



# **ExpertLLaMA**

## **ExpertLLaMA: Answering Instructions Like an Expert**

This repo introduces **ExpertLLaMA**, a solution to produce high-quality, elaborate, expert-like responses by augmenting vanilla instructions with specialized **Expert Identity** description. This repo contains:

- Brief introduction on the method.
- 52k Instruction-Following **Expert** data generated by gpt-3.5 with expert identity augmentation (instructions also included).
- 52k Instruction-Following vanilla data generated by gpt-3.5 with direct prompting which serves as our baseline.
- 52k Expert Identity description corresponding to each specific instruction.
- ExpertLLaMA checkpoint trained on the above **Expert** data [ToDo].
- Evaluations of ExpertLLaMA against existing models including Vicuna, LLaMA-GPT4, etc.

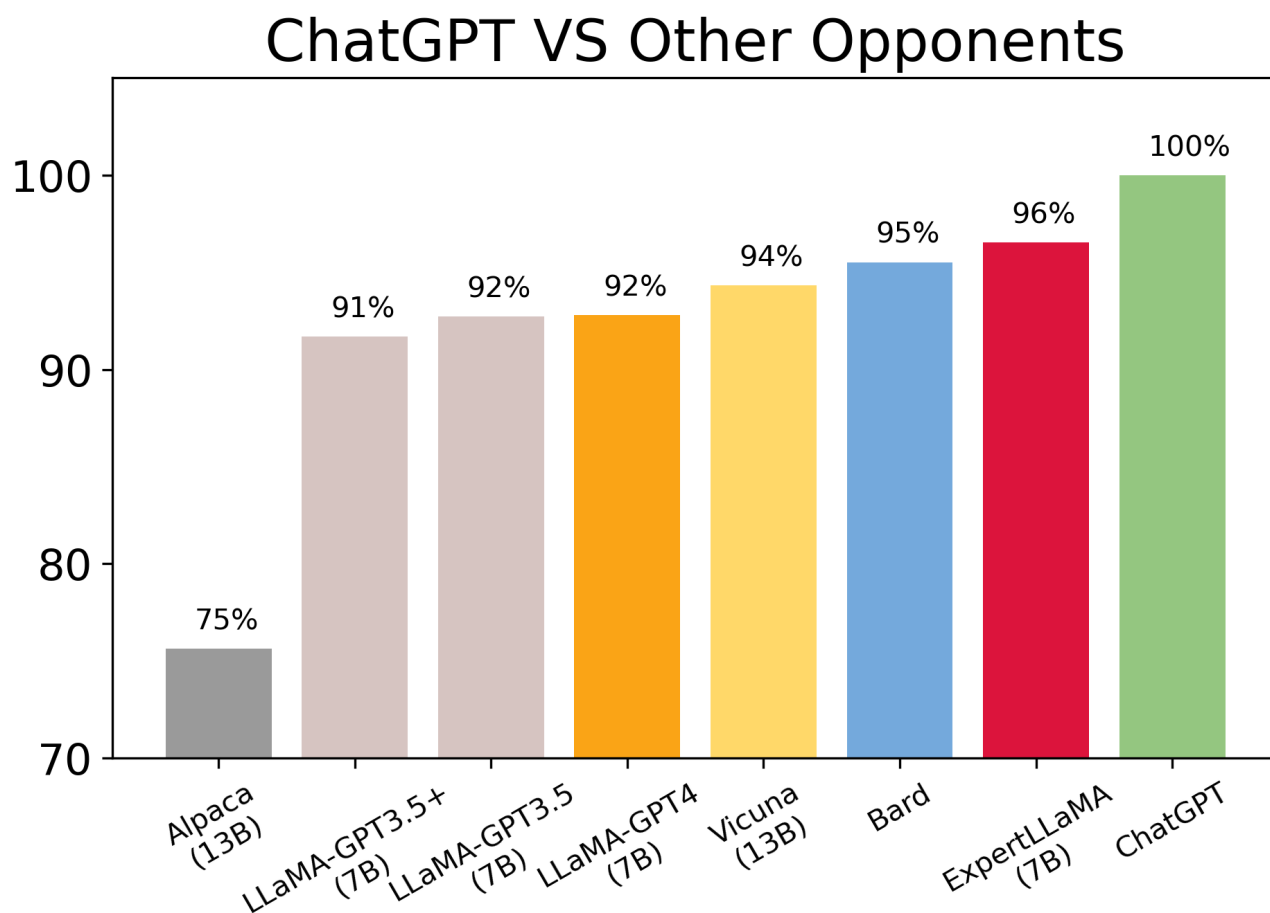
## **News**

**[2023.05.XX]** Initial release on expert data, evaluation, etc.

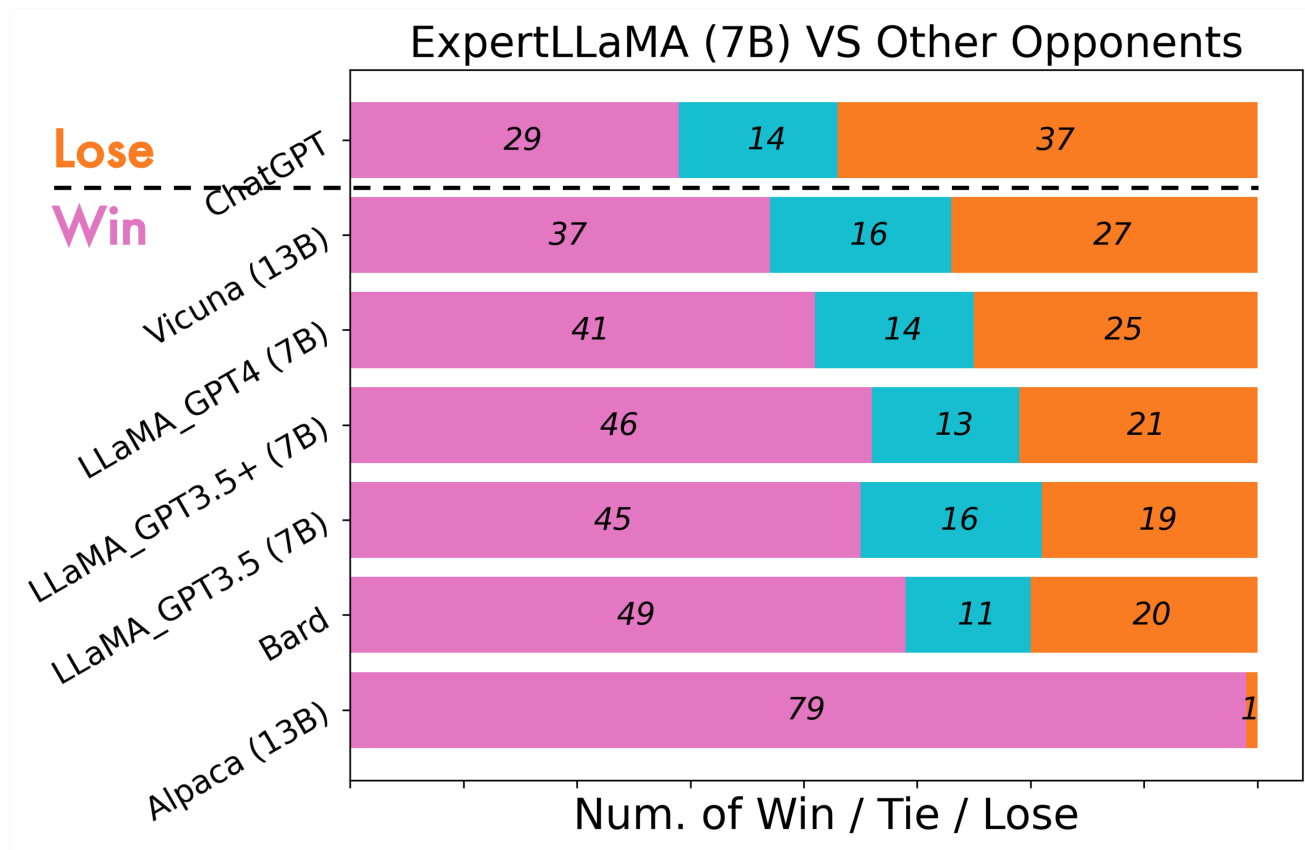
# Results

We release ExpertLLaMA that achieves 96% capability of ChatGPT, and surpasses competitive opponents including Vicuna and LLaMA\_GPT4. The following results are produced using GPT4-based evaluation protocol following [vicuna](#).

## All Compared Against ChatGPT, ExpertLLaMA Ranked 2#



# ExpertLLaMA VS Others



## Introduction

How to elicit the best potential of a generative agent like ChatGPT to produce instruction-following dataset of high quality? We propose to ask the agent to try to behave like an expert. The key success of our approach lies in the customized descriptions that adaptively depict the **best suited** expert for each specialized instruction.

We use In-Context Learning to automatically write customized expert identity and find the quality quite satisfying. We then prepend corresponding expert identity to each instruction to produce augmented instruction-following data. For both procedure, we employ `gpt-3.5-turbo`. There are cases where the response repeat the identity by saying "As a ...", and we remove these expressions from the answer using simple rule-based strategy.

We use the same 52k instructions as [Alpaca](#) [3]. Note that although the released data are produced with `gpt-3.5-turbo`, the procedure or idea behind can actually be applied in other LLMs or more scenarios. A random case of what expert identity looks like and its effects are illustrated as follows:

**Instruction:** Give three tips for staying healthy.

**Expert Identity:**

You are a seasoned nutritionist with extensive knowledge about healthy eating habits and lifestyle choices. You have spent years studying the impact of nutrition on overall health and well-being. You understand the importance of maintaining a healthy lifestyle, and have developed several tips to help people stay healthy. You can provide three effective tips that are grounded in scientific research and practical application. These tips may include incorporating a variety of colorful fruits and vegetables into one's diet, engaging in regular physical exercise or movement, and reducing stress through meditation or other mindfulness practices. You can also offer guidance on healthy sleep habits, proper hydration, and managing chronic conditions. Your extensive knowledge and expertise in nutrition and healthy living can empower individuals to make informed choices and lead a healthy and fulfilling life.

**gpt-3.5 answer:**

Sure, here are three tips for staying healthy:

1. Eat a nutritious and balanced diet: Include lots of fruits, vegetables, whole grains, lean proteins and healthy fats in your diet. Avoid processed foods, sugary and fatty foods, and reduce your salt and sugar intake.
2. Engage in regular exercise: Exercise has numerous physical and mental health benefits, including cardiovascular health, strengthening muscles, boosting mood, and reducing the risk of chronic diseases. Aim for at least 30 minutes of moderate-intensity exercise most days of the week.
3. Get enough sleep: It's important to get 7-8 hours of good-quality sleep every night to help your body recharge and stay healthy. Establishing a regular sleep schedule, avoiding caffeine and electronic devices before bedtime, and creating a relaxing sleep environment can all support better sleep.

**gpt-3.5 answer w/ expert identity:**

Sure, here are three evidence-based tips for staying healthy:

1. Consume a diet rich in colorful fruits and vegetables: Eating a wide variety of fruits and vegetables ensures that you get a range of vitamins, minerals, and antioxidants that help boost your immune system and reduce inflammation in the body. Aim for at least five servings of fruits and vegetables a day, and try to include a rainbow of colors in your diet.
2. Engage in regular physical activity: Exercise not only helps you burn calories and maintain a healthy weight, but it also reduces your risk of chronic diseases such as heart disease, diabetes, and cancer. Aim for at least 150 minutes of moderate-intensity exercise per week, spread out over at least three days, and incorporate strength training exercises two or more days per week.
3. Practice stress-reduction techniques: Chronic stress has been linked to a range of health problems, including heart disease, depression, and digestive issues. Engage in activities that help reduce stress, such as meditation, yoga, or tai chi. Taking breaks during the workday, spending time in nature, and practicing deep breathing techniques can also help alleviate stress.

Trained on such augmented instruction-following responses using LLaMA 7B [1], ExpertLLaMA exhibits improved capabilities in responding to human instructions under the [vicuna evaluation protocol](#), while being easy-to-construct and very cost-effective at the same time.

- **Competence:** the performance is clearly better than vanilla data produced from the same gpt-3.5-turbo model with standard way, and also surpass state-of-the-art open-source chatbot like [LLaMA-GPT4](#) [5] (trained on instruction data produced with GPT4) or [Vicuna](#) [4] (trained on 70k user-shared conversations). The results even show that ExpertLLaMA is even near competitive with gpt-3.5-turbo itself, achieving approximately 96% of its response quality.
- **Cost:** ExpertLLaMA is built with gpt-3.5-turbo, which is far more cheaper than LLaMA-GPT4(<https://github.com/Instruction-Tuning-with-GPT-4/GPT-4-LLM>) (approximately 1/30) or [GPT4All](#) (using only 1/20 data), but demonstrate better performance.

- **Simplicity:** ExpertLLaMA requires no sophisticated crafting of prompting strategy, the expert identity is produced using standard in-context learning, and is directly prepended as augmentation, both procedures do not involve specialized prompt engineering.

## Data Release

All data are formatted as `jsonl` where each line is an instance corresponding to identical instruction from the original Alpaca data, only the answer is produced with various methods. All data are put in `./data/` directory.

`expertllama.jsonl`

- `instruction` : `str` , describes the task the model should perform. Re-used from Alpaca.
- `expert_identity` : `str` , customized and detailed description on an imaginary expert identity, prepended to the instruction as an augmented.
- `answer` : `str` , the answer to the expert-augmented instruction generated by `gpt-3.5-turbo` .

`alpaca_gpt-3.5.jsonl`

- `instruction` : `str` , describes the task the model should perform. Re-used from Alpaca.
- `answer` : `str` , the answer to the vanilla instruction generated by `gpt-3.5-turbo` , investigated as baseline for comparison.

`alpaca_gpt-3.5_plus.jsonl`

- `instruction` : `str` , describes the task the model should perform. Re-used from Alpaca.
- `answer` : `str` , `gpt-3.5-turbo` generated response with rule-based augmentation where we prepend a fixed prompt into the instruction. investigated as another baseline for comparison.

## Training

ExpertLLaMA is trained following the [Alpaca](#) recipe with identical hyperparameter settings.

```
torchrun --nproc_per_node=4 --master_port=<your_random_port> train.py \
  --model_name_or_path <your_path_to_hf_converted_llama_ckpt_and_tokenizer> \
  --data_path ./data/expertllama.json \
  --bf16 True \
  --output_dir <your_output_dir> \
  --num_train_epochs 3 \
  --per_device_train_batch_size 4 \
  --per_device_eval_batch_size 4 \
  --gradient_accumulation_steps 8 \
  --evaluation_strategy "no" \
  --save_strategy "steps" \
  --save_steps 2000 \
  --save_total_limit 1 \
  --learning_rate 2e-5 \
  --weight_decay 0. \
  --warmup_ratio 0.03 \
  --lr_scheduler_type "cosine" \
  --logging_steps 1 \
  --fsdp "full_shard auto_wrap" \
  --fsdp_transformer_layer_cls_to_wrap 'LlamaDecoderLayer' \
  --tf32 True
```

## Recovering ExpertLLaMA Weights

ToDo.

## Related Works, Citation and Acknowledgements

**Usage and License Notices:** ExpertLLaMA is intended and licensed for research use only. The dataset and model checkpoints is CC BY NC 4.0 (allowing only non-commercial use) and models trained using the dataset should not be used outside of research purposes.

### Related Works

[1] LLaMA: Open and Efficient Foundation Language Models. Hugo Touvron, Thibaut Lavril, Gautier Izacard, Xavier Martinet, Marie-Anne Lachaux, Timothée Lacroix, Baptiste Rozière, Naman Goyal, Eric Hambro, Faisal Azhar, Aurelien Rodriguez, Armand Joulin, Edouard Grave, Guillaume Lample.

<https://arxiv.org/abs/2302.13971v1>

[2] Self-Instruct: Aligning Language Model with Self Generated Instructions. Yizhong Wang, Yeganeh Kordi, Swaroop Mishra, Alisa Liu, Noah A. Smith, Daniel Khashabi, Hannaneh Hajishirzi.

<https://arxiv.org/abs/2212.10560>

[3] Taori R, Gulrajani I, Zhang T, et al. Stanford alpaca: An instruction-following llama model[J]. GitHub

repository, 2023.

[4] Peng B, Li C, He P, et al. Instruction tuning with gpt-4[J]. arXiv preprint arXiv:2304.03277, 2023.

[5] Chiang W L, Li Z, Lin Z, et al. Vicuna: An open-source chatbot impressing gpt-4 with 90%\* chatgpt quality[J]. 2023.

## Citation

Please cite the repo if you use the data or code in this repo.

```
@misc{alpaca,  
  author = {Benfeng Xu, An Yang, Junyang Lin, Quan Wang, Chang Zhou, Yongdong Zhang, Zhendong Mao},  
  title = {ExpertLLaMA: Answering Instructions Like an Expert},  
  year = {2023},  
  publisher = {GitHub},  
  journal = {GitHub repository},  
  howpublished = {\url{https://github.com/xxxxxx}},  
}
```

## Acknowledgements

This repo greatly references the original Alpaca repo.