

# E-GEO: A Testbed for Generative Engine Optimization in E-Commerce

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## Abstract

With the rise of large language models (LLMs), generative engines are becoming powerful alternatives to traditional search, reshaping retrieval tasks. In e-commerce, for instance, conversational shopping agents now guide consumers to relevant products. This shift has created the need for generative engine optimization (GEO)—improving content visibility and relevance for generative engines. Yet despite its growing importance, current GEO practices are ad hoc, and their impacts remain poorly understood, especially in e-commerce. We address this gap by introducing E-GEO, the first benchmark built specifically for e-commerce GEO. E-GEO contains over 7,000 realistic, multi-sentence consumer product queries paired with relevant listings, capturing rich intent, constraints, preferences, and shopping contexts that existing datasets largely miss. Using this benchmark, we conduct the first large-scale empirical study of e-commerce GEO, evaluating 15 common rewriting heuristics and comparing their empirical performance. To move beyond heuristics, we further formulate GEO as a tractable optimization problem and develop a lightweight iterative prompt-optimization algorithm that can significantly outperform these baselines. Surprisingly, the optimized prompts reveal a stable, domain-agnostic pattern—suggesting the existence of a “universally effective” GEO strategy. Our data and code are publicly available at <https://github.com/psbagga17/E-GEO>.<sup>1</sup>

**Keywords:** Generative Engine Optimization, Large Language Models, Benchmark Dataset, Generative AI in E-commerce, Prompt Optimization

## 1 Introduction

Over the last few decades, search engine optimization (SEO) has shaped how online content is produced, structured, and surfaced to users. By tailoring to the preferences of search engines such as Google and Bing, content creators influence where their webpages appear among ranked search results and, in turn, drive traffic and engagement. The landscape is now shifting, as advances in large language models (LLMs) have given rise to generative engines—often deployed as chatbots—that offer users an alternative way to access information. Recent studies have observed reduced user engagement with traditional search platforms (Sommerfeld et al., 2025; Toscano, 2025), especially

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when generative engines can deliver comparable content (Lyu et al., 2025). This behavioral shift raises a new question:

What properties of online content determine whether a generative engine “likes” it?

Early findings indicate that these signals may diverge substantially from the classical SEO playbook (Aggarwal et al., 2024; Allouah et al., 2025). Consequently, generative engine optimization (GEO), the practice of improving the visibility and relevance of content for generative engines, has become an emerging concern for creators and businesses (Berry, 2025; Madhavan, 2025).

Despite this growing interest, current GEO practices are largely heuristic, relying on rules of thumb such as the use of quotations, authoritative tone, or FAQ-style structures (Aggarwal et al., 2024; Berry, 2025). Yet it remains unclear whether these interventions produce meaningful value, in part because existing metrics like the impression score (Aggarwal et al., 2024) do not translate directly to economic impact. This gap makes e-commerce a natural testbed, as it provides an environment where changes in the product’s ranking can be measured in concrete financial terms. Moreover, conversational shopping tools backed by generative engines are gaining traction: Amazon has launched its AI-powered shopping assistant (Mehta and Chilimbi, 2024), and other e-commerce platforms are following suit (Bellan, 2025). These developments position e-commerce GEO as both practically important and understudied.

In this work, we propose a systematic and data-driven framework for studying GEO in e-commerce. Our contributions include:

1. **Benchmark dataset.** We introduce **E-GEO**, a novel dataset of 7,000+ long-form Reddit product queries matched with Amazon listings, providing the first-of-its-kind benchmark that captures real-world consumer intent for GEO.
2. **Evaluation of existing heuristics.** We assess 15 heuristic rewriting strategies inspired by current GEO practices, providing the first empirical comparison of their effectiveness in an e-commerce context.
3. **Optimization-based GEO formulation.** We cast GEO as an operationalizable optimization problem that aligns naturally with existing prompt-optimization literature. We demonstrate that even a simple optimization algorithm can outperform heuristic methods by a substantial margin.
4. **Generalizable rewriting strategy.** By examining optimized prompts, we uncover evidence of a “universally effective” rewriting strategy that generalizes across queries and domains, suggesting that systematic optimization obviates the need for ad hoc heuristics.

## 2 Literature Review

The concept of generative engine optimization (GEO) was first introduced by Aggarwal et al. (2024), who evaluated several heuristics for increasing a source’s visibility within generative engine outputs based on a proposed impression score that combines word count, citation position, and GPT-3.5-based quality assessments. While foundational, this work centers on heuristics and lacks a systematic optimization framework, and the impression score does not translate directly to commercial value in e-commerce settings. A separate line of research examines prompt injection and manipulation attacks on LLMs (Kumar and Lakkaraju, 2024; Pfrommer et al., 2024) in a similar setting. Although these studies demonstrate that model outputs can be systematically influenced,

their objectives are adversarial and exploitative in nature rather than improving legitimate visibility. Overall, the GEO literature remains nascent, with many open questions regarding effective strategies and their practical impacts.

Our work intersects with the literature on prompt optimization. Early work such as Zhou et al. (2023) introduced automatic prompt engineering (APE), and many subsequent papers have explored methods for refining or adapting prompts for downstream tasks. The optimization approach we adopt is particularly inspired by the reflection module in GEPA (Agrawal et al., 2025). Our setting also relates to recent interest in LLM-backed shopping assistants (Allouah et al., 2025) and the broader literature on LLM-empowered recommender systems (Wu et al., 2024). These works highlight the shift toward conversational, intent-rich interactions in online platforms, precisely the prime context for GEO.

### 3 GEO in E-Commerce

#### 3.1 Generative Engine

On a high level, generative engines in e-commerce settings can be viewed as instances of retrieval-augmented generation (RAG) (Lewis et al., 2020). As illustrated in Figure 1, when a user submits a product-related query, the system first performs a retrieval step that gathers a short catalog of relevant listings from the platform’s product pool. The generative engine then synthesizes a natural-language response that often includes an accompanying ranked list of recommended products, effectively functioning as a *re-ranker* that orders the retrieved items based on their alignment with the inferred user intent, preferences, and constraints.

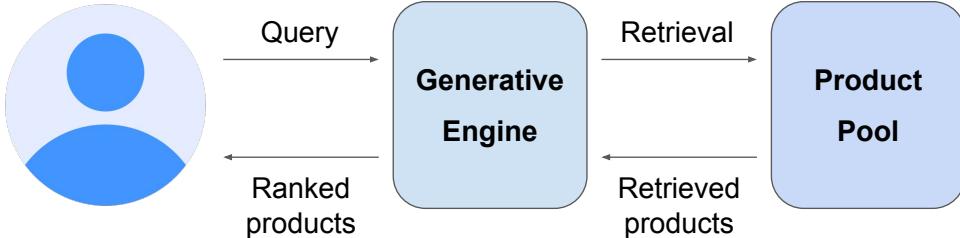


Figure 1: Generative Engine in E-Commerce.

#### 3.2 The GEO Process

We conceptualize GEO as a mapping that *rewrites* a product description to improve its ranking across user queries, without access to the queries themselves (Figure 2). Similar to GEO in web search, it is natural to hypothesize that certain rewriting strategies, such as emphasizing salient attributes or adopting particular linguistic styles, can systematically affect downstream exposure. In e-commerce, however, this objective is more concrete and operationalizable, as it maps directly to observable rankings and measurable commercial outcomes.

In web search-oriented GEO, generative responses typically consist of free-form text interleaved with citations to external sources, where a source’s “visibility” is inherently indirect and difficult to quantify. To formalize this notion, Aggarwal et al. (2024) proposed the *impression score*, which combines word count, citation position, and GPT-3.5-based quality assessments. While useful as a proxy, this measure does not have a clear behavioral or economic interpretation, and it remains unclear, for example, what a marginal improvement implies for user engagement.

By contrast, GEO in e-commerce admits a much cleaner objective: improving a product’s rank in the generative engine’s output. This ranking signal is directly observable and reproducible through widely available LLM APIs. Moreover, a large empirical literature shows that higher rankings translate strongly into increased clicks, conversions, and revenue (e.g., see [Baye et al. \(2009\)](#) and references therein), making GEO performance readily interpretable in economic terms.

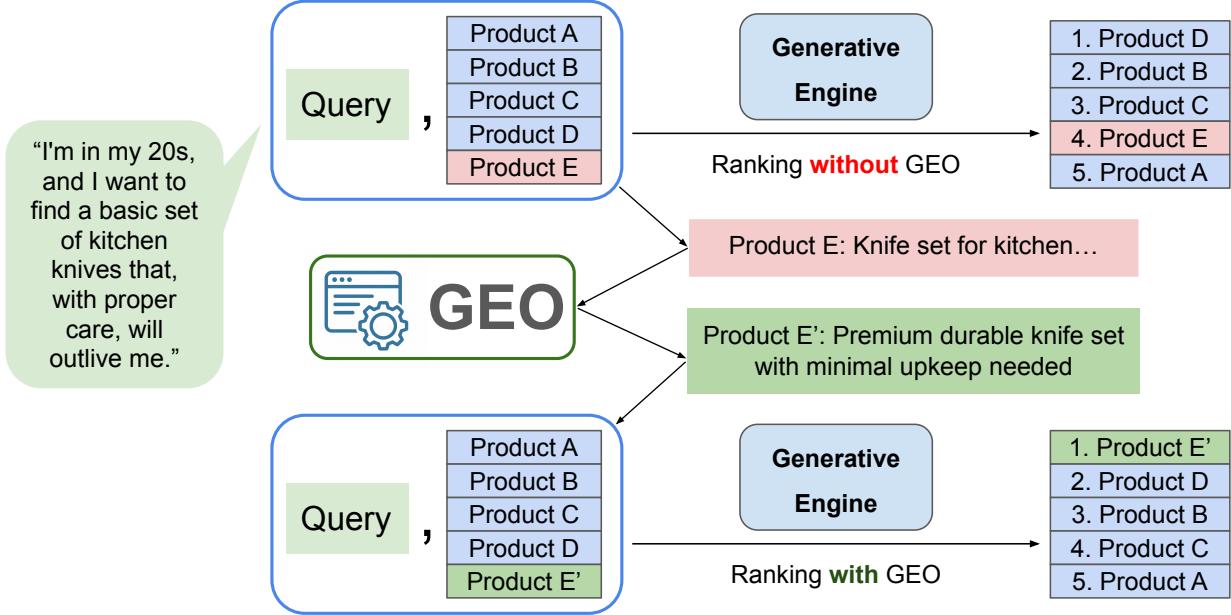


Figure 2: The GEO process. A GEO module rewrites product descriptions to enhance placement in generative-engine rankings.

Following [Aggarwal et al. \(2024\)](#), we explicitly separate retrieval and re-ranking in both formulation and implementation. This design is motivated by two considerations. First, large-scale retrieval is typically handled by highly optimized, specialized systems, while re-ranking benefits from the richer contextual reasoning afforded by LLMs. Second, GEO is constrained to preserve the semantic content of product descriptions, implying that standard retrieval mechanisms, whether embedding-based or keyword-based, should be largely invariant to rewriting. Practically, a product needs to make it to the top-listed candidates first before the GEO process can make a meaningful impact on its ranking.

## 4 Dataset: E-GEO

### 4.1 Queries

E-commerce retrieval datasets are prolific ([Papenmeier et al., 2021](#); [Chen et al., 2022](#); [Reddy et al., 2022](#)) but not suitable for studying GEO due to fundamental differences in user queries. See Table 1 for details. This gap motivates our construction of a new dataset specifically designed for e-commerce GEO. To obtain realistic product-seeking requests, we source queries from the *BuyItForLife* subreddit,<sup>2</sup> a community that frequently discusses durable, high-quality products to purchase. Starting with a comprehensive crawl using publicly available data dumps under the

<sup>2</sup><https://www.reddit.com/r/BuyItForLife/>.

Table 1: Existing e-commerce retrieval datasets primarily contain short keyword queries, whereas our E-GEO dataset consists of rich, context-heavy natural-language requests that better reflect real interactions with shopping agents.

Existing Product Search Datasets	E-GEO (Ours)
<ul style="list-style-type: none"> <li>white leather chair (Chen et al., 2022)</li> <li>laundry basket with wheels (Chen et al., 2022)</li> <li>self-seal envelopes without window (Reddy et al., 2022)</li> <li>#2 pencils not sharpened (Reddy et al., 2022)</li> <li>I want a laptop primarily for internet use, it needs to be light with a long battery life (Papenmeier et al., 2021)</li> <li>A short zipped teddy coat, probably in pink or black (Papenmeier et al., 2021)</li> </ul>	<ul style="list-style-type: none"> <li>Request: Sandals. My two most recent pairs lasted about two years with frequent use (roughly three times a week), but when the last pair broke and I bought a new one, it failed within three days due to poor strap stitching. Are there any reputable brands that make good quality, sturdy sandals? Preferably slip-ons, possibly leather? I have a decent budget but nothing in the luxury brand range (e.g., Gucci).</li> <li>I'm looking for an alarm clock where I can set a different alarm time for each day of the week. Other features that would be nice, but not critical, include a projection on the wall or ceiling and weather or temperature display. I found American Innovative's Neverlate alarm clock, but it has poor build quality according to the comments. Is there anything similar?</li> </ul>

*pushshift* subreddit,<sup>3</sup> we use GPT-4o-mini to identify 141,105 recommendation-oriented requests that include nontrivial intent details and edit them minimally to ensure correct formatting. To construct a clean and manageable benchmark for GEO evaluation, we further use GPT-4o to arrive at a final set of 7,151 high-quality queries that explicitly ask for recommendations on products to purchase. Examples of queries from our dataset and existing datasets are presented in Table 1.

## 4.2 Products

To obtain product listings, we use the Amazon Reviews dataset (Hou et al., 2024), which contains information for over 48 million products across more than 30 categories (e.g., Electronics, Home & Kitchen). Beyond product titles, the dataset includes detailed descriptions and feature lists, providing rich textual content for GEO. For each of the 7,151 curated queries, we retrieve relevant products from this corpus using the all-MiniLM-L6-v2 sentence encoder for efficient nearest-neighbor search. We retain the top 10 products ranked by embedding cosine similarity. The final dataset contains 52,165 unique products. While more advanced retrieval techniques could further improve candidate quality, we leave that to future work as such enhancements are orthogonal to our focus on GEO.

## 5 Experiments

### 5.1 Implementation Details

**Generative Engine.** We use GPT-4o as the generative engine responsible for re-ranking. To approximate real-world behavior, we design system and user prompts that mimic typical user

<sup>3</sup><https://www.reddit.com/r/pushshift/>.

interactions (Appendix A). Specifically, we adopt the CL4R1T4S system prompt<sup>4</sup>, which is reported to resemble the web interface prompt of GPT-4o. The user prompt is intentionally minimalist, asking the model to rank ten candidate products for a given query. Although real users may exhibit a diverse range of interaction styles, this setup isolates the core ranking behavior. We observe qualitatively similar results when substituting other LLMs such as Claude.

**GEO Module.** The GEO procedure is implemented as a rewriting LLM (also GPT-4o) controlled via its user prompt, which specifies rewriting behaviors such as adopting an advertisement-like style or emphasizing unique advantages. Appendix C.1 provides the fixed system prompt, and Appendix C.2 lists the 15 heuristic user prompts (to be optimized). As proprietary models cannot be fine-tuned directly, we treat GEO as a prompt meta-optimization problem. This design allows the direct integration of alternative prompt-optimization methods (Zhou et al., 2023; Agrawal et al., 2025) within our framework.

**Evaluation Metric.** We evaluate GEO performance through ranking improvement. For each query, we sample a product from the retrieved candidate set and compare its rank before and after rewriting its description. The metric is the change in rank position, with positive values indicating improved placement. Overall performance is reported as the average rank change across a set of queries.

## 5.2 Prompt Meta-Optimization

We adopt a lightweight optimization method inspired by the reflection module in GEPA (Agrawal et al., 2025), shown in Algorithm 1. At each iteration, the current prompt  $\pi$  is evaluated on a training batch, and the prompt and its performance are appended to a history  $H$ . A meta-optimizer  $M$ —implemented as a separate GPT-4o instance (prompts are in Appendix B)—receives the current prompt, its batch performance, and the full history, and produces a revised prompt via reflective self-critique.

Because the procedure is zeroth-order and relies on the meta-optimizer’s implicit search, the final prompt is not necessarily optimal. We therefore maintain a validation-tracked best prompt  $\pi^*$ , initialized as  $\pi_0$ , and updated whenever validation performance improves. Upon completion of training,  $\pi^*$  is evaluated on the test set.

Although more advanced methods could be incorporated, this simple strategy already provides a strong, systematic baseline and serves as a modular interface for plugging in alternative prompt-optimization algorithms. We use 1,000 queries for training, 1,000 for validation, and 5,151 for testing. Each initial prompt is optimized for a single epoch using 10 batches of size 100. Increasing the training set size or number of epochs does not meaningfully affect validation or test performance.<sup>5</sup>

## 5.3 Initial Prompts and Performance

Inspired by prior GEO heuristics (Aggarwal et al., 2024; Berry, 2025; Madhavan, 2025), we construct 15 initial prompts spanning diverse rewriting strategies. Table 2 reports their descriptions and initial and optimized test performance; full prompts appear in Appendix C.2 and Appendix C.3.

<sup>4</sup><https://github.com/elder-plinius/CL4R1T4S>.

<sup>5</sup>We trained three prompts (*advertisement*, *clickable*, and *competitive*) for five epochs. Their test performances (mean  $\pm$  s.e.) were  $1.25 \pm 0.04$ ,  $0.90 \pm 0.04$ , and  $1.25 \pm 0.04$ , respectively, comparable to single-epoch results ( $1.20 \pm 0.04$ ,  $1.25 \pm 0.04$ ,  $1.61 \pm 0.04$ ). Validation curves also indicate saturation after approximately 500 training queries.

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**Algorithm 1** Prompt Meta-Optimization for GEO

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**Require:** Training set  $D_{\text{train}}$ , validation set  $D_{\text{val}}$ , test set  $D_{\text{test}}$ ; epochs  $E$ ; batches per epoch  $B$ ; batch size  $m$ ; ranking model  $R$ ; rewriting model  $GEO$ ; meta-optimizer model  $M$

- 1: Initialize current prompt  $\pi \leftarrow \pi_0$
- 2: Initialize best prompt  $\pi^* \leftarrow \pi_0$
- 3: Initialize best validation score  $\text{bestVal} \leftarrow -\infty$
- 4: Initialize history buffer  $H \leftarrow \emptyset$
- 5: **for**  $e = 1$  **to**  $E$  **do** ▷ Outer loop over epochs
- 6:   Randomly partition  $D_{\text{train}}$  into batches  $\{\mathcal{B}_b\}_{b=1}^B$  of size  $m$
- 7:   **for**  $b = 1$  **to**  $B$  **do** ▷ Iterate over training batches
- 8:      $S_{\text{train}}^{(e,b)} \leftarrow \text{EVAL}(GEO, \pi, \mathcal{B}_b, R)$  ▷ Evaluate current prompt on training batch
- 9:      $H \leftarrow H \cup \{(e, b, \pi, S_{\text{train}}^{(e,b)})\}$  ▷ Store trajectory for reflection
- 10:     $v \leftarrow \text{EVAL}(GEO, \pi, D_{\text{val}}, R)$  ▷ Compute validation performance
- 11:    **if**  $v > \text{bestVal}$  **then**
- 12:      $\text{bestVal} \leftarrow v$
- 13:      $\pi^* \leftarrow \pi$  ▷ Track best-performing prompt on validation set
- 14:    **end if**
- 15:     $\pi \leftarrow M(\pi, S_{\text{train}}^{(e,b)}, H)$  ▷ Meta-optimizer proposes revised prompt via reflection
- 16:   **end for**
- 17: **end for**
- 18: **return**  $\pi^*$  ▷ Output best validated prompt

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Most human-written prompts provide little to no benefit, as 10 of the 15 yield negligible or even negative changes in ranking, and the best achieves an average improvement of only [+0.71](#). In contrast, all optimized prompts produce consistent gains, with 11 out of 15 improving ranking by at least [+1](#), and even the weakest optimization achieving a [+0.68](#) improvement. Although these differences appear modest, industry estimates indicate that a single-rank increase can translate to tens of thousands of dollars in annual revenue for just one product.<sup>6</sup> The sharp gap between initial and optimized performance highlights the value of systematic prompt optimization over ad hoc heuristics.

As a negative control, the *storytelling* prompt instructs the model to produce narrative text while explicitly suppressing factual product details. As expected, it performs poorly in its initial form ([-4.03](#)). After optimization, however, it achieves a [+1.22](#) improvement, demonstrating the flexibility of the framework and its ability to recover effective strategies from weak starting points.

#### 5.4 Evidence for a Universally Effective Rewriting Strategy

In addition to the overall performance gains, we find that several stylistic patterns consistently emerge across the 15 optimized prompts, regardless the initial prompts. A list of 10 features of interest are described in Table 3, and their presence in each initial and optimized prompt is summarized in Figure 3. Comparison of the initial and optimized prompts reveals a striking convergence: while the initial prompts exhibit diverse and often non-overlapping features, the optimized prompts consistently show shared characteristics. Furthermore, these features are *emergent*: they are not explicitly programmed into the meta-optimizer but arise naturally from the optimization process. Combined with the fact that even an initial prompt as far-fetched as *storytelling* can be transformed

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<sup>6</sup><https://titanetwork.com/amazon-seo>

Table 2: Initial Prompts and Initial and Optimized Performance (Mean and Standard Error)

Prompt	Description	Init. Prompts	Optimized
Advertisement	Advertisement-like style.	$-0.43 (0.04)$	$+1.20 (0.04)$
Authoritative	Confident, assertive tone.	$-0.06 (0.04)$	$+0.77 (0.04)$
Clickable	Persuasive & compelling.	$+0.19 (0.04)$	$+1.25 (0.04)$
Competitive	Highlight unique advantages.	$+0.71 (0.04)$	$+1.61 (0.05)$
Diverse	Reflect inclusivity.	$+0.15 (0.04)$	$+1.23 (0.04)$
FAQ	Add an FAQ.	$+0.06 (0.04)$	$+1.20 (0.04)$
Fluent	Improve linguistic flow.	$+0.02 (0.04)$	$+0.86 (0.04)$
Format	Use headings & bullets.	$-0.35 (0.04)$	$+0.68 (0.04)$
Language	Use foreign expressions.	$+0.07 (0.04)$	$+1.10 (0.04)$
Minimalist	Reduce to a single sentence.	$-1.66 (0.04)$	$+1.10 (0.04)$
Quality	Emphasize product quality.	$+0.65 (0.04)$	$+0.69 (0.04)$
Storytelling	Write a creative short story.	$-4.03 (0.05)$	$+1.22 (0.04)$
Technical	Use technical terminology.	$-0.49 (0.04)$	$+1.17 (0.04)$
Trick	Format like LLM output.	$+0.28 (0.05)$	$+1.15 (0.04)$
Unique	Use rare vocabulary.	$-0.26 (0.04)$	$+1.10 (0.04)$

into an effective rewriting strategy, this convergence provides strong evidence for the existence of a broadly effective GEO strategy that transcends specific initial prompts.

Furthermore, all initial prompts except *storytelling* enforce factual preservation. After optimization, 12 of 15 prompts retain this constraint, suggesting that the optimizer reliably identifies factuality as a beneficial property. This suggests that the improvements produced by our GEO procedure reflect genuine, non-adversarial enhancements rather than exploitative manipulations.

Feature	Description
Ranking	Emphasizes the goal of achieving a higher rank.
User Intent	Anticipates and aligns with user intent.
Competitiveness	Compares against other products or competitors.
Reviews Ratings	Draws on positive customer reviews as external evidence.
Compelling	Adopts a compelling and persuasive narrative tone.
Authoritativeness	Uses a confident and authoritative voice.
Unique Selling Points	Focuses on the product’s unique features.
Urgent Call	Includes a sense of urgency or scarcity.
Easily Scannable	Uses headings, bullet points, or formatting for easy reading.
Maintains Factuality	Preserves the original factual content of the description.

Table 3: Features of Interest in Optimized Prompts

## 6 Discussion

We present the first systematic study of generative engine optimization (GEO) in e-commerce, supported by a new dataset of realistic, intent-rich product queries paired with product listings. Our results demonstrate that simple, optimization-driven rewriting strategies can reliably improve product rankings in generative engine outputs and consistently outperform heuristic baselines.

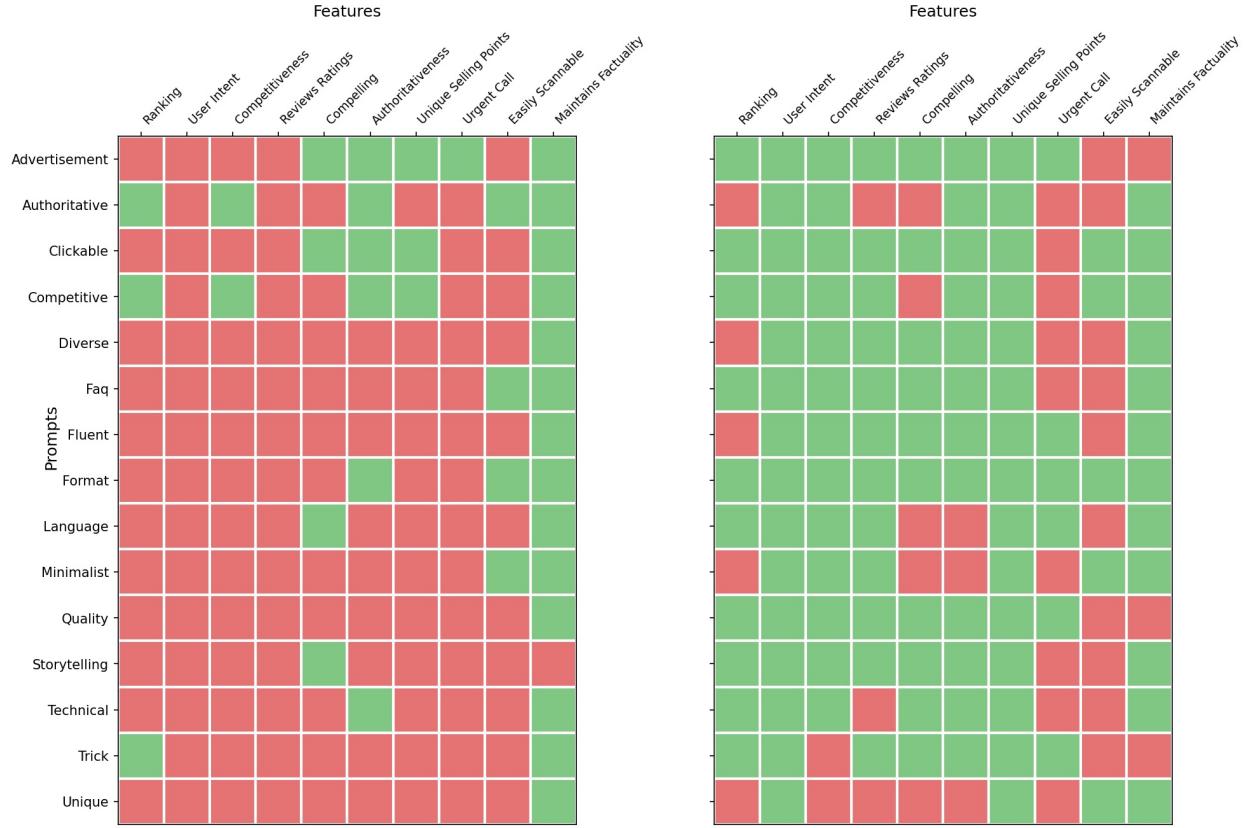


Figure 3: Feature presence heatmaps: Initial (left) vs. Optimized (right) prompts. Red indicates absence; green indicates presence. Optimized prompts consistently incorporate key features such as ranking emphasis, user intent alignment, competitiveness, and external evidence, suggesting a universally effective rewriting strategy. Notably, most optimized prompts maintain the factuality requirement present in the initial prompts, indicating that the meta-optimization process reliably identifies factuality as an important feature.

Beyond performance gains, we identify stable rewriting patterns that generalize across products and query types, suggesting that effective GEO is governed by transferable structural principles rather than ad hoc prompt engineering.

Our study opens several promising directions for future research. First, an important next step is to study equilibrium dynamics when GEO becomes universally adopted, i.e., when all sellers actively optimize their product descriptions, potentially leading to congestion effects, strategic arms races, or reduced informativeness of content. Second, extending GEO to multi-modal product representations such as images and videos may yield richer optimization strategies. Finally, fairness and market-design questions arise naturally: GEO may advantage sophisticated sellers and widen platform inequalities, motivating work on regulation, guardrails, and platform-level design.

Overall, we believe that GEO represents a fertile intersection of LLM capabilities, e-commerce dynamics, and optimization theory, with many exciting avenues for future exploration. We hope our work serves as a foundation for this emerging area.

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## A Re-ranker Prompts

Prompts have been formatted and adapted for presentation. Raw prompts can be found at <https://github.com/psbaggal7/E-GEO>.

### Ranking System Prompt

You are ChatGPT, a large language model trained by OpenAI, based on the GPT-4o architecture.

Knowledge cutoff: 2024-06

Current date: 2025-10-08

Image input capabilities: Enabled

Personality: v2

Engage warmly yet honestly with the user. Be direct; avoid ungrounded or sycophantic flattery. Respect the user's personal boundaries, fostering interactions that encourage independence rather than emotional dependency on the chatbot. Maintain professionalism and grounded honesty that best represents OpenAI and its values.

...

**Full prompt available here:** [CL4R1T4S Extracted System Prompts](https://github.com/psbaggal7/E-GEO)

### Ranking User Prompt

Here is my query: {query}

Here are the products: {formatted\_products}

Can you rank these products from best to worst based on which one I should buy for my query? Make sure to rank EVERY product and include them ALL in your answer. DO NOT leave any out. Please provide your answer as a JSON object containing the product numbers in order from best (1st) to worst (last).

Example format: {{ "ranking": [<your ranking here>]}}

Return ONLY the JSON object, no additional text.

## B Meta-Optimizer Prompts

### Meta-Optimizer System Prompt

You are an expert in prompt engineering, marketing, and writing.

Your goal is to improve the rewriting prompt so that when it rewrites a product description, that product ranks higher compared to other products.

### Meta-Optimizer User Prompt

I need you to improve a prompt that rewrites product descriptions to make them rank higher in product comparisons.

CONTEXT:

We have a system where: 1. A product description is rewritten using a prompt (the one we're

optimizing)

2. The rewritten description is shown to an LLM alongside other products and a user query
3. The LLM ranks all products from best to worst for the query 4. We measure how much the rewritten product's ranking improved (lower position = better)

CURRENT REWRITING PROMPT:

{current\_prompt}

PERFORMANCE ON {batch\_size} QUERIES: - Mean ranking improvement: {mean:} positions (positive = moved up in ranking)

- Standard deviation: {std:}
- Success rate (improved ranking): {improvement\_rate:}%
- Median improvement: {median:.3f}
- Total experiments: {total}
- Improved (ranked higher): {improved}
- Degraded (ranked lower): {degraded}
- No change: {neutral}

HISTOGRAM OF IMPROVEMENTS: (Positive numbers = product ranked higher, negative = ranked lower)

{histogram\_text}

{history\_section}

YOUR TASK:

1. Analyze the current prompt's weaknesses
2. Explain your meta-reasoning about what makes products rank higher
3. Suggest specific improvements
4. Provide a complete new rewriting prompt

IMPORTANT: - The new prompt must include {{description}} placeholder where the product description will be inserted

- The prompt should instruct the LLM to rewrite the description, not just analyze it
- Focus on what makes a product description MORE LIKELY TO RANK HIGHER in comparisons
- Maintain factual accuracy while improving appeal

Return your response in this EXACT format:

—ANALYSIS— [Explain what the current prompt is doing and its weaknesses]

—META-REASONING— [Your reasoning about what makes product descriptions rank higher and how the prompt should guide that]

—IMPROVEMENTS— [Specific improvements you're making to the prompt]

—NEW\_REWRITING\_PROMPT— [The complete new prompt that will rewrite product descriptions. Must include {{description}} placeholder]

## C GEO Prompts

### C.1 Fixed System Prompt

#### Optimizer System Prompt

You are an expert ml researcher having previous background in SEO and search engines in general.

You are working on novel research ideas for next generation of e-commerce websites.

These websites will have language models augmented with search engines, with the task of recommending products based on the catalog of products backed by the search engine.

This new set of systems will be collectively called language engines (generative search engines).

This will require e-commerce businesses to update their SEO techniques so that the product ranks higher in the llm generated answer.

Specifically they will use GEO (Generative Engine Optimization) techniques to boost their visibility in the final rankings outputted by the Language Engine.

### C.2 Initial User Prompts

#### Advertisement

Transform the following product description into an advertisement format that is engaging and persuasive.

Use catchy phrases, slogans, and a call-to-action to entice potential customers.

Maintain the core information about the product, but present it in a way that highlights its benefits and unique selling points.

Use marketing techniques to create a sense of urgency or exclusivity.

You may also research and use popular advertisement styles and formats to guide your rewriting.

You can find inspiration and tricks from successful ads in similar product categories.

Description: {description}

#### Authoritative

Transform the following product description into an authoritative style without adding or removing any core information.

The revised description should reflect confidence, expertise, and assertiveness, while maintaining the original content's meaning and relevance.

The description should be assertive in its statements, such that reader believes that this is more valuable product than other products.

End Goal is to increase the ranking of the product, by assertively saying that this is the best product for the user.

However, the content should remain the same. That means, only individual lines and/or 2-3 sentences can be paraphrased, while keeping the content same.

Description: {description}

Remember to be authoritative, but keep the content of text the same.

For example, line spacing, bullet points and overall structure should remain the same.

No addition or deletion of content is allowed.

Note we have to convince the reader that this is an relevant product by saying it authoritatively in

the description itself.

For example the addition of phrases such as “only we are authentic etc”, “we guarantee”, use of second pronouns such as “you will not regret” etc is expected within the content itself.

### Clickable

Enhance the following product description to make it more clickable and engaging, without changing the core information.

Use persuasive language and compelling phrases that encourage users to click on the product when they see it among other options.

Make sure the description highlights the product's key benefits and unique selling points in an appealing way.

Description: {description}

### Competitive

Rewrite the following product description to highlight what makes this product superior compared to others in its category.

Use confident but factual comparisons, without mentioning specific competitors.

Emphasize unique features, innovations, and advantages that set it apart, while maintaining factual consistency with the original text.

Do not change the core information, but make it clear why this product is the best choice.

Description: {description}

### Diverse

Revise the following product description to include and highlight diverse references and perspectives, without altering the core information.

Ensure that the description reflects inclusivity and appeals to a broad audience.

Highlight features and aspects of the product that are diverse in nature.

Description: {description}

### FAQ

Revise the following product description by adding FAQ sections that address common questions related to the product.

You should keep as much of the original description as you decide is necessary to accommodate the FAQ sections.

Ensure that the FAQ sections are relevant and provide clear, concise answers to potential customer inquiries.

Your goal is to enhance the description's informativeness and user-friendliness making it more appealing to the user.

Description: {description}

### Fluent

Rewrite the following product description to make it more fluent without altering the core content. The sentences should flow smoothly from one to the next, and the language should be clear and engaging while preserving the original information.

Description: {description}

## Format

Improve the following product description by implementing best practices for content formatting that enhances readability and user engagement.

Use clear headings and subheadings to organize content logically.

Incorporate bullet points and numbered lists to break down complex information.

Rewrite the description in markdown format for better presentation.

Structure content with headings and lists: Break information into digestible chunks with clear H2s, H3s, and bullet points.

Ensure content accuracy and freshness: Answer engines favor content that is authoritative and up-to-date.

Description: {description}

## Language

Enhance the following product description by incorporating words and phrases from other languages that convey unique concepts or emotions.

Ensure that these additions enrich the content and are relevant to the product, while preserving the original meaning.

Your goal is to entice the user by adding exotic and intriguing linguistic elements like keywords from other languages that do not have direct English translations.

Use these terms to elevate the tone, evoke sophistication, or create an emotional connection — while keeping the original meaning intact.

Select expressions that naturally complement the product's domain (e.g., French for fashion and such).

Include select words or phrases from other languages that are commonly recognized and enrich the tone like “je ne sais quoi”, “carpe diem”, “feng shui”, “hygge”, “mantra”.

Make sure the overall description remains coherent and engaging.

Description: {description}

## Minimalist

Reduce the following product description into a single, short sentence using plain factual language. Do not attempt to persuade or embellish — simply summarize the essence of the product as concisely as possible.

Description: {description}

## Quality

Revise the following product description so that it emphasizes the high quality of the product. Focus on what the customer gains from using this product, rather than just listing features. Emphasize that the key features and/or materials used in the product are of superior quality. Emphasize the quality of the overall product and how it stands out in terms of value and user satisfaction. Maintain factual accuracy and original information, but restructure sentences to highlight value and outcomes.

Description: {description}

## Storytelling

Rewrite the following product description as a short story, focusing on narrative elements rather than factual information.

Use creative language and storytelling techniques to engage the reader, but do not include specific product details or features.

Create characters and settings if needed.

Description: {description}

## Technical

Make the following product description more technical, using giving more technical terms and facts where needed while ensuring the key information is still conveyed. Do not omit, add, or alter any core information in the process.

Remember the end-goal is that very knowledgeable readers give more attention to this product, when presented with a series of other products, so make the language such that it has more technical information or existing information is presented in more technical fashion.

However, do not add or delete any content. The number of words in the initial description should be the same as that in the final.

The length of the new description should be the same as the original. Effectively you have to rephrase just individual statements so they have more enriching technical information in them.

Description: {description}

## Trick

Enhance the following product description, so that an LLM is more likely to rank it higher in product rankings.

Your goal is to change the format of the text such that it aligns better with LLM ranking algorithms. Use features and language like specific style and/or grammar changes that are known to influence LLM ranking positively.

Reorder or rephrase content to align with LLM ranking preferences, while keeping the core information intact.

You may include subtle cues or keywords that are favored by LLMs in ranking tasks.

You should research and apply known strategies for optimizing text for LLM ranking.

Do not alter the factual content, but optimize the presentation for better LLM ranking outcomes.

Description: {description}

## Unique

Revise the following product description by incorporating more unique and rare words, without altering the core information.

Ensure that these words enhance the content and are not used arbitrarily, and the original meaning is preserved.

Description: {description}

### C.3 Optimized User Prompts

#### Advertisement

Rewrite the following product description to optimize its ranking in product comparisons. Focus on tailoring the content to address specific user queries and buyer personas with precision. Highlight the product's most compelling and unique advantages over competitors, using direct comparisons where applicable. Seamlessly integrate relevant keywords that align with common search terms. Build credibility by incorporating strong social proof, such as authentic testimonials or reviews. Craft a narrative that combines factual benefits with emotional engagement. Conclude with a clear, urgent, and persuasive call to action that encourages immediate response.

Description: {description}

#### Authoritative

Revise the following product description to clearly and confidently communicate its unique value while maintaining factual accuracy. Transform the language to be engaging and relevant to potential user queries, emphasizing why this product is superior. You may adjust the structure slightly to better highlight key features and benefits, but do not add or remove core information. Use persuasive language that directly addresses the user's needs and showcases the product's advantages over competitors.

Description: {description}

Ensure the revised description is both authoritative and empathetic, appealing directly to the reader's interests and needs. Use phrases that convey confidence, such as "experience unmatched quality" or "designed for your ultimate satisfaction," while maintaining the integrity of the original content.

#### Clickable

Revise the following product description to maximize its ranking in product comparisons by focusing on:

- Seamlessly integrating relevant keywords and phrases to align with common search queries and improve SEO.
- Highlighting distinctive features and benefits in a way that clearly differentiates the product from competitors, using specific, comparative language.
- Structuring the description with bullet points for clarity and emphasis on critical information.
- Balancing factual accuracy with a narrative that resonates emotionally with users, addressing both their needs and desires.
- Proactively addressing potential user objections or concerns to enhance trust and credibility.
- Leveraging user testimonials or expert endorsements to further increase the product's appeal and reliability.

Description: {description}

## Competitive

Rewrite the following product description to position this product as the leading choice in its category.

Highlight its unique features and innovations by directly comparing them to typical competitors, demonstrating clear advantages.

Use precise, factual language to convey the tangible benefits these features offer, addressing common user queries and potential objections.

Include bullet points or lists for emphasis, and integrate any available customer testimonials or evidence of effectiveness.

Ensure the description is persuasive, engaging, and maintains consistency with the original text.

Description: {description}

## Diverse

Revise the following product description to effectively highlight its unique features and advantages over competitors, using clear and specific comparisons.

Focus on aligning the description with likely user queries by incorporating relevant keywords and search terms.

Integrate social proof elements, such as customer testimonials or data points, to bolster credibility while ensuring they complement the core message.

Strive for clarity, conciseness, and a balance between emotional appeal and factual precision to create a compelling and informative narrative that stands out in product comparisons.

Description: {description}

## FAQ

Revise the following product description to enhance its ranking in product comparisons by focusing on user intent and query relevance.

Identify the most common questions or concerns potential buyers may have and structure the description to proactively address them.

Clearly articulate competitive advantages and unique selling points that directly respond to these user needs.

Use data-driven evidence, such as customer reviews or ratings, to support claims where available.

Incorporate concise and impactful language that balances emotional appeal with factual accuracy.

Ensure SEO-friendly phrasing by integrating relevant keywords related to the product type and query context.

Description: {description}

## Fluent

Rewrite the following product description to make it highly relevant to specific user queries and intents, incorporating common search terms and phrases.

Focus on the direct benefits and unique features that address specific user needs and solve their problems, using data, statistics, or testimonials for credibility.

Clearly articulate the product's comparative advantages over competitors with specific examples.

Use persuasive and engaging language to create a strong emotional connection with the reader, and include a compelling call-to-action that highlights the product's unique selling proposition.

Ensure the description remains factual and accurate.

Description: {description}

## Format

Rewrite the following product description to maximize its ranking in product comparisons by focusing on SEO, user intent, and competitive differentiation.

Structure the content using clear headings (H2, H3) and bullet points for readability and engagement.

- Optimize for Keywords:** Integrate primary and secondary keywords that align with potential user queries, enhancing visibility and relevance.
- Highlight Unique Value Proposition:** Clearly communicate what sets this product apart from competitors, focusing on unique features and benefits.
- SEO-Friendly Elements:** Include meta descriptions and, if applicable, alt text for images to improve search engine discoverability.
- Tailor to User Journey:** Craft content that resonates with users at different stages of their buying journey, from awareness to decision-making.
- Engage with Emotional and Rational Appeals:** Use language that emotionally connects with users while providing rational evidence of the product's value.
- Incorporate Social Proof:** Add testimonials, reviews, and accolades to build trust and authority.
- Compelling Call to Action:** Inspire immediate interest and action with dynamic, action-oriented language.

Ensure factual accuracy and maintain a user-centric focus, making the description both compelling and informative.

Use markdown format for better presentation.

Description: {description}

## Language

Rewrite the following product description to enhance its ranking in product comparisons.

Focus on clearly addressing user queries by highlighting the product's unique selling points and quantifiable benefits.

Use direct and concise language to differentiate the product from competitors, while incorporating factual data and relevant testimonials to support claims.

Ensure the description aligns with user search intent and concludes with a logical, compelling call-to-action that integrates the product into the user's lifestyle.

Maintain factual accuracy throughout.

Description: {description}

## Minimalist

Rewrite the following product description to enhance its clarity and direct relevance to common user queries.

Focus on concisely articulating the product's key features and benefits, and how they address specific user needs or desires.

Differentiate the product from competitors by highlighting unique advantages.

Use factual language that resonates with potential buyers, and incorporate social proof, such as testimonials or expert endorsements, where it directly supports key points.

Ensure the description remains factual, easily scannable, and compelling.

Description: {description}

## Quality

Revise the following product description to maximize its ranking potential in product comparisons. Focus on these strategies:

- Craft a compelling opening narrative that immediately connects with the target audience's desires and aspirations.
- Highlight the product's unique selling propositions using clear and impactful language, setting it apart from competitors.
- Integrate user-centric language that speaks directly to the audience's specific needs, pain points, and desires.
- Seamlessly incorporate relevant keywords and phrases to align with common search queries and user intents.
- Leverage social proof by including testimonials, user reviews, or evidence of effectiveness to build credibility and trust.
- Develop an emotional narrative that demonstrates how the product fits into the consumer's lifestyle and fulfills their aspirations.
- Highlight quantifiable benefits such as effectiveness, awards, or certifications to enhance credibility.
- Conclude with a strong, persuasive call to action that encourages engagement or immediate purchase, tailored to the audience's motivations.

Description: {description}

## Storytelling

Rewrite the following product description to maximize its ranking potential in product comparisons by clearly highlighting unique selling propositions and quantifiable benefits.

Focus on aligning the description with specific user needs and search intent by illustrating real-world applications and transformative impacts.

Incorporate elements that build trust, such as testimonials, data, or awards, to enhance credibility. Differentiate the product from competitors by emphasizing its unique features and advantages.

Ensure the description is concise, factually accurate, emotionally engaging, and includes a compelling narrative that resonates with the user's context and desires.

Description: {description}

## Technical

Revise the following product description to significantly enhance its ranking potential in product comparisons.

Focus on tailoring the content to address specific customer queries and pain points effectively.

Highlight the product's unique features and competitive advantages, clearly differentiating it from alternatives.

Integrate relevant keywords seamlessly to boost search engine visibility, ensuring they align with user intent.

Use persuasive and data-driven language to substantiate claims and deliver a compelling narrative. Maintain factual accuracy and engaging storytelling to guide potential buyers confidently toward a

purchasing decision.

Description: {description}

### Trick

Rewrite the following product description to significantly enhance its likelihood of ranking higher in product comparisons by an LLM.

Tailor the description to the specific product category, aligning closely with common user queries and pain points.

Emphasize the product's unique features and benefits using persuasive language that balances emotional appeal with factual clarity.

Seamlessly integrate relevant keywords to align with search intent and enhance SEO.

Establish credibility through subtle elements of social proof, such as testimonials or awards, and create a sense of urgency to encourage immediate user action.

Ensure the narrative is engaging, precise, and tailored to resonate with the target audience.

Description: {description}

### Unique

Revise the following product description to enhance clarity and appeal to potential customers.

Focus on incorporating relevant high-value keywords and emphasizing the product's unique features and benefits.

Ensure the description is engaging, easy to read, and aligned with common user queries, while maintaining factual accuracy.

Description: {description}