

Is RRF the Secret to Dominating AI Citations? I Decoded ChatGPT's Ranking Formula

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Like many SEOs, I love looking at ChatGPT's dev console on Chrome. I was digging around for Google & Bing fingerprints when I discovered a code snippet that reveals how ChatGPT processes search results, using Reciprocal Rank Fusion (RRF). While there have been experiments and rumors about ChatGPT using various search engines, what's clear from the code is their RRF implementation, which gives us insights into how AI search works.

Important Note: I'm not saying that I found the exact dominating formula; this can be changed. This post presents mathematical compositions from my findings and you can review it on your own. RRF is not something new. ^[1]However, as an SEO; it's great to see search engine mathematical methods, models in the source code. I'm writing this post to give you a mathematical perspective and tell why you still need SEO. For some cases, I believe LLMs are using one single query.

a coffee question for the friends in London -> [Do you want to join a free AI & SEO chat in-person?](#) ^[2]

Let's start.

Figure

What is Reciprocal Rank Fusion (RRF)?

RRF isn't new - it's been around since 2009 and is widely used in information retrieval. It's a method to combine search results from multiple queries into one final ranking. The formula is straightforward:

RRF score = $1/(60 + \text{rank position})$

So:

- Rank #1 = $1/(60+1) = 0.0164$
- Rank #5 = $1/(60+5) = 0.0154$
- Rank #10 = $1/(60+10) = 0.0143$

When a system runs multiple queries and finds the same page in different positions, it adds up all these scores. I will keep it 60 as default since there are no specific settings in the source code. Meanwhile, it doesn't change the perspective even using default numbers.

Why LLMs Search Multiple Times When You Ask a Question (Not Just Once)

Here's what many people don't realize: When you ask ChatGPT, Perplexity or Google's AI mode a question, they don't just run one search. They run multiple searches with different terms and combine all the results.

For example, ask about "coffee makers" and behind the scenes they might search:

- "coffee makers"
- "best coffee machines"
- "how to choose coffee maker"
- "coffee brewing devices"
- "home coffee makers reviews"

This is how Google's newest AI mode works too; multiple searches, combined results. RRF is the mathematical method that merges all these searches into one final answer. This explains why AI search results often look different from a traditional single Google search. (And of course, QFO can use a different angle for multiple searches)

The Code Discovery: How ChatGPT Processes Search Results

While inspecting ChatGPT's search implementation, I found this revealing code:

TEXT

```
rrf_alpha: 1,  
rrf_input_threshold: 0,  
ranking_model: null
```

This confirms ChatGPT uses standard RRF to combine search results. What's interesting is how this implementation reveals the importance of ranking for multiple query variations.

Why RRF Validates the Importance of Topical Authority

Here's where it gets interesting for SEOs. RRF mathematically proves why topical authority and topic clusters work so well:

Page A: Single-Keyword Focus

- "coffee makers" → Rank #1 → Score: 0.0164
- "best coffee makers" → Rank #15 → Score: 0.0133
- "coffee machines" → Not ranking → Score: 0
- "coffee maker reviews" → Rank #25 → Score: 0.0118
- **Total RRF Score: 0.0415**

Page B: Topic Cluster Approach

- "coffee makers" → Rank #4 → Score: 0.0156
- "best coffee makers" → Rank #5 → Score: 0.0154
- "coffee machines" → Rank #6 → Score: 0.0152
- "coffee maker reviews" → Rank #4 → Score: 0.0156
- "home coffee makers" → Rank #7 → Score: 0.0149
- **Total RRF Score: 0.0767**

Page B wins by almost 1.8x because it has broader topical coverage.

The Math Behind "Consistency Beats Individual Rankings"

This explains why topic clusters are so effective:

Scenario 1: Traditional Keyword Targeting

- 1 keyword at position #1: $1/(60+1) = 0.0164$
- Total RRF = 0.0164

Scenario 2: Topic Cluster Strategy

- 10 related keywords at position #5: $10 \times (1/(60+5)) = 10 \times 0.0154 = 0.154$
- Total RRF = 0.154

The topic cluster scores **almost 10x higher** (0.154 vs 0.0164). This math applies whenever systems combine multiple related queries.

How Modern Search Engines Think About Relevance

RRF implementation in ChatGPT gives us a window into how AI-powered search evaluates content:

1. **Multiple Query Variations:** AI doesn't just search once; it explores related queries
2. **Cumulative Scoring:** Pages gain value by appearing across multiple searches
3. **Topic Understanding:** Systems recognize and reward comprehensive coverage

Why Topic Clusters Work: The RRF Perspective

Topic clusters aren't just a content strategy - they're mathematically optimal for RRF-style ranking:

Example: Coffee Maker Topic Cluster

Hub Page: "Complete Guide to Coffee Makers" **Cluster Pages:**

- Types of coffee makers
- How to choose a coffee maker
- Coffee maker maintenance

- Best coffee makers by budget
- Coffee maker troubleshooting

When someone searches any coffee maker query, the entire cluster has ranking potential:

TEXT

```
Query: "how to clean coffee maker"
- Maintenance page: Rank #2 → 0.0161
- Hub page: Rank #5 → 0.0154
- Troubleshooting page: Rank #8 → 0.0147
Total cluster RRF: 0.0462
```

vs.

```
Standalone page: Rank #1 → 0.0164
```

The cluster wins by almost 300%!

Since Google AI Mode runs on this same multi-query idea, tracking it well matters, and I compared the tools that do it in my guide to [the best AI Mode rank trackers](#)^[3].

Real-World Topical Authority Calculation

Let's model a site with strong topical authority:

Coffee Authority Site (30 related pages):

- Ranks #3-10 for 50 coffee-related queries
- Average position: #6
- RRF per query: $1/(60+6) = 0.0152$
- Total RRF: $50 \times 0.0152 = 0.76$

Single-Page Site:

- Ranks #1 for "best coffee makers 2025"
- Ranks nowhere for other queries
- Total RRF: 0.0164

The topical authority site scores almost 60x higher!

What This Means for Modern SEO

1. Topical Authority is Mathematically Superior

RRF proves that comprehensive topic coverage beats individual keyword rankings. This isn't just theory, it's math.

2. AI Search Rewards Comprehensive Coverage

Whether it's ChatGPT or other AI systems, the trend is clear: comprehensive, authoritative content wins over narrow optimization.

3. Topic Clusters Align with Ranking Math

The topic cluster strategy isn't just good for users, it's optimized for how modern search systems combine and evaluate results.

4. Query Variations Matter More Than Ever

Every way users might search for your topic is an opportunity to add to your RRF score:

- "coffee makers"
- "coffee machines"
- "coffee brewing devices"
- "home coffee makers"
- "automatic coffee makers"

The Code Also Shows Multi-Source Integration

Another interesting finding from the code:

TEXT

```
// ChatGPT processes multiple result types:  
- webpage  
- webpage_extended  
- grouped_webpages  
- image_inline
```

This suggests AI search systems don't just look at one result type, they combine multiple signals, further rewarding comprehensive content that appears across different formats.

How to Apply RRF Thinking to Your SEO Strategy

1. Map Your Entire Topic Space

- Find ALL query variations users might search
- Look at search suggestions and related queries
- Analyze what comprehensive coverage looks like
- Study sites with strong topical authority

2. Build Comprehensive Topic Clusters

- Create a strong hub page
- Build supporting pages for subtopics

- Interlink extensively
- Cover every angle users might search

3. Measure Topical Coverage, Not Just Rankings

- Track rankings across 50+ related queries
- You can work on your "topic RRF score"
- Monitor total presence across the topic, not just individual positions

4. Optimize for Consistency

Better to rank #4-8 for 30 queries than #1 for 3 queries. The math:

- 30 queries at average #6: $RRF = 0.456$
- 3 queries at #1: $RRF = 0.049$
- **Consistency wins by almost 10x**

Note: You may rank at a top keyword in the first position, but you may likely rank more in the top 10 positions for many queries. This math is for simulation.

Conclusion

Finding RRF in ChatGPT's code gives us a mathematical framework for understanding why topical authority and topic clusters work so well in modern search. While we can't know exactly which search engines ChatGPT uses or will use in the future, the RRF implementation shows us how AI systems think about ranking and relevance.

The math doesn't lie. In a world where AI search combines multiple queries and signals, the sites that win are those that consistently appear across entire topic spaces. Topic clusters aren't just a content strategy - they're a mathematical advantage in modern search.

Understanding RRF helps us see why topical authority matters. It's not about gaming the system - it's about aligning with how AI search naturally evaluates and combines relevance signals across related queries.

This isn't just about ChatGPT, it's about preparing for a future where all search becomes more AI-driven and comprehensive coverage beats narrow optimization.

Who to follow?

[Lily Ray^{\[4\]}](#), [Mike King^{\[5\]}](#), [Andrea Volpini^{\[6\]}](#), [Kevin Indig^{\[7\]}](#), [Aleyda Solis^{\[8\]}](#), [Gianluca Fiorelli^{\[9\]}](#), [Gagan Ghotra^{\[10\]}](#), [Koray Tugberk Gubur^{\[11\]}](#), [Shaun Anderson^{\[12\]}](#), [Charles Floate^{\[13\]}](#)

Ending note:

I'll leave a related research paper here:

<https://arxiv.org/html/2507.12425v1>^[14]

-They are not the same. But MRR(Mean Reciprocal Rank) is related to the RRF.

**One is for evaluation, the other is for ranking.*

Useful sources:

<https://lfomendes.medium.com/thoughts-on-rag-hybrid-search-and-rank-fusion-ab2024d2102b>^[15]

<https://medium.com/@devalshah1619/mathematical-intuition-behind-reciprocal-rank-fusion-rrf-explained-in-2-mins-002df0cc5e2a>^[15]

Note: These findings are based on code analysis from ChatGPT's Chrome DevTools and represent experimental observations. Search implementations may vary and evolve over time. I'm using AI to write my posts faster.

If you want to act on these citation mechanics, see my breakdown of the [best AI visibility tools](#)^[16] and the patterns behind [how AI platforms pick their citations](#)^[17].

RRF is one of the clearest signals we have about how ChatGPT weighs citations. For AEO work, that matters more than classic SEO signals: the pages that earn AI citations in ChatGPT and Perplexity tend to be the ones that survive RRF blending across multiple retrievers. Treat RRF as the answer engine optimization equivalent of PageRank - a structural lever, not a content tweak.

Generative engine optimization for ChatGPT is partly RRF engineering. RRF is the structural layer generative engine optimization programs have to design around.

REFERENCES & SOURCES

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- [9] Gianluca Fiorelli — <https://x.com/gfiorelli1>
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- [12] Shaun Anderson — https://x.com/Hobo_Web
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