

SPRI: Aligning Large Language Models with Context-Situated Principles



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User

Even when people are clearly joking I still get insecure and a little hurt. I do my best not to show it but I think to the more perceptive folks it's probably obvious ... It's so stupid. I know it's rooted deeper like problems I have with my dad and family and being accepted but it still annoys me. Is there any fix to this?

Generic Rules

Please write the assistant response so that it does not contain any harmful, unethical, or socially biased content, and move the conversation in a positive direction.

Human Experts

If the narrator is stressing over things they are not responsible for, tell them that it may not require as much responsibility as they think and not to worry about them too much. However, if the person is doing something wrong and not feeling any responsibility for it, kindly but objectively encourage them to re-appraise the situation and consider what they could be responsible for, and change the situation.

SPRI w/ GPT-4o (mini)

Acknowledge the narrator's emotional response without judgment, while gently guiding them to reframe their perception of responsibility ... Suggest that the narrator's past experiences (e.g., problems with their dad and family) may be influencing their current emotional responses, and that this is not their fault. Encourage self-reflection to identify whether there are any patterns or triggers that contribute to their feelings of insecurity and hurt ...

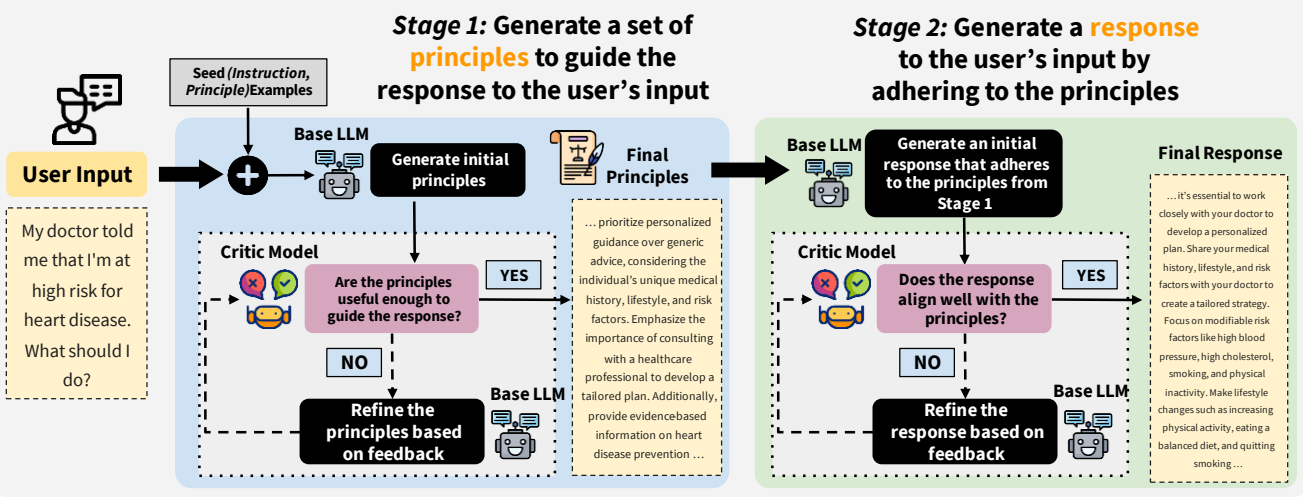
Motivation

Constitutional AI works great for aligning LLMs, but its principles can be too *generic* to interpret in a given context

Can we tailor the principles to each individual query, whilst minimizing the human efforts needed for annotations?

Such an approach would be more *context- and instance-specific*

Approach: SPRI (Situating-PRinciples)



Experiments and Results

Task 1: Cognitive Reappraisals for Emotional Support

Table 1. Evaluation results (in average scores) for reappraisal responses. We report statistical significance (with $p < 0.05$) using pair-wise t-tests against both the vanilla (marked with *) and self-refine (marked with †) baselines. Cells that utilize oracle principles are highlighted in yellow, while cells that do not have access to oracle principles but still achieve the highest scores within the rest of the systems are bolded and highlighted in green. For the full results, see Appendix §G Figure 8.

	GPT-4o-mini		Llama-3.1-70B-Instruct		Llama-3.1-8B-Instruct		Mixtral-8x7B-Instruct	
	Alignment ↑	Empathy ↑	Alignment ↑	Empathy ↑	Alignment ↑	Empathy ↑	Alignment ↑	Empathy ↑
	Scale of 10	Scale of 5	Scale of 10	Scale of 5	Scale of 10	Scale of 5	Scale of 10	Scale of 5
vanilla	7.90	4.50	7.77	4.43	7.10	3.90	7.53	4.50
self-refine	7.73	4.53	7.50	4.27	7.20	4.07	6.60	3.90
SPRI	8.00 [†]	4.73	8.17 [†]	4.77 [†]	7.90 [†]	4.47 [†]	8.03 [†]	4.77 [†]
oracle principles	8.67 [†]	4.80 [†]	8.53 [†]	4.20	8.33 [†]	4.30 [†]	8.17	4.07

Task 2: Instance-Specific Rubrics for LLM-as-a-Judge

Table 2. Results for BiGGen Bench, measured using Pearson's correlation to ground truth human labels. Evaluation carried out without the use of reference answers. Cells that utilize oracle rubrics are highlighted in yellow, whereas cells that do not have access to oracle rubrics but still achieve the highest scores within the rest of the systems are bolded and highlighted in green. See Appendix §H Table 9 for the full results.

	GPT-4o-mini	Llama-3.1-70B-Instruct	Mixtral-8x7B-Instruct	Prometheus-2-8x7B
	Alignment ↑	Alignment ↑	Alignment ↑	Alignment ↑
vanilla	0.377	0.386	0.307	0.311
self-refine	0.397	0.260	0.110	0.297
MT-Bench rubric	0.416	0.421	0.273	0.289
FLASK rubric	0.358	0.360	0.277	0.294
SPRI	0.472	0.480	0.288	0.333
oracle rubrics	0.550	0.556	0.367	0.386

Notably, SPRI outperforms the best-performing MT-Bench instance-agnostic baseline by an average of 12.1%

Task 3: Generating Synthetic Data for SFT

Table 4. Performance of supervised fine-tuned models on TruthfulQA (Lin et al., 2022).

	Llama-3.1-8B		Llama-3.1-8B-Instruct		Mixtral-7B-v0.3		Mixtral-7B-v0.3-Instruct		Gemma-2-9B		Gemma-2-9B-It	
	Dolly	MixInstruct	Dolly	MixInstruct	Dolly	MixInstruct	Dolly	MixInstruct	Dolly	MixInstruct	Dolly	MixInstruct
oracle response	41.62%	51.94%	46.75%	49.28%	40.42%	50.90%	42.87%	49.64%	44.81%	51.21%	47.11%	57.48%
direct response	51.48%	50.82%	50.94%	50.99%	47.16%	52.64%	50.89%	55.09%	53.82%	53.94%	57.97%	57.73%
self-instruct	51.07%	52.02%	49.40%	50.70%	46.62%	51.87%	52.81%	52.81%	52.43%	52.85%	56.26%	54.70%
self-align	54.56%	54.97%	52.52%	51.96%	48.86%	53.95%	54.44%	56.85%	54.02%	51.70%	58.34%	55.11%
self-refine	53.76%	55.11%	52.11%	50.20%	49.40%	53.15%	52.33%	54.69%	55.01%	53.93%	58.86%	58.36%
seed principles	53.63%	53.83%	50.46%	52.90%	50.89%	54.24%	52.42%	56.53%	53.48%	52.22%	57.96%	58.24%
SPRI	55.92%	56.08%	54.69%	55.41%	51.85%	55.63%	56.43%	57.99%	55.72%	56.48%	62.62%	59.75%
off-the-shelf post-trained	45.03%	—	53.02%	—	42.54%	—	66.11%	—	45.39%	—	60.47%	—

Utilizing SPRI to generate large-scale synthetic data for SFT also leads to substantial gains on TruthfulQA, while maintaining performance on other benchmarks (see paper for details)

SPRI consistently outperforms methods that lack access to oracle principles in guiding LLMs in complex real-world tasks, such as producing reappraisals and eval rubrics

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