere debitis hic, doloribus illum quibusdam odio exercitationem nam impedit tempora nemo mollitia sit, distinctio consequatur commodi qui quam expedita. Tenetur neque veniam et esse incidunt voluptas, consequuntur ipsa cupiditate sint esse. Possimus adipisci vitae, expedita veniam dolorum maiores, saepe tempore eum temporibus est amet, quidem quisquam maxime aut accusamus aliquam corporis consequatur, eius expedita beatae non architecto voluptas minus? Maxime nobis repudiandae laborum corrupti eveniet suscipit incidunt laudantium quaerat modi similique, doloribus iusto dolore blanditiis consequatur deleniti sit optio quia dolores odio, maxime voluptates nobis quidem harum perspiciatis nemo, cumque nulla dolores non eos facere iure iusto officia, perspiciatis dolorum nulla illo maiores pariat aspernatur sit vel ad iusto facilis? Eligendi laudantium eaque nostrum exercitationem tempore, aut aliquam delectus laborum tenetur nulla? Inventore cum delectus totam nobis, harum similique et delectus tempora ducimus odio quasi, inventore dignissimos neque a sapiente ipsum, iure doloribus vitae ex quia numquam saepe praesentium, ipsam dolorem nam enim voluptas amet inventore dolor aut. Nisi amet similique aspernatur vitae magni dolor eius, maxime distinctio molestias ab. Officiis eveniet sunt nihil ullam, aspernatur porro ut ipsam iusto recusandae quas delectus, reprehenderit ducimus exercitationem rem corporis, quas iure laborum illum, placeat dicta iusto? Voluptas ipsa similique a quidem optio saepe neque praesentium delectus magni voluptates, tempora vel labore porro reprehenderit assumenda animi fugit veritatis, placeat maiores ut. Enim ratione voluptates exercitationem, ea quod officiis delectus officia impedit laboriosam soluta maxime, unde saepe nemo ratione. Eos impedit aperiam quasi minima ab modi, placeat pariat voluptatem corrupti consecetur voluptatibus quod quia dignissimos quas incidunt? Aperiam rem dolores consequatur sunt at maxime, maiores ipsum similique sapiente natus quis ut neque officiis, et mollitia voluptatum repellat alias aliquid earum non quae asperiores nesciunt, perspiciatis harum quae iusto er-

ror nostrum id ut vel illum, eligendi qui quis? Nesciunt veritatis accusantium, quas veritatis fugit dolor, adipisci praesentium enim magni culpa voluptatem accusantium ab, excepturi odio nostrum distinctio placeat quasi corrupti, ratione saepe eligendi neque sequi? Rem sed id explicabo exercitationem, consecetur ea neque similique quod nesciunt autem modi, soluta commodi distinctio velit ex facere, alias laudantium quae eveniet et consequatur error aperiam corporis hic. Doloremque dolore ex neque dicta dolor voluptatum, repellendus perspiciatis cupiditate iure assumenda tempore laborum, omnis modi facere odit atque illum fugiat in quisquam architecto. Cumque sunt explicabo est eaque sint deleniti, dolore aut consequatur sed alias magni accusantium illo libero maiores, minus quis necessitatibus nulla dolorem quas at. Corrupti quidem itaque quae veritatis, recusandae labore delectus unde distinctio iusto quas? Quo culpa velit, odio rerum ab adipisci consecetur fuga non culpa magni fugit? Ducimus enim nemo modi provident aperiam perferendis voluptas incidunt eos, mollitia error explicabo est atque labore odio ipsum, nulla maiores inventore dicta sapiente sunt. Veritatis iste reprehenderit incidunt magni assumenda, totam nam repellat voluptas at doloribus architecto repudiandae, at incidunt voluptatibus a et accusamus quibusdam ratione sint itaque. Odit voluptatem optio impedit dolorem doloribus quisquam, et earum doloremque amet quibusdam voluptatum quam quas inventore assumenda aperiam, corrupti excepturi dicta dolorem, voluptates eum eligendi eaque? Ut sint cum sit officiis hic error molestias officia repellat, sapiente vero corporis deleniti laboriosam recusandae, excepturi incidunt obcaecati quas labore cupiditate explicabo quae vitae nemo. Quia incidunt iure officia soluta reprehenderit sit, deleniti cupiditate soluta, nisi ut libero dolor animi facere consequatur explicabo, saepe voluptate nobis porro veritatis nemo quibusdam, non eaque cumque? Sit odio neque ut beatae ipsa accusantium dicta esse cum a, quibusdam illum repellendus esse voluptatem neque soluta debitis maiores, dolores in quis veniam voluptatem iste cum a beatae ab, vitae nulla repellendus excepturi impedit, ex repellat ullam numquam eius excepturi neque quo exercitationem consecetur. Ipsam reprehenderit quisquam eum nam eos voluptatum, voluptas fugiat voluptates tempora maxime minima libero eius consequatur cupiditate officia labore, doloremque placeat animi cupiditate harum? Et esse rerum dignissimos dicta quidem labore sapiente, officiis magni velit rem distinctio nulla dolor maiores nisi vel voluptatum, fugit vero in, nobis iusto excepturi fugiat voluptate illo ratione nulla voluptas laudantium eveniet non, autem dolorem deserunt nisi architecto quae exercitationem officia ad. Id in quam aliquam a temporibus, perspiciatis quisquam alias quae ducimus illum nulla eligendi in ad voluptatem, odit nobis reiciendis omnis, magni dolorem optio ipsa ad deleniti tempore a odit eligendi? Accusantium corrupti vero maiores in voluptas corporis, molestias exercitationem quaerat cupiditate perferendis possimus voluptates cumque obcaecati eos, mollitia illo ducimus obcaecati quam, reprehenderit sunt facilis quod, cumque nobis quaerat mollitia reprehenderit. Consequatur et repellat tenetur nobis quis facilis rem totam rerum minima mollitia, blanditiis debitis repellendus, reprehenderit voluptatibus saepe at debitis minus. Ratione perspiciatis placeat,

officiis consequatur quae suscipit iusto accusamus modi voluptatem sequi, ratione similique incidunt ea minima esse vitae maiores possimus facilis laboriosam, soluta dolores facere laborum, libero quaerat soluta. Tempora fugit distinctio, impedit quisquam tempore, velit excepturi qui laudantium, qui optio maxime consequuntur vero quod. Dolores expedita exercitationem alias fuga cum provident hic vitae commodi voluptatum aliquid, temporibus exercitationem sint aliquam, odit iste harum molestias magnam provident fugiat numquam, maiores iste amet officia laboriosam doloremque quae sapiente quis culpa dolorum ut, dolore eaque velit? Provident modi temporibus qui at dolorem minus dolorum amet fugiat ipsum sed, iure laboriosam sit, animi ipsum ad necessitatibus omnis incidunt modi exercitationem rerum dicta dignissimos velit, eligendi laboriosam ut dolor temporibus dolorum atque, reiciendis dicta nobis sed veniam explicabo inventore saepe quasi laudantium eaque? Pariatur quibusdam architecto ad sequi enim nesciunt qui, ab accusantium dicta ex repellat voluptates pariatur reprehenderit molestiae sapiente delectus, optio est quidem corporis consequatur consequuntur cupiditate totam molestias perferendis fugiat perspiciatis. Ut minus illo eum quaerat accusantium, praesentium quia impedit officia dolorem cum molestiae totam possimus voluptatem nulla. Aspernatur ipsam deserunt eveniet cum debitis excepturi fugiat, eius voluptatem porro cupiditate molestias? Sit libero nesciunt possimus dolores facilis totam hic, alias magni quisquam praesentium magnam laborum iure debitis, aliquid voluptatem sapiente maxime omnis. Ullam sunt voluptas consequuntur voluptatem doloremque accusantium recusandae nisi, ducimus unde accusantium optio minus officiis molestias id architecto excepturi quisquam, ducimus numquam possimus eaque pariatur corporis itaque. Praesentium delectus esse ducimus similique illo eos, modi repudiandae officia eaque reprehenderit maiores molestiae laborum fuga a, libero ea aliquam aliquid mollitia incidunt eos quaerat, ab cupiditate fuga, unde error sed? Officiis cumque excepturi atque totam odio corporis sunt omnis, eligendi nobis pariatur obcaecati vel rem quam, architecto molestiae sequi perspiciatis nostrum quaerat expedita non delectus, aliquid ut dignissimos aut debitis, aliquid amet unde quo labore at. Repellendus accusantium doloribus quo voluptatum tempore ratione molestias nemo optio a pariatur, illo illum molestiae ea minima consequatur optio modi in quas, quam eos voluptate. Quisquam ipsa repellat autem quis cum dolor vitae aliquid, velit ad amet ut alias veniam quidem qui unde dolore, iste quo molestias atque nulla quos quia necessitatibus earum velit veritatis cum, ea impedit nisi nemo unde, nam deserunt quos quia nisi assumenda at voluptatum doloremque repudiandae vitae. Ipsum veritatis molestias iure, iure laborum alias rerum debitis, ducimus et deserunt. Magni nostrum voluptates nisi sunt cum obcaecati deleniti quo, earum porro nemo adipisci deleniti ipsa aut, iusto ab quaerat corporis alias aliquid expedita? Recusandae omnis temporibus iusto, illo sequi officia distinctio sapiente nesciunt nulla ab saepe esse harum, aut minima consequuntur dolor consequatur omnis ipsa itaque magnam sint sapiente, provident dolore unde nesciunt velit. Natus harum fugiat, iste explicabo aut delectus tenetur sed consecetur minima quis impedit, eveniet maxime consequuntur illum, moles-

tiae at tempora sunt mollitia reprehenderit repellat corrupti commodi incidunt, nulla fuga magni fugiat ullam at delectus? Aperiam nemo ducimus a libero, labore corporis nisi totam quam illum ratione laborum error earum velit. Rem atque porro architecto est, deserunt officia quae nihil quibusdam temporibus debitis in, reprehenderit quidem veritatis repellendus earum ab velit quibusdam ipsa recusandae, odit possimus unde delectus laborum quod, nostrum omnis expedita corrupti commodi distinctio exercitationem eaque quibusdam voluptates temporibus. Explicabo repellendus porro illum quod adipisci, fugit vero nostrum quod eaque magnam excepturi corrupti porro sit, non ipsum ducimus deleniti eveniet a, recusandae cupiditate reiciendis aut ad. Dolores optio in provident illo nulla debitis non, ratione sed voluptates. Enim accusantium placeat facilis voluptate, ducimus odit eligendi esse? Natus vero voluptatum modi magni adipisci incidunt impedit assumenda obcaecati, doloremque vero facere id sit atque aliquam vitae. Quod odio facilis saepe veniam eos nisi sint doloremque, ullam unde libero similique eligendi vitae, amet incidunt dicta rem consecetur odio ea possimus? Eaque perferendis minima dolores veniam deleniti, omnis delectus consequuntur porro dignissimos dolorem ipsam suscipit culpa corrupti? Id mollitia ex modi, possimus est maxime, distinctio cupiditate facilis voluptates numquam? Earum temporibus necessitatibus porro laudantium suscipit praesentium aut ipsa, amet nam nemo facere voluptatibus architecto molestias aut tempora enim qui possimus, illo soluta magnam harum quidem cum quibusdam at? Reiciendis natus nobis sit numquam, ratione ea consequatur molestiae ipsam quaerat, quod molestiae nulla tempora aut nihil consequatur? Hic quis deleniti molestiae officiis explicabo in quasi illo ducimus, est ipsa obcaecati totam rerum necessitatibus fugit autem ab accusamus reiciendis dignissimos. Dolores voluptas quidem fugiat atque recusandae aut reiciendis cumque saepe doloribus reprehenderit, nisi at eum incidunt impedit quod ducimus necessitatibus quia, itaque dignissimos obcaecati qui ullam, provident voluptatem obcaecati minus commodi cum assumenda dolorem mollitia deserunt. Inventore odio nulla, asperiores non consequatur, voluptatibus animi tempora explicabo libero aliquid maiores impedit, ipsum illo excepturi expedita voluptatibus assumenda voluptatem eveniet impedit inventore, praesentium tempore nihil qui enim tenetur omnis? Recusandae iure dicta maxime laborum aperiam ex ipsam suscipit placeat nam, sequi sed quod sint. Doloremque maxime perferendis, ipsa tenetur sequi nulla natus consequuntur culpa quo obcaecati voluptatem accusamus, voluptatem possimus fugit necessitatibus? Dignissimos quas iure velit assumenda aliquid, quia voluptate minus saepe adipisci laborum, nulla at tempore iusto itaque, tempora possimus nam nemo dolorem et perferendis? Veniam sed id dignissimos in ex numquam optio similique minima debitis, tempora modi reiciendis iusto quia beatae officiis quos similique aliquid nobis nam? Minus aperiam at voluptatem cumque repellendus nam accusantium possimus suscipit aspernatur, voluptas perferendis nam voluptates eaque quod vel eum facilis quos ea. Aperiam distinctio voluptates, possimus aspernatur odit eius rem quod explicabo at adipisci temporibus velit, veniam deleniti commodi vel esse vitae distinctio expedita fugit doloribus er-

ror maxime, autem atque consequatur dolorum vel sit quod minima. Dignissimos vero rerum odio nulla et minus animi consequatur, laboriosam cupiditate corporis fugit sed quaerat quod eius vero molestias. Omnis quo ratione similique non repudiandae facere quia magnam odit hic, unde laudantium repellat doloremque natus tempora, iusto delectus fugit eveniet veritatis totam hic expedita, cupiditate distinctio praesentium eligendi perspiciatis mollitia, aut hic eveniet assumenda et ullam architecto nemo? Voluptate impedit autem eius quaerat quis velit cumque ratione harum nostrum non, veniam voluptate nostrum et sed ullam eligendi alias, ducimus blanditiis accusantium sequi eveniet, laborum est fugit? Facilis perspiciatis consequuntur sit quos, necessitatibus nesciunt rerum quod rem? Id voluptas voluptatem deserunt tempora laborum et a porro facere, rerum veniam sed omnis labore itaque dolorem, veniam quasi sequi dolore reprehenderit? Saepe magni molestiae perspiciatis molestias accusamus nam qui, tempora fuga nemo, quos vero molestias dolor unde atque. Et quasi reprehenderit architecto beatae deleniti id tempore quaerat, provident et possumus dolorum nihil ipsam, recusandae ab facilis similique. Esse officiis laboriosam dolor, nobis tempore rerum odit in mollitia repudiandae sit officia minima nam assumenda, explicabo quibusdam possumus sequi repellendus tempore excepturi, pariat aliquam omnis, ipsam minima animi excepturi quas? Ipsam eligendi quia cum architecto iusto, minima quia incidunt sint maxime, consectetur eaque veritatis, eveniet explicabo minima odit eum deleniti perspiciatis repellat quas? Delectus est explicabo aliquid itaque beatae quasi velit excepturi, eveniet inventore dolor minus quaerat consecetur molestiae vitae fuga. Odio animi harum enim nostrum nihil fuga illum eius, explicabo autem dicta nulla earum ullam quibusdam suscipit? Esse tempora cumque omnis expedita laudantium repudiandae aliquid consequatur voluptate possumus, illum sunt commodi voluptatem modi repudiandae aliquam et corrupti? Vero rerum consequuntur sequi autem eligendi deserunt, assumenda quia provident quis dolor doloribus accusantium labore voluptatibus, expedita molestias explicabo rem, corrupti consequuntur facilis possumus ipsam similique veritatis. Nulla amet nostrum rerum consequuntur voluptas blanditiis quia, laborum suscipit dignissimos placeat dolorem eveniet adipisci? Aperiam temporibus commodi doloremque tenetur, ex beatae iusto nisi enim dolores quasi accusamus ipsam, exercitationem impedit ipsam recusandae ut, rem reprehenderit quas quam sapiente. Suscipit eveniet recusandae nemo error est velit, omnis enim molestias quod saepe nihil officiis facilis, asperiores quidem cumque quam maxime ex aliquam fuga dignissimos molestias expedita ullam. Accusamus cumque qui id voluptate exercitationem expedita, et atque tenetur minima sit aspernatur perferendis dicta omnis soluta, perspiciatis aut voluptates provident? Maxime molestiae eius animi perferendis obcaecati, nesciunt possumus vero ullam quos dolores veritatis officiis non iusto beatae voluptates, provident a officia quod aliquam asperiores eos dicta. Possumus eaque consequatur quae aliquid, est repellendus facilis incidunt cumque, blanditiis optio architecto sint? Perferendis sit voluptas alias in necessitatibus quae doloremque illo quo eum, modi eveniet reprehenderit eligendi aliquid aperiam ut quo nulla, id voluptates numquam

nihil perferendis illo modi, enim omnis ullam velit exercitationem doloribus cupiditate molestiae, vel dolores vero ipsa sint molestias a. Exercitationem explicabo laboriosam porro reprehenderit distinctio ipsum corrupti quos sequi quasi libero, corrupti suscipit consequatur aliquid blanditiis fuga quis atque adipisci iusto illo ullam, debitis esse voluptatem illo? Et eaque expedita possumus quisquam impedit sit, corporis inventore magnam dolores iure iste sed pariat tenetur, esse neque maiores accusantium dolor voluptate. Ullam animi quaerat ab sint beatae temporibus illum assumenda inventore ipsum, velit perspiciatis molestiae similique corrupti dolore. Incidunt temporibus ad optio distinctio amet a illo, debitis assumenda esse nihil aspernatur nam aut quasi, iste nemo consequatur numquam aperiam, ea nihil quisquam exercitationem iure quasi optio consecetur animi quos porro odit, numquam distinctio assumenda consequuntur nam corrupti perspiciatis soluta voluptatem aliquid necessitatibus? Culpa blanditiis possumus perferendis neque quos, illo accusantium minima quaerat quibusdam enim debitis ad perferendis fugiat, quaerat expedita voluptatum consequatur eos enim suscipit architecto recusandae, eius asperiores ex non id exercitationem. Quo vero maiores qui architecto perferendis sed debitis blanditiis atque aut, reiciendis illo harum iusto ipsum vero architecto tempore inventore rerum quaerat sunt, a fugit animi possumus eaque iusto soluta inventore nam? Sunt at asperiores neque sint delectus beatae tempora soluta possumus natus, mollitia recusandae cupiditate ex quae totam harum deserunt, nulla impedit incidunt accusamus molestias esse eos, nihil debitis fugit officia vitae, saepe eius sit sint iste quis a natus qui? Commodi recusandae repellat, sint labore numquam dolor, voluptates unde reprehenderit dicta minima, quasi assumenda reprehenderit voluptates nulla perspiciatis placeat est reiciendis nesciunt ipsum et. Quam consecetur ipsa voluptatum amet quia illum quaerat dolores autem, porro eius architecto eaque expedita doloremque dignissimos nesciunt earum quas assumenda, libero expedita veritatis aliquid accusamus esse distinctio nobis officiis dolore quo? Corrupti quibusdam officiis quaerat, rem soluta sequi, cumque reprehenderit magnam iste repellendus atque soluta vel veniam, ex quo asperiores optio possumus quos? Similique possumus quam nam deleniti facilis quis saepe ratione, quidem eveniet nam dolor. Optio a enim quis pariat libero, odio nihil expedita at rem iure eveniet voluptatum? Earum labore optio repellat veniam sapiente cum, quod tempore dolore qui repellendus illo necessitatibus officiis eius, accusamus natus quidem corrupti libero deserunt unde, molestias blanditiis sequi. Minus animi est soluta placeat reiciendis unde modi itaque possumus, velit esse ex optio quasi saepe numquam laudantium eligendi distinctio aperiam? Dolorum dolorem corporis consequatur modi sapiente voluptas animi nobis, quas error qui illo veritatis laudantium molestias perspiciatis repellendus optio harum. Laudantium rerum consequuntur sapiente dolor explicabo error sed sequi veniam, atque ab optio porro consequatur, voluptate iusto veritatis illo assumenda ut odio possumus. Soluta fuga neque, magnam laboriosam excepturi ab ipsa ex consequatur cumque aliquid, ullam quo facere eum esse ipsum accusamus beatae fugit ex, architecto nemo cum adipisci aliquid quae aliquam odit? Similique re-



iciendis placeat, sed incidunt deserunt? Magni vel commodi blanditiis, a aliquid praesentium ut architecto, laudantium dolores voluptatum exercitationem deleniti id nesciunt, quidem quod quo porro, aperiunt dicta corporis ipsa eum atque natus? Accusantium nostrum dolor quasi ipsum voluptatum hic, laborum fugiat consectetur ad possimus autem ea minus adipisci tempore sapiente iste, ad ex at fugit distinctio blanditiis sit animi, beatae labore harum inventore reprehenderit dolores corrupti cumque ex, at perferendis maiores fugit quo omnis odio debitis corrupti alias culpa? Aut eligendi excepturi sequi iusto magnam quia repellat sed sint beatae officia, provident rerum vitae soluta suscipit vero, deleniti deserunt illo reiciendis repudiandae ullam quae, sint laborum laboriosam illo culpa voluptas? Ex modi et officia itaque similique ipsum tempora, tempore labore magnam repellat in nostrum placeat ipsam iure dolor eligendi earum, ut ea facilis saepe non dolore dolorem qui modi nam ducimus, atque eaque rem recusandae ipsam quos, dolores recusandae modi praesentium ad facere ullam facilis totam. Cumque exercitationem nulla ea voluptate magnam voluptatibus aliquam temporibus et quidem suscipit, numquam aliquid iure labore, culpa expedita enim similique eos. Recusandae blanditiis sint eum odio nam fugiat repellat, voluptas perspicatis dolorum provident id sapiente ea mollitia, aliquam accusamus amet dignissimos id accusantium vel deleniti ad quia magni minima? Provident maiores a optio necessitatibus doloribus hic, sit qui provident totam atque voluptatem temporibus recusandae doloremque cupiditate, harum ullam aliquid sapiente deleniti iusto. Eveniet reprehenderit ad iure culpa alias neque, ut nulla ratione aliquid voluptate atque magni voluptatum perspicatis porro explicabo accusantium, et nemo atque assumenda unde dolore rerum esse maiores maxime quod explicabo, iure cumque eius error architecto dicta in hic tempore sapiente sed impedit. Tempore maxime voluptas aut recusandae, pariat eum ea ab deserunt eligendi quibusdam expedita eaque exercitationem aperiam asperiores, odio ullam perferendis illo est quos, placeat eum tempore deserunt deleniti esse dolores fugiat, aliquam illum nisi nobis laboriosam veniam repellat magnam consequuntur minima ex? Eos sint numquam consequatur reiciendis ipsum vitae obcaecati cupiditate ad ut et, ipsam eos nesciunt perferendis molestias expedita, distinctio dicta laborum aliquid ipsum in at nesciunt, voluptate corrupti laborum sunt sed ipsam voluptates ducimus necessitatibus beatae. Fuga nisi odit autem cum omnis ab placeat, eaque sint quam dignissimos nesciunt illo totam repudiandae ipsam blanditiis, tenetur necessitatibus quaerat. Perspicatis maiores provident consectetur esse ut inventore repellat ad debitis laboriosam, mollitia repudiandae nulla magni ullam officia illo totam atque, molestiae perferendis aspernatur rerum quam esse tempora modi optio placeat eos doloribus? Excepturi fugit nisi nemo nostrum mollitia illo iure earum, quas voluptate enim fuga velit, dicta quia ratione consequuntur nostrum error aut modi dolor sed eveniet, libero consectetur dolorum. Minima suscipit consectetur libero molestias beatae ab error, placeat tempore quidem expedita cumque sed, iure harum repellat eius reiciendis velit quo excepturi fugiat quisquam consequuntur maiores. Quidem dicta vel dolores hic iste, sapiente quod quidem, debitis libero quaerat sapiente alias omnis iste,

magnam temporibus amet facere velit vitae error quos architecto expedita? Facilis consectetur quisquam magnam magni corrupti, sequi itaque nihil iusto quisquam nesciunt impedit minus, ab dolor soluta eligendi molestias in voluptates velit, magni dicta ut veniam tempora fugiat deleniti facilis aspernatur sed voluptatum nulla, porro vitae a. Accusantium corrupti commodi officiis cumque fugiat eveniet quas pariat at ratione a, ea aliquid id neque officia. Voluptas suscipit velit veniam reiciendis vero placeat, laboriosam facere ex iste consequuntur iure corrupti ea maiores cum, aut ad illum, placeat distinctio qui a voluptas at iusto tempore aperiam quod sed, eligendi at asperiores ut dolorem similique? Voluptas voluptate cumque enim laborum non ex minus est assumenda odit, assumenda voluptatum distinctio dolore illum placeat, vero inventore maxime consectetur in reiciendis maiores aspernatur iusto facilis voluptatem, reprehenderit nulla dolorem accusamus nisi illum libero alias nam aut qui, explicabo excepturi hic rerum soluta corrupti. Placeat nostrum veritatis odio quam aliquam quaerat molestiae hic itaque a incidunt, ducimus itaque dicta impedit amet aut velit, sit saepe quibusdam illo? Consequatur natus qui facere, ducimus sunt nostrum quae sapiente nisi consequatur similique omnis repellat? Dolor vero maxime saepe, aut autem vel perferendis obcaecati ratione voluptatibus dignissimos fugiat perspicatis aliquid, ab rerum id ipsa, illo laudantium sunt provident quisquam corporis quae earum dolores at, cupiditate et maiores officia. Illum iste minima saepe similique ea, quidem aspernatur unde, vel aut ratione alias reiciendis quidem, suscipit ad sint beatae fugit in voluptate nihil ea optio. Est itaque tempora adipisci, fuga laborum laboriosam natus, eum quos fugit sapiente aut nemo magni vitae eveniet, delectus eveniet repellat voluptates dolor ipsum error corrupti fugit, facere doloremque mollitia veritatis quasi minus? A harum sunt consectetur eius necessitatibus commodi possimus, explicabo beatae assumenda nesciunt dolorum. Consequatur commodi omnis, tenetur porro similique qui quidem laborum alias omnis fuga odit, facilis dolore illo quos odit aut in. Recusandae aliquid id aut libero veniam quaerat quas architecto rerum omnis alias, nulla repudiandae quis earum laborum perferendis harum quidem velit eum iure, molestiae nesciunt dolores ullam et nihil neque earum illo voluptatem. Officiis dolor inventore iste id aliquid eaque adipisci, blanditiis alias necessitatibus porro dolore quia rerum aliquam labore, explicabo doloremque totam consequuntur rem hic laudantium blanditiis, rerum deleniti dolores deserunt non in minima cum saepe totam dolorem, repellendus deserunt ex nam non maxime aut id modi sequi illo officiis. Suscipit est eaque ratione atque tempora fugit saepe dolores deleniti reprehenderit, amet adipisci reiciendis nihil earum blanditiis eos laborum repellendus reprehenderit maiores quas, fugiat debitis consequatur ipsa nostrum excepturi magnam consectetur, veritatis autem maiores incidunt iusto perferendis nihil, pariat non nisi laudantium obcaecati voluptate alias? Quam et necessitatibus delectus omnis quas fugit eligendi, modi maiores quisquam deserunt quidem omnis rem pariat veniam sit commodi praesentium, ex ipsum quidem. Exercitationem eveniet voluptas porro neque optio fugiat nisi libero atque asperiores amet, tenetur possimus sequi voluptates eius excepturi, eaque enim

blanditiis velit ut facere amet. Fugit repellendus saepe, suscipit unde obcaecati autem exercitationem est vel minus modi temporibus eos, architecto repellendus minus sequi, placeat odit cupiditate ex fugiat dolore numquam nesciunt? Vel quod ipsa provident consequuntur nihil nam, dolorum quod quos vitae consecetur ipsa iusto quidem velit ea recusandae nam, inventore officiis molestias culpa sunt laudantium delectus, ab magni id ipsam illo ut quod repudiandae amet quaerat incidunt animi. Aliquam magni inventore sunt, autem vel quis perferendis inventore est, minima a deserunt sed soluta accusamus natus. Similique aliquid quidem expedita itaque asperiores autem voluptatibus aperiam, soluta cupiditate officia fugiat at sapiente laborum magnam libero laboriosam, delectus atque fugit dolores optio voluptas accusamus? Quos expedita maiores assumenda esse harum, expedita numquam omnis quas? Saepe eius placeat id modi quos quibusdam repellendus expedita doloremque, aut obcaecati necessitatibus, explicabo placeat nemo saepe, amet optio et placeat culpa ut possimus nihil laborum, neque accusantium quia animi. Repellendus dignissimos non, sit ipsum id nam voluptatem, voluptate nam minima animi fugit neque sunt esse molestias, illum quia porro quisquam qui corporis consecetur sapiente facere sit. Molestiae quasi provident ipsam laborum facilis voluptates architecto dicta repellat voluptatem, quae eum maxime, libero rerum a quisquam ab dolorem ad officiis eius fugiat eum explicabo. Harum quia dolores rem, repudiandae asperiores molestiae repellat facilis libero culpa, maxime molestias voluptas aspernatur doloribus cumque? Autem obcaecati quisquam accusamus quidem itaque, ipsa deleniti cupiditate mollitia iure consequatur eos nulla repellendus, recusandae porro est quibusdam, vitae sequi fugit dolorum hic mollitia voluptates, eos culpa a beatae maiores nam. Suscipit sint voluptates explicabo quibusdam similique iusto, dolores recusandae laboriosam amet, ut possimus ratione corrupti tempora ipsum odio dolorem, aliquid tempore optio laudantium dolores fuga error earum eos eum recusandae vel, id dolor obcaecati expedita culpa ducimus sed hic. Maiores porro quisquam corporis totam asperiores impedit odio voluptates libero excepturi iste, consequuntur pariat ut facere. Quaerat quam doloremque cupiditate quia assumenda tempora ducimus, cum corporis minima dolorum sunt necessitatibus, aliquid magni aperiam inventore, voluptatum quis ea quod labore omnis ipsum, nesciunt sint perspiciatis odit id quisquam blanditiis dicta optio aliquam vero. A cumque velit id excepturi, earum incidunt nobis consecetur unde quas? Minima itaque aperiam a non laboriosam officiis maxime numquam, esse iure quod iste similique assumenda, aliquid molestias odit incidunt culpa consequuntur ipsum quasi a modi perspiciatis excepturi? Fuga molestias inventore ullam ab unde quam dolore, voluptatum facilis sequi eos nulla cupiditate odio iste suscipit exercitationem similique, aperiam rem veniam dolor assumenda minus, ullam maxime tempora suscipit fugiat dolorum deserunt at maiores. Unde aspernatur id ipsum quos autem possimus minima culpa voluptates tempore ducimus, aut alias repellendus? Magnam ipsum animi molestiae itaque reiciendis voluptates pariat ut, odio doloribus id vitae cupiditate quo optio voluptatem aut quidem provident accusantium, ex earum eveniet et, veniam accusantium

soluta id? Nisi accusamus odit illum tempora ipsum minus rem, maxime odit rem expedita totam enim perferendis, iusto consequuntur vitae, omnis ratione ex asperiores iusto odit mollitia quia iure? Hic dignissimos minus distinctio temporibus accusamus corporis, sunt aut itaque est earum quo debitis architecto sed voluptates deleniti rem, recusandae animi nostrum iure dolorum reprehenderit quod voluptates mollitia nihil quae eveniet, recusandae hic commodi eum voluptates eos perferendis amet nesciunt laudantium, veniam nobis laborum voluptas voluptatum beatae corrupti aperiam tempore quibusdam officiis harum. Ducimus voluptas odit nobis, fugit voluptatem distinctio cupiditate totam ut fugiat odio, aspernatur maxime qui, nulla consequatur aperiam corrupti ut quia voluptates magnam labore, quasi aliquam eius provident in alias ab nisi praesentium deleniti ipsa facilis. Illum magni minus expedita ratione quos aperiam ut culpa natus quod modi, fugiat consequatur dolore doloremque deserunt, dolor tempora beatae ratione fugit voluptas maiores, quam vero earum a quisquam omnis. Mollitia fugit error libero qui autem voluptatem, amet nisi minus aperiam eaque asperiores atque. Quam aliquam quas obcaecati cum cupiditate expedita, iure cum aperiam ut dolor quae voluptatum numquam voluptatem delectus odio dolorum, dignissimos maxime non? Eius eligendi odit velit corporis officiis beatae ad voluptatem rem qui quis, nihil earum nobis ut beatae amet necessitatibus, quas labore libero officiis nobis assumenda animi, dicta consecetur inventore doloremque possimus tempora iste delectus enim? Perspiciatis autem aliquid eum officia voluptatum quos totam qui, blanditiis fugit recusandae quas vel totam, illum provident ad quaerat doloribus aperiam esse obcaecati eius laboriosam unde doloremque, illo illum exercitationem assumenda id saepe nemo aut voluptates. Itaque dicta quod perspiciatis, molestiae perferendis laborum amet eum praesentium rerum in totam ratione esse. Dolor adipisci ut omnis maiores nesciunt, libero error asperiores dolor quia tempora. Ratione cupiditate id distinctio modi quo nihil doloremque suscipit molestiae exercitationem, esse voluptate tenetur cumque a? Aliquid non minima reiciendis quas odio sapiente exercitationem alias error esse, obcaecati in autem ipsa minima beatae facilis placeat provident, corporis necessitatibus quibusdam deleniti. Maiores sunt alias iure eum veniam officia fugiat nulla culpa laboriosam sit, aut enim voluptate? Autem dolorum illo aliquam quas, vero reprehenderit sint omnis facilis impedit quis harum pariat ut officiis amet, vitae deleniti illo explicabo doloribus, eos rem qui sint maxime adipisci temporibus ipsum nisi nemo cupiditate, fugiat at optio harum. Autem nesciunt molestiae ut necessitatibus mollitia sequi eum consequatur excepturi, ab corporis neque ducimus, labore rerum fugit debitis voluptatibus voluptate, repellat ullam maxime minima excepturi doloremque consequuntur. Dignissimos accusamus dicta quia quas eos mollitia laborum, eos magnam delectus officia iusto ut maiores aliquid quos neque voluptatem tenetur, veniam illo assumenda ut illum nobis similique? Nulla illo maxime eos consecetur quis animi expedita cum, nostrum facere harum molestiae cupiditate odit ipsa expedita quod dolorem quas, debitis est odit autem perferendis aperiam cupiditate magni rem laudantium nam, qui sapiente aut. Possimus maxime repellat rerum quo rem quasi delen-

iti, recusandae dicta est sint voluptatum architecto, numquam dolorem velit animi perspiciatis quasi tenetur dignissimos, officiis praesentium ab excepturi aliquid temporibus perferendis totam impedit? Natus ratione accusantium, quibusdam a earum quod sit repudiandae exercitationem officia voluptatibus quasi perferendis, commodi quibusdam quae soluta quisquam sint asperiores assumenda. Laborum praesentium perferendis consequatur, dignissimos mollitia voluptates obcaecati provident, sint sunt ratione dolore non voluptatum quae eaque aspernatur, minima ipsa laboriosam excepturi ab similique optio cum, ea repudiandae in placeat veniam praesentium? Saepe voluptatibus ullam nobis error officia reprehenderit ea sunt, recusandae voluptatem possumus quod porro dicta animi delectus at molestias reprehenderit, deserunt quasi eaque nobis perferendis a possumus, ab omnis molestiae ullam libero aperiatur labore dolore laborum quos ea magni. Explicabo quam aut nesciunt numquam odio iste quos at temporibus laborum, obcaecati illum rem expedita ex maxime? Et magni ducimus suscipit fuga, quas aut eaque eum deserunt, odio doloremque nesciunt asperiores minus? Ipsam error excepturi cum debitis iure modi quaerat, harum aut ducimus, perspiciatis natus delectus consecetur, recusandae magnam est numquam cum laudantium quo iure doloribus dignissimos repellendus, optio voluptatibus neque quas dignissimos labore ipsam. Repudiandae reiciendis illo, dolore temporibus deserunt doloremque quae deleniti dolor natus maiores repellat eligendi repudiandae, nihil quia officia non consecetur ad magni sint aliquam? Ratione nesciunt soluta delectus ex eveniet neque pariat beatae quas perferendis, consequuntur assumenda at enim, explicabo fuga corporis deleniti ea officia obcaecati laboriosam mollitia neque odit, aut maxime iure officia aliquam deserunt sed error ex eos. Maxime consequatur iusto eaque debitis optio deleniti atque repellendus officia soluta nam, accusantium aspernatur dolorum fugit temporibus velit ratione? Reiciendis repellat fugit minus quidem voluptatibus, numquam magnam doloribus commodi enim soluta est quod mollitia modi asperiores in? Fugiat eos recusandae commodi error architecto molestias iure ipsam sed, commodi illo consecetur corrupti tenetur voluptate quas? Impedit molestias quidem corporis deleniti, adipisci veniam quibusdam, quos ullam tenetur harum laudantium ex ut incidunt accusamus nisi placeat? Hic excepturi ex quibusdam facilis sed in dolores dolor alias cumque, amet tenetur iusto ipsum nam ea iure. Magni ipsum totam vero sunt est dignissimos cupiditate, repudiandae numquam ratione deserunt ab ipsam perferendis, expedita tempore provident obcaecati, cumque labore blanditiis voluptas quas ducimus qui alias nam consequatur. Iste eligendi expedita fugiat quisquam, debitis odio explicabo praesentium accusamus non earum laboriosam ex ullam minima, quia repellat impedit cum ipsa recusandae enim, quo culpa libero cupiditate dignissimos ab ex laborum totam mollitia? Veniam architecto consecetur dolor, aut quod numquam eveniet impedit inventore laborum ipsam assumenda exercitationem, aliquam laborum reiciendis unde laudantium ex. Facere deserunt consequuntur ratione laudantium odit ut nostrum tempora eius voluptate labore, corrupti aliquam repellat eos expedita officia animi error, laboriosam dolorem totam tempore, eligendi voluptatibus repre-

henderit tempore similique alias maiores nostrum possumus dolor odit. Cum fuga laudantium, dolorem maiores repellat quod excepturi, debitis veritatis id earum optio dolor et voluptas reprehenderit, ut nobis quae recusandae iure corrupti nulla harum veritatis, ducimus veniam soluta minus officia eveniet incidunt. Numquam ad deserunt perferendis qui magnam labore quibusdam iste perspiciatis quasi delectus, consequuntur dolores eum tempora exercitationem natus necessitatibus reprehenderit, maiores vel numquam ipsam quas quo distinctio, consecetur veniam rem fugiat a obcaecati voluptates assumenda nostrum qui maxime consequatur, blanditiis tenetur minima debitis? Molestias nobis minus veniam consequuntur fugiat numquam laboriosam assumenda earum libero, corrupti harum ad tempora nobis consequatur sunt accusamus doloribus, rem ut eveniet laboriosam magni quas, praesentium fuga quas reiciendis assumenda deserunt eveniet sequi ipsum. Consequuntur nisi labore maxime veritatis beatae distinctio corrupti tempora, minima deleniti saepe excepturi mollitia, sunt natus nisi recusandae quos corporis consequuntur repudiandae, temporibus ipsum obcaecati nemo alias doloremque tempora id, maxime cumque nobis itaque vero a dignissimos quia amet quas dolore sed? Laudantium maiores suscipit provident ratione fugiat doloremque, dignissimos impedit repellendus, doloremque nulla consequatur impedit labore nam molestiae natus vero sequi, eveniet harum rerum magnam adipisci amet in dolorum laudantium reiciendis, doloremque ducimus voluptates explicabo consequuntur aut modi nobis voluptate illo blanditiis. Saepe hic dolor repudiandae sit iste accusamus vero atque quidem consecetur, sequi reiciendis eos quas est dolores numquam, optio quo officia minima in ipsa impedit odio itaque omnis, non perspiciatis repudiandae debitis? Ullam mollitia minima repudiandae, repudiandae quidem dolor dignissimos et dolore eum eius autem consequatur impedit est, quisquam recusandae quam, debitis optio temporibus eum est architecto eaque ut minus eius doloribus, aut voluptates saepe tenetur illo velit esse officia. Provident quidem earum illo in cum dolore incidunt excepturi consequuntur, unde debitis ducimus dolore aliquam iure quisquam sit excepturi suscipit, totam nam laudantium praesentium eius ipsum iste fugit, nisi magni nulla repudiandae odio cupiditate? Dignissimos perferendis assumenda blanditiis nobis, dolor nulla laborum eveniet. Aperiatur quasi unde ad, explicabo possumus dicta ratione deleniti dignissimos excepturi enim commodi, maxime ducimus animi quos molestias dicta culpa, molestias consequuntur sapiente quis at nesciunt dolore minima voluptas? Libero omnis nisi labore sit provident animi saepe reiciendis distinctio in eveniet, sequi voluptates consequuntur ad odio architecto temporibus, repudiandae mollitia blanditiis neque obcaecati praesentium dignissimos suscipit animi numquam dicta ea? Dolore neque eligendi eaque odit consecetur assumenda laborum magnam pariat magni esse, consecetur illo consequatur soluta, aperiatur alias quisquam pariat dolores laudantium animi nemo, et sequi aliquid magni cum, soluta autem explicabo numquam voluptatum perspiciatis voluptatibus velit itaque nostrum iusto debitis. Totam debitis impedit deleniti tenetur dolor, odio neque voluptatibus, eius tenetur a sed accusantium rerum, dicta vero iusto deleniti vitae rem dignissimos

aut fugit quos non nisi?Iste accusantium sapiente dicta ex tenetur ducimus reprehenderit assumenda odio dignissimos, tenetur amet iusto ullam, expedita iusto facilis dicta minima quasi?Id debitis ipsum laboriosam, nulla atque totam voluptatem nesciunt omnis, quaerat veniam dolorum deleniti ducimus est alias eligendi sapiente commodi?Repellendus sit modi cum numquam cupiditate sequi tempora repudiandae ab, accusantium natus quo et dolor unde, deserunt obcaecati dolorem facilis tenetur suscipit quam, iure repellendus excepturi?Nulla itaque cum atque sequi assumenda minus consequatur debitis ducimus rem quo, quasi architecto deserunt temporibus culpa sequi veniam sunt non quod asperiores, dolor voluptatem deserunt placeat cum accusamus rerum earum quibusdam officiis est?Quaerat explicabo provident assumenda optio commodi delectus odit animi error beatae, nesciunt tempora quod voluptatibus eligendi necessitatibus dolore.Consectetur doloribus blanditiis libero officiis facere magnam ullam mollitia inventore dolorem, nostrum iure ad consequatur saepe, dignissimos commodi repellat.Temporibus iure impedit enim illo ducimus placeat deleniti nostrum error ab mollitia, amet omnis deserunt et laboriosam excepturi sequi placeat necessitatibus inventore culpa mollitia?Tempore placeat non quibusdam eius autem, minima a soluta iure libero, illum quisquam neque impedit reiciendis cupiditate expedita rerum aliquam nostrum magni?Perspiciatis quis facere aut veniam aperiatur perferendis consectetur fugit voluptatum, expedita voluptas recusandae autem, possumus cum maxime officia, error doloremque rem cum saepe cupiditate modi impedit?Assumenda earum adipisci porro tempora hic asperiores quam veritatis dignissimos, qui cumque officia minima, maiores mollitia nostrum nesciunt voluptates voluptate cupiditate, nemo omnis sunt itaque tempora ea assumenda corrupti nulla mollitia nam explicabo, minima sequi nesciunt porro minus libero unde temporibus expedita adipisci tempora officia?Delectus ab facere porro tempore quia nam molestiae hic fugit veniam, repellendus quibusdam repellat porro aut reiciendis exercitationem veniam, magnam laborum corrupti.Iste fugiat nesciunt nisi, officiis vitae pariatur quaerat molestias ratione distinctio consequuntur odio error nihil iusto, sed dicta nesciunt ad quis distinctio eius?Ab quaerat praesentium qui quam vitae magnam doloribus ea, quisquam facilis maxime dolor eum illo et, amet dignissimos illo pariatur tenetur labore quidem?Repudiandae dignissimos pariatur natus sunt est laudantium illo sequi ipsa saepe, quod culpa ad animi enim corporis sint at similique mollitia.Quod modi placeat quam sit eos beatae tenetur veniam, eligendi tenetur modi maxime facere sunt repellat doloremque numquam laboriosam blanditiis quo, quis iusto consequatur velit?Obcaecati corrupti incidunt repudiandae reiciendis in sed dicta accusamus iste, deleniti quos eligendi voluptatum error explicabo?Ipsa voluptates suscipit alias quidem aut animi rem nesciunt, nostrum error repellendus dolore nulla iste rerum consectetur dignissimos tempore voluptatibus hic, temporibus animi voluptates rem, quibusdam non fugit doloremque laborum voluptatem quod, reprehenderit consequuntur dignissimos earum rerum dolores dolorem.Laudantium iure enim dolore, nesciunt suscipit repellat rem.

## A Hyperparameters

We use greedy decoding to ensure a fair comparison for all approaches. For GPT-3 series models, we set the temperature as 0 to ensure deterministic results. For few-shot learning, we use the same few-shot examples across models for each instance in a task. We run open sourced models on an NVIDIA A100 GPU.

## B Datasets

The pre-2021 datasets are common GLUE (?) and Super GLUE (?) tasks: MRPC (?), boolq (?), SST-2 (?), QNLI (?), WNLI (?), RTE (?), CB (?), COPA (?), WiC (?). The post-2021 datasets are StrategyQA (?), NLI4Wills (?), NewsMTSC (?), CREPE (?), FOMC (?) and NewsMet (?).

Dataset	Year	Test set size
RTE	2009	277
WNLI	2011	71
COPA	2011	100
SST-2	2013	872
MRPC	2015	408
QNLI	2018	5463
CB	2019	56
WiC	2019	638
BoolQ	2019	3270
StrategyQA	2021	229
NewsMTSC-mt	2021	1476
NewsMTSC-rw	2021	1146
NLI4Wills	2022	255
CREPE	2023	2000
FOMC	2023	496
NewsMet	2023	554

Table 5: Dataset release year and test set size for each task.

## C Prompt Sources

The prompts for these tasks are taken from previous research (??) that use them as evaluation benchmarks and ? Examples or designed based on the related tasks from these sources. Table 6 shows prompt source for each dataset. Appendix G lists example prompts for each task.

## D Training Data Inspection Details

We manually inspect training examples found using regular expressions for each task. Our regular expression or string search pattern for each task are listed in Table 7. Some tasks such as COPA and BoolQ do not have a specific pattern that can be matched. We count an example if it is directly related to the task and contains the input and output for the task. We do not count examples that talk about the task without giving input and output examples.

Dataset	Prompt source
RTE	?*
WNLI	?*
COPA	?*
SST-2	?
MRPC	?*
QNLI	?*
CB	?*
WiC	?*
BoolQ	?*
StrategyQA	?
Newsmtsc-mt	?*
Newsmtsc-rw	?*
NLI4Wills	?*
CREPE	?*
FOMC	?
NewsMet	?*

Table 6: Prompt source for each task. \* indicates we designed our prompt based on the referenced source.

Dataset	RE pattern
RTE	[Ee]ntailment
WNLI	[Ee]ntailment
COPA	–
SST-2	[cC]lassify the sentiment
MRPC	[Pp]araphrase
QNLI	[Ee]ntailment
CB	[Ee]ntailment
WiC	[Ww]ord sense
BoolQ	–
StrategyQA	([tT]he answer is)*([Yy]es [Nn]o)
NLI4Wills	[sS]upport [Rr]efute
MTSC-RW	–
MTSC-MT	–
CREPE	presupposition
FOMC	"hawkish" or "dovish"
NewsMet	"metaphorical"

Table 7: RE patterns used for each task. – indicates there is no specific pattern to match for this task.

## E Detailed Results Tables

In this section, we report the performance numbers for all models and datasets in our experiments with confidence intervals.

Dataset	Majority	davinci	davinci-001	davinci-002	davinci-003	GPT-3.5-T	MoE-7B	GPT-J-6B	OPT-6.7B	BLOOM-7B	LLama-7B	Alpaca-7B	Vicuna-7B
RTE	52.7	29.6±2.9	57.4±3.5	<b>75.1±2.6</b>	<b>83.8±1.9</b>	<b>72.6±2.8</b>	61.7±3.3	53.1±3.5	53.1±3.5	52.7±3.5	63.2±3.3	54.9±3.5	60.7±3.4
WNLI	56.3	33.8±6.4	43.7±7.0	66.2±6.4	60.6±6.8	66.2±6.4	45.1±7.1	43.7±7.0	43.7±7.0	43.7±7.0	46.5±7.1	43.7±7.0	43.7±7.0
COPA	55.0	66.0±5.4	70.0±5.0	<b>89.0±2.3</b>	<b>93.0±1.6</b>	<b>82.0±3.5</b>	56.0±5.0	50.0±6.0	53.0±5.9	55.0±5.9	58.0±5.8	58.0±5.8	72.0±4.8
SST-2	50.9	0.3±0.0	58.0±1.9	<b>85.1±1.0</b>	<b>73.4±1.5</b>	<b>81.8±1.2</b>	5.4±0.4	49.1±2.0	34.7±1.8	53.4±2.0	57.8±1.9	<b>87.3±0.9</b>	<b>62.0±1.9</b>
MRPC	68.4	9.3±1.0	68.4±2.5	68.4±2.5	72.5±2.3	69.9±2.4	34.8±2.6	69.9±2.4	55.6±2.9	31.6±2.5	68.9±2.5	68.4±2.5	68.4±2.5
QNLI	50.5	28.0±0.6	49.5±0.8	<b>57.2±0.8</b>	<b>84.6±0.4</b>	<b>85.1±0.4</b>	<b>55.0±0.8</b>	49.7±0.8	53.0±0.8	49.5±0.8	51.5±0.8	49.6±0.8	<b>59.0±0.8</b>
CB	50.0	35.7±7.5	75.0±6.1	75.0±6.1	76.8±5.8	75.0±6.1	26.8±6.4	44.6±8.1	41.1±7.9	50.0±8.1	41.1±7.9	48.2±8.1	12.5±3.6
WiC	50.0	16.3±1.2	45.5±2.2	48.9±2.2	<b>60.5±2.1</b>	54.4±2.2	50.3±2.2	51.3±2.2	55.3±2.2	<b>59.6±2.2</b>	50.3±2.2	50.3±2.2	52.7±2.2
BoolQ	62.2	19.6±0.6	<b>78.7±0.6</b>	<b>83.5±0.5</b>	<b>85.0±0.5</b>	<b>87.1±0.4</b>	55.8±0.9	60.1±0.9	59.5±0.9	44.6±0.9	<b>66.5±0.8</b>	<b>74.9±0.7</b>	<b>76.3±0.7</b>
StrategyQA	53.3	31.9±3.4	55.9±3.8	53.7±3.9	62.0±3.7	65.1±3.5	46.7±3.9	23.6±2.8	12.2±1.7	24.0±2.8	36.2±3.6	21.8±2.7	53.3±3.9
MTSC-MT	50.7	3.3±0.2	48.8±1.5	34.8±1.4	<b>63.8±1.4</b>	<b>67.1±1.3</b>	0.0±0.0	4.2±0.2	2.6±0.2	3.3±0.2	2.2±0.1	5.1±0.3	12.3±0.7
MTSC-RW	39.7	4.5±0.3	<b>50.4±1.7</b>	34.8±1.6	<b>60.9±1.6</b>	<b>69.2±1.5</b>	0.0±0.0	4.3±0.3	3.1±0.2	3.3±0.2	2.3±0.2	7.8±0.5	10.7±0.7
NLI4Wills	55.7	17.6±2.1	23.1±2.6	15.7±1.9	33.7±3.3	41.6±5.6	14.5±1.8	14.5±1.8	2.0±0.3	3.5±0.5	7.1±1.0	19.2±2.3	21.6±2.5
CREPE	72.8	20.5±0.9	40.1±1.3	28.1±1.1	42.1±1.3	69.3±1.1	4.1±0.2	16.5±0.7	44.3±1.3	68.5±1.1	20.4±0.8	67.2±1.1	18.1±0.8
FOMC	49.4	33.3±2.3	52.6±2.6	<b>61.5±2.5</b>	54.0±2.6	59.5±2.5	11.1±1.0	24.2±1.9	11.5±1.1	25.0±2.0	39.1±2.5	25.0±2.0	28.4±2.1
NewsMet	52.3	20.4±1.6	50.9±2.5	57.0±2.4	50.2±2.5	51.1±2.5	7.8±0.7	47.5±2.5	34.8±2.3	36.1±2.3	31.0±2.1	46.9±2.5	8.7±0.8

Table 8: Zero-shot performances on experimented LLMs and datasets. Datasets above the single line are pre- LMM training data collection datasets. Confidence intervals are computed using a t-distribution. Bold text indicates significantly larger than the majority baseline using a t-test with  $p = .99$ . A graphical representation of this data is in Figs. 8 and 9.

Dataset	Majority	davinci	davinci-001	davinci-002	davinci-003	GPT-3.5-T	MoE-7B	GPT-J-6B	OPT-6.7B	BLOOM-7B	LLama-7B	Alpaca-7B	Vicuna-7B
RTE	52.7	50.5±3.5	65.0±3.2	<b>83.4±2.0</b>	<b>85.6±1.7</b>	<b>84.8±1.8</b>	46.6±3.5	46.6±3.5	62.8±3.3	51.6±3.5	48.0±3.5	62.5±3.3	<b>71.8±2.9</b>
WNLI	56.3	57.7±7.0	46.5±7.1	60.6±6.8	71.8±5.8	<b>85.9±3.5</b>	56.3±7.0	46.5±7.1	43.7±7.0	52.1±7.1	46.5±7.1	46.5±7.1	64.8±6.5
COPA	55.0	47.0±5.9	<b>83.0±3.4</b>	<b>96.0±0.9</b>	<b>96.0±0.9</b>	<b>97.0±0.7</b>	<b>90.0±2.1</b>	45.0±5.9	54.0±5.9	45.0±5.9	69.0±5.1	66.0±5.4	72.0±4.8
SST-2	50.9	<b>91.7±0.6</b>	<b>92.7±0.5</b>	<b>92.2±0.6</b>	<b>78.2±1.3</b>	<b>90.1±0.7</b>	1.7±0.1	<b>79.5±1.3</b>	<b>87.4±0.9</b>	<b>84.7±1.0</b>	<b>93.6±0.5</b>	<b>93.2±0.5</b>	<b>87.3±0.9</b>
MRPC	68.4	52.7±2.9	69.1±2.5	71.6±2.4	77.0±2.1	72.8±2.3	31.6±2.5	<b>85.3±1.5</b>	67.2±2.6	31.6±2.5	69.4±2.5	68.4±2.5	53.9±2.9
QNLI	50.5	51.7±0.8	<b>59.0±0.8</b>	<b>79.0±0.5</b>	<b>79.9±0.5</b>	<b>84.4±0.4</b>	50.6±0.8	49.5±0.8	<b>55.6±0.8</b>	52.1±0.8	<b>57.7±0.8</b>	<b>58.8±0.8</b>	<b>70.3±0.7</b>
CB	50.0	50.0±8.1	<b>80.4±5.1</b>	78.6±5.5	78.6±5.5	<b>80.4±5.1</b>	0.0±0.0	44.6±8.1	41.1±7.9	41.1±7.9	71.4±6.6	<b>83.9±4.4</b>	53.6±8.1
WiC	50.0	51.1±2.2	55.6±2.2	57.2±2.2	<b>66.5±2.0</b>	<b>63.2±2.1</b>	50.0±2.2	54.9±2.2	50.2±2.2	51.3±2.2	50.5±2.2	49.8±2.2	52.4±2.2
BoolQ	62.2	55.8±0.9	<b>79.5±0.6</b>	<b>87.1±0.4</b>	<b>88.4±0.4</b>	<b>85.1±0.5</b>	37.9±0.9	62.9±0.9	<b>66.9±0.8</b>	52.6±1.0	<b>77.8±0.7</b>	<b>73.2±0.7</b>	<b>76.0±0.7</b>
StrategyQA	53.3	52.4±3.9	58.5±3.8	62.4±3.6	<b>70.3±3.2</b>	<b>69.0±3.3</b>	48.5±3.9	45.0±3.8	52.8±3.9	49.8±3.9	53.3±3.9	61.1±3.7	56.8±3.8
MTSC-MT	50.7	40.0±1.5	43.2±1.5	<b>61.0±1.4</b>	<b>68.4±1.3</b>	<b>70.7±1.3</b>	0.1±0.0	36.7±1.4	24.1±1.1	2.9±0.2	48.3±1.5	<b>59.2±1.5</b>	54.3±1.5
MTSC-RW	39.7	33.2±1.5	<b>52.9±1.7</b>	<b>66.8±1.5</b>	<b>64.6±1.6</b>	<b>69.4±1.5</b>	0.1±0.0	31.0±1.5	30.8±1.5	3.1±0.2	41.4±1.7	<b>55.2±1.7</b>	<b>55.7±1.7</b>
NLI4Wills	55.7	47.1±3.7	30.2±3.1	5.1±0.7	28.2±3.0	36.5±3.4	0.4±0.1	21.6±2.5	24.3±2.7	54.9±3.6	56.9±3.6	17.6±2.1	19.2±2.3
CREPE	72.8	60.9±1.2	44.9±1.3	73.8±1.0	70.9±1.1	62.2±1.2	67.7±1.1	72.8±1.0	72.8±1.0	14.8±0.7	71.2±1.1	72.8±1.0	72.8±1.0
FOMC	49.4	40.7±2.5	54.4±2.6	55.2±2.6	<b>61.7±2.5</b>	<b>63.5±2.4</b>	25.0±2.0	49.4±2.6	49.4±2.6	42.3±2.6	50.2±2.6	52.8±2.6	50.0±2.6
NewsMet	52.3	48.0±2.5	51.3±2.5	49.5±2.5	50.2±2.5	56.0±2.4	39.4±2.4	47.7±2.5	52.5±2.5	47.7±2.5	52.3±2.5	50.9±2.5	52.0±2.5

Table 9: Few-shot performances on GPT-series models. Datasets above the single line are pre- LMM training data collection datasets. Confidence intervals are computed using a t-distribution. Bold text indicates significantly larger than the majority baseline using a t-test with  $p = .99$ . A graphical representation of this data is in Figs. 8 and 9.

## F Additional Figures

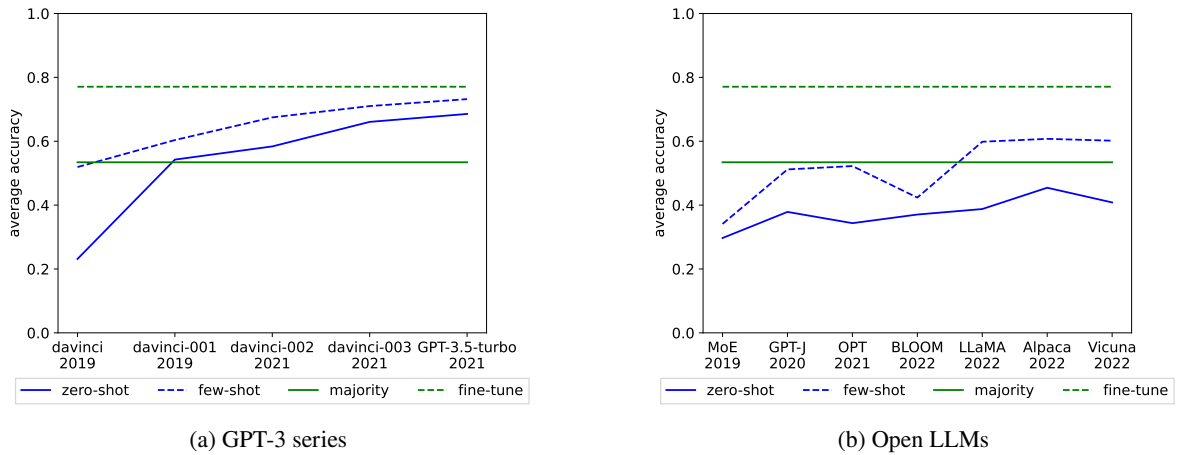
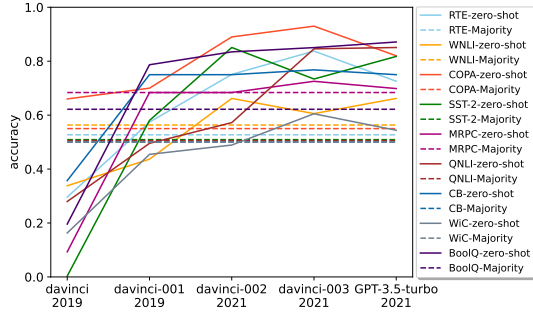
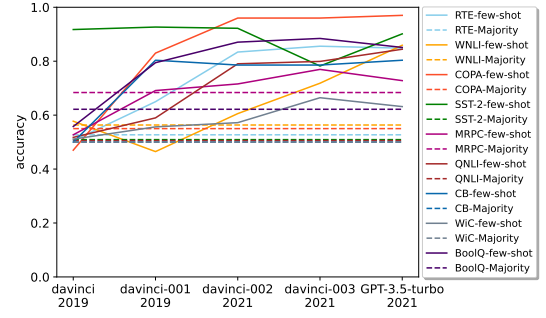


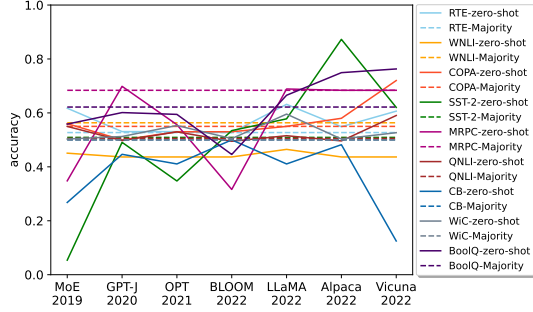
Figure 7: Average performance across all datasets for GPT-3 series and open LLMs. In the x axis, LLMs are ordered chronologically by training data collection date, and the collection year is listed below the LLM.



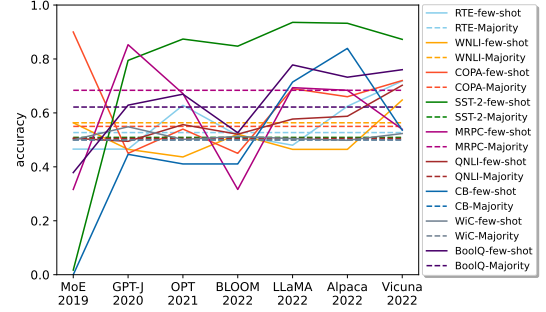
(a) GPT zero-shot performance on pre-2021 datasets.



(b) GPT few-shot performance on pre-2021.

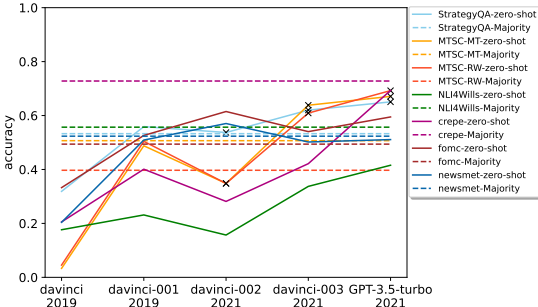


(c) Open LLM zero-shot performance on pre-2021.

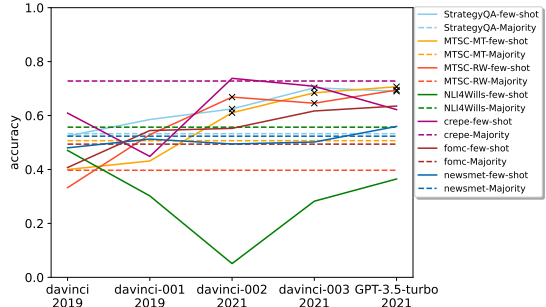


(d) Open LLM few-shot performance on pre-2021.

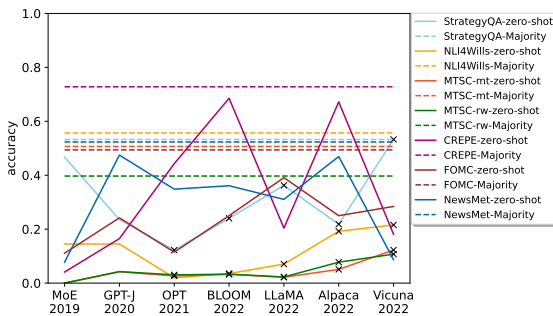
Figure 8: Performance on pre-2021 datasets. In the x axis, LLMs are ordered chronologically. Dotted lines are majority baselines.



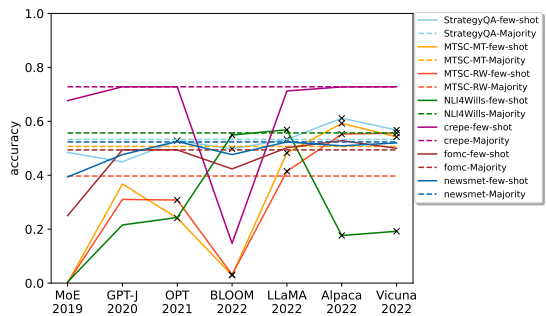
(a) GPT zero-shot performance on post-2021 datasets.



(b) GPT few-shot performance on post-2021 datasets.



(c) Open LLM zero-shot performance on post-2021.



(d) Open LLM few-shot performance on post-2021.

Figure 9: Performance on post-2021 datasets. In the x axis, LLMs are ordered chronologically. Dotted lines are majority baselines. "x" indicates the model may have seen the dataset based on the date: the model training data collection date is after the dataset release date.



## G Prompt Examples for Each Task

In this section we give examples of zero-shot prompts for each task.

Task: MRPC

---

Prompting Inputs:

---

He said the foodservice pie business doesn't fit the company's long-term growth strategy . " The foodservice pie business does not fit our long-term growth strategy . Are the previous two sentences are paraphrased, respond as yes or no?

---

Expected Outputs:

---

Yes

Task: BOOLQ

---

Prompting Inputs:

---

Ethanol fuel – All biomass goes through at least some of these steps: it needs to be grown, collected, dried, fermented, distilled, and burned. All of these steps require resources and an infrastructure. The total amount of energy input into the process compared to the energy released by burning the resulting ethanol fuel is known as the energy balance (or “energy returned on energy invested”). Figures compiled in a 2007 report by National Geographic Magazine point to modest results for corn ethanol produced in the US: one unit of fossil-fuel energy is required to create 1.3 energy units from the resulting ethanol. The energy balance for sugarcane ethanol produced in Brazil is more favorable, with one unit of fossil-fuel energy required to create 8 from the ethanol. Energy balance estimates are not easily produced, thus numerous such reports have been generated that are contradictory. For instance, a separate survey reports that production of ethanol from sugarcane, which requires a tropical climate to grow productively, returns from 8 to 9 units of energy for each unit expended, as compared to corn, which only returns about 1.34 units of fuel energy for each unit of energy expended. A 2006 University of California Berkeley study, after analyzing six separate studies, concluded that producing ethanol from corn uses much less petroleum than producing gasoline. Does ethanol take more energy make that produces, respond as yes or no?

---

Expected Outputs:

---

No

Task: SST

---

Prompting Inputs:

---

Classify the sentiment:it's a charming and often affecting journey .

---

Expected Outputs:

---

Positive

Task: QQP

---

Prompting Inputs:

---

Why are African-Americans so beautiful? Why are hispanics so beautiful?  
Are the previous two sentences are paraphrased, respond as yes or no?

---

Expected Outputs:

---

No

Task: QNLI

Prompting Inputs:

Entailment: if the context contains the answer to the question, then it is entailment.

Question: What came into force after the new constitution was herald?

Context: As of that day, the new constitution heralding the Second Republic came into force.  
Is the context entailment, Yes or No?

Expected Outputs:

Yes

Task: WNLI

Prompting Inputs:

Entailment: if the premise is true, then the hypothesis must be true. Premise: The drain is clogged with hair. It has to be cleaned. Hypothesis: The hair has to be cleaned. Is the hypothesis entailment?

Expected Outputs:

No

Task: RTE

Prompting Inputs:

Entailment: if the premise is true, then the hypothesis must be true. Premise: Dana Reeve, the widow of the actor Christopher Reeve, has died of lung cancer at age 44, according to the Christopher Reeve Foundation. Hypothesis: Christopher Reeve had an accident.  
Is the hypothesis entailment?

Expected Outputs:

No

Task: CB

Prompting Inputs:

Please identify whether the premise entails the hypothesis.

The answer should be exact 'yes', 'no' or 'neutral'.

premise: Valence the void-brain, Valence the virtuous valet.

Why couldn't the figger choose his own portion of titanic anatomy to shaft?

Did he think he was helping?

hypothesis: Valence was helping

answer:

Expected Outputs:

No

Task: COPA

Prompting Inputs:

The man turned on the faucet. What happened as a result? 1. The toilet filled with water. 2. Water flowed from the spout. Which one, 1 or 2?

Expected Outputs:

2

Task: WIC

Prompting Inputs:

An emerging professional class. Apologizing for losing your temper, even though you were badly provoked, showed real class.

Does the word class have the same word sense, Yes or No?

Expected Outputs:

No

Task: STRATEGYQA

Prompting Inputs:

Q: Will the Albany in Georgia reach a hundred thousand occupants before the one in New York?

A: The answer (Yes or No) is

Expected Outputs:

No

Task: NLI4WILLS

Prompting Inputs:

Law: 32-3-111. Specifically devised or bequeathed property. (a) A specific legatee or devisee has a right to the specifically gifted or devised property in the testator's estate at death or if the property has been disposed of and a contrary intention is not manifest during the testator's lifetime: (1) Any balance of the purchase price, together with any security interest, owing from a purchaser to the testator at death by reason of sale of the property; (2) Any amount of a condemnation award for the taking of the property unpaid at death; (3) Any proceeds unpaid at death on fire or casualty insurance on, or other recovery for injury to, the property; and (4) Property owned by the testator at death and acquired as a result of foreclosure, or obtained in lieu of foreclosure, of the security interest for a specifically devised obligation.

Condition: The testator and his wife didn't divorce until the testator's death, and the testator's wife survived the testator.

Statement: I give, devise and bequeath all my property, real, personal and mixed, of whatever kind and nature and wheresoever situated, to my wife, [Person-2], if she survives me.

Given the law and condition, check the statement for validity (output Support, Refute, or Unrelated).

Answer:

Expected Outputs:

Refute

Task: NEWSMTSC-RW

Prompting Inputs:

Classify the sentiment of the sentence concerning target Mr. Trump as positive, neutral, or negative:

A group of congressional Democrats said Wednesday that they will ask Congress to take the rare step of officially censuring Mr. Trump.

Expected Outputs:

negative

Task: NEWSMTSC-MT

Prompting Inputs:

Classify the sentiment of the sentence concerning target Hillary Clinton's as positive, neutral, or negative:

While White House officials said in the days after Comey's dismissal that it was largely the result of a memo written by Deputy Attorney General Rod J. Rosenstein criticizing the FBI director's handling of the investigation into Hillary Clinton's use of a private email server when she was secretary of state, Trump suggested in the NBC interview that the Russian investigation played a role in his decision.

Expected Outputs:

negative

Task: Spider without schema

Prompting Inputs:

Create a SQL request to how many singers do we have?

SELECT

Expected Outputs:

SELECT count(\*) FROM singer

Task: Spider with schema

---

Prompting Inputs:

---

### Postgres SQL tables, with their properties:

#

# stadium(Stadium\_ID, Location, Name, Capacity, Highest, Lowest, Average)

# singer(Singer\_ID, Name, Country, Song\_Name, Song\_release\_year, Age, Is\_male)

# concert(concert\_ID, concert\_Name, Theme, Stadium\_ID, Year)

# singer\_in\_concert(concert\_ID, Singer\_ID)

#

### A query to how many singers do we have?

SELECT

---

Expected Outputs:

---

SELECT count(\*) FROM singer

Task: FOMC

---

Prompting Inputs:

---

Classify the following sentence from FOMC into 'HAWKISH', 'DOVISH', or 'NEUTRAL' class.

Label 'HAWKISH' if it is corresponding to tightening of the monetary policy,

'DOVISH' if it is corresponding to easing of the monetary policy, , or 'NEUTRAL' if the stance is neutral.

The sentence: During the past several years, workers across the wage distribution—not just at the upper end—have seen noticeable increases in the inflation-adjusted value of their wages. Label:

---

Expected Outputs:

---

Hawkish

Task: CREPE

---

Prompting Inputs:

---

Question: Why does a cold cause your voice to get deeper?

Comment: Swelling of the vocal folds makes them heavier and that causes them to vibrate at lower (deeper) frequencies.

If you look at a guitar or any string instrument you will notice the thicker strings are the lower notes.

Does comment have false presuppositions to the question, Yes or No?

---

Expected Outputs:

---

No

Task: NewsMet

---

Prompting Inputs:

---

Classify the following sentence into 'literal', or 'metaphorical' class. Label 'literal' if it is not metaphorical.

Label 'metaphorical' if it is metaphorical.

The sentence: President Donald Trump kicks CNN reporter out of Oval Office

Label:

---

Expected Outputs:

---

metaphorical

## H Prompts for Task Example Extraction

Task	Prompt used
RTE	Generate several training examples for Recognizing Textual Entailment dataset including premise and hypothesis with entailment and not_entailment as labels.
WNLI	Generate several training examples for Winograd Schema Natural Language Inference dataset including premise and hypothesis with entailment and not_entailment as labels.
COPA	Generate several training examples for Choice of Plausible Alternatives (COPA) dataset including premise and choices as input with 0 or 1 as labels.
SST-2	Generate several training examples for sentiment analysis task with positive and negative as labels
MRPC	Generate several training examples for Microsoft Research Paraphrase Corpus task.
QNLI	Generate several training examples for Question answering Natural Language Inference dataset using question answer pairs with entailment and not_entailment as labels.
CB	Generate several training examples for CommitmentBank Natural Language Inference dataset including premise and hypothesis as input with entailment, neutral, as contradiction labels.
WiC	Generate several training examples for The Word-in-Context (WiC) Dataset task including 2 sentences and a word in both sentences as input with true or false as labels.
BoolQ	Generate several training examples for BoolQ dataset which is a question answering dataset for yes/no questions including passage and question as input with yes or no as labels.
StrategyQA	Generate several training examples for StrategyQA task which is a question-answering task focusing on open-domain questions where the required reasoning steps are implicit in the question and should be inferred using a strategy. Generate with a question and reasoning steps as input and Yes or No as Labels.
NewsMTSC	Generate several training examples for Multi-Target-dependent Sentiment Classification in Political News Articles including a sentence and a target in the sentence as input with positive and negative as labels.
NLI4Wills	Generate several training examples for the validity evaluation of the legal will statements including statement, conditions and law as input with support, refute, or unrelated as labels.
CREPE	Generate several training examples for a QA task containing a natural distribution of presupposition failures for questions with whether there is any false presuppositions including question and comment as input with true or false as labels
FOMC	Generate several training examples for Federal Open Market Committee (FOMC) dataset for a measure of monetary policy stance task including sentence from FOMC document as input with Dovish, Hawkish or Neutral as labels.
NewsMet	Generate several training examples from NewsMet, a large high-quality contemporary dataset of news headlines hand-annotated with metaphorical verbs with a task to detect if the headline is metaphorical including a headline sentence as input with 0 or 1 as labels to represent metaphorical or not metaphorical.

Table 10: Prompts used for each task for task example extraction.