

Proposition: ‘Which gives a Generative AI-based application the greatest capability and differentiation over competitors: RAG or Fine-Tuning?’

GPT-4, with Michael L. Thompson

2024-02-20

Contents

“Which gives a Generative AI-based application the greatest capability and differentiation over competitors: RAG or Fine-Tuning?”	2
Retrieval-Augmented Generation (RAG)	2
Fine-Tuning	2
Comparative Analysis for Capability and Differentiation	2
Conclusion	3
Search Results	3
“Generative AI RAG vs Fine-Tuning”	3
“Generative AI RAG vs Fine-Tuning comparison”	3
“Generative AI definition”	4
“Generative AI current applications”	4
“RAG definition”	5
“RAG use cases in Generative AI”	5
“RAG advantages”	6
“RAG disadvantages”	6
“Fine-Tuning definition”	7
“Fine-Tuning use cases in Generative AI”	7
“Fine-Tuning advantages”	8
“Fine-Tuning disadvantages”	9
“RAG vs Fine-Tuning capability comparison”	9
“RAG vs Fine-Tuning differentiation comparison”	9
“RAG best use cases in CPG R&D”	10
“Fine-Tuning best use cases in CPG R&D”	10
“Factors contributing to profitability in CPG R&D”	11
“RAG evaluation for profitability in CPG R&D”	12
“Fine-Tuning evaluation for profitability in CPG R&D”	12
How Was This Done?	13

1

¹Proposition: ‘Which gives a Generative AI-based application the greatest capability and differentiation over competitors: RAG or Fine-Tuning?’ [rag_vs_finetuning.pdf] © 2024 by Michael L. Thompson is licensed under CC BY-SA 4.0. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/>

“Which gives a Generative AI-based application the greatest capability and differentiation over competitors: RAG or Fine-Tuning?”

Determining whether Retrieval-Augmented Generation (RAG) or Fine-Tuning provides the greatest capability and differentiation for a Generative AI-based application, especially in a competitive landscape, requires a nuanced understanding of both methodologies and their respective strengths and applications. Based on the provided context and additional insights, let's analyze both approaches to deduce which might offer superior capability and differentiation.

Retrieval-Augmented Generation (RAG)

Capabilities:

- Integrates external knowledge into the generation process, enhancing accuracy and reliability with facts fetched from external sources.
- Provides up-to-date and accurate responses by connecting to live data feeds, making it ideal for applications requiring the latest research, statistics, or news.

Differentiation:

- The ability to pull in real-time information from external sources for generating responses offers a unique advantage, especially in rapidly changing fields or where accuracy and timeliness of information are critical.
- Enhances model versatility by grounding responses in factual data, potentially reducing the risk of generating inaccurate or outdated information.

Fine-Tuning

Capabilities:

- Specializes the model for a specific task or domain by adapting pre-trained models to specific tasks or objectives with a smaller, targeted dataset.
- Improves model performance and accuracy for targeted applications, making it suitable for tasks aligned with the model's pre-training objectives.

Differentiation:

- Allows for deep customization of AI models to specific domains or tasks, offering potentially more accurate and efficient performance within those contexts.
- Cost and resource efficiency compared to training from scratch, providing a practical advantage for applications with limited datasets or specific performance requirements.

Comparative Analysis for Capability and Differentiation

1. **Adaptability to Rapid Changes:** RAG's ability to integrate real-time data makes it highly adaptable to rapid changes in information, providing a significant competitive edge in fields where staying updated is crucial. This adaptability is a unique capability that can be a key differentiator.
2. **Customization and Specialization:** Fine-Tuning allows for high levels of customization and specialization, which can be a critical differentiator in saturated markets or specialized applications. The ability to tailor models to very specific tasks or datasets can lead to superior performance in those areas.
3. **Technical Complexity and Resource Requirements:** RAG might require moderate technical expertise in data integration and retrieval mechanisms but can leverage existing data sources without the need for extensive additional training data. Fine-Tuning, while potentially more resource-intensive due to the need for specific training datasets, offers a pathway to high accuracy and customization with existing pre-trained models.

4. **Application Scope:** The choice between RAG and Fine-Tuning may also depend on the application scope. RAG's strength in providing up-to-date, accurate information from external sources makes it ideal for applications requiring real-time data or external insights. Fine-Tuning, on the other hand, excels in applications where deep domain knowledge or customization is required, making it potentially more suitable for specialized tasks.

Conclusion

Both RAG and Fine-Tuning offer distinct capabilities and differentiation potential. The choice between them should be guided by the specific requirements and goals of the application:

- **RAG** offers unparalleled capability in applications that benefit from real-time information and external data integration, providing a significant differentiation in fields where information is rapidly changing.
- **Fine-Tuning** provides superior capability in achieving high levels of accuracy and customization for specific tasks or domains, offering a key competitive advantage in specialized applications.

In a scenario where differentiation and capability are paramount, and the application demands both up-to-date information and high customization, a strategic combination of both RAG and Fine-Tuning could offer the best of both worlds, maximizing the application's competitive edge.

Search Results

“Generative AI RAG vs Fine-Tuning”

- [RAG Vs Fine-Tuning Vs Both: A Guide For Optimizing LLM ... - Galileo](#): Conclusion: RAG leans towards moderate technical expertise, mainly in data integration and retrieval mechanisms. Fine-tuning, on the other hand, ...
- [Differences Between RAG and Fine Tuning - LinkedIn](#): RAG combines traditional text generation with a retrieval mechanism. It means the model generates text, but it retrieves relevant information ...
- [Fine-Tuning Vs RAG in Generative AI - In Plain English](#): RAG models are specialized for tasks that require a combination of information retrieval and text generation, while fine-tuning LLMs are adapted to specific NLP ...
- [Fine-tuning vs Context-Injection \(RAG\) - OpenAI Developer Forum](#): Essentially, you would be fine-tuning the model to better use the retrieved data and hopefully giving it the ability to ignore irrelevant ...
- [Which is better, retrieval augmentation \(RAG\) or fine-tuning? Both.](#): Fine-tuning outperforms RAG when addressing slow-to-change challenges, such as adapting the model to a particular domain or set of long-term ...
- [RAG vs Finetuning Which Is the Best Tool to Boost Your LLM ...](#): While RAG focuses primarily on information retrieval, finetuning can help the LLM adjust its responses to the company's internal vernacular or ...
- [RAG vs. Fine-Tuning : r/LangChain - Reddit](#): RAG is to link document sources and can be updated almost instantly depending on your connectors. LLMs are not really meant to be search engines ...
- [RAG vs. fine-tuning: LLM learning techniques - Addepto](#): RAG is relatively less complex as it only requires coding and architectural skills. Fine-tuning, on the other hand, is more complex as it ...
- [Fine-Tuning vs RAG: Understand the Difference in AI Approaches](#): A comprehensive guide to LLM fine-tuning vs RAG (retrieval-augmented generation) for Generative AI deployments in the enterprise.

“Generative AI RAG vs Fine-Tuning comparison”

- [RAG Vs Fine-Tuning Vs Both: A Guide For Optimizing LLM ... - Galileo](#): Conclusion: RAG leans towards moderate technical expertise, mainly in data integration and retrieval mechanisms. Fine-tuning, on the other hand, ...
- [Differences Between RAG and Fine Tuning - LinkedIn](#): RAG combines traditional text generation with a retrieval mechanism. It means the model generates text, but it retrieves relevant information ...

- [Fine-Tuning Vs RAG in Generative AI - In Plain English](#): RAG models are specialized for tasks that require a combination of information retrieval and text generation, while fine-tuning LLMs are adapted to specific NLP ...
- [Fine-tuning vs Context-Injection \(RAG\) - OpenAI Developer Forum](#): I finished my research work on comparing fine-tuning with context-injection (as an implementation of retrieval-augmented generation). A lot ...
- [RAG vs. Fine-Tuning in Large Language Models: A Comparison](#): RAG is more suited for tasks that can benefit from external information retrieval, while Fine-Tuning is best for adapting models to specific ...
- [Which is better, retrieval augmentation \(RAG\) or fine-tuning? Both.](#): Fine-tuning outperforms RAG when addressing slow-to-change challenges, such as adapting the model to a particular domain or set of long-term ...
- [RAG vs. Fine-Tuning : r/LangChain - Reddit](#): RAG vs. Fine-Tuning Cost: FT is much more expensive (requires GPUs; assuming you can actually get them with current shortage). Privacy: if you ...
- [RAG vs Finetuning Which Is the Best Tool to Boost Your LLM ...](#): While RAG focuses primarily on information retrieval, finetuning can help the LLM adjust its responses to the company's internal vernacular or ...
- [Fine-Tuning vs RAG: Understand the Difference in AI Approaches](#): A comprehensive guide to LLM fine-tuning vs RAG (retrieval-augmented generation) for Generative AI deployments in the enterprise.

“Generative AI definition”

- [What is ChatGPT, DALL-E, and generative AI? | McKinsey](#): Generative artificial intelligence (AI) describes algorithms (such as ChatGPT) that can be used to create new content, including audio, ...
- [What is generative AI? | IBM Research Blog](#): Generative AI refers to deep-learning models that can generate high-quality text, images, and other content based on the data they were trained ...
- [Generative artificial intelligence - Wikipedia](#): Generative artificial intelligence is artificial intelligence capable of generating text, images or other data using generative models, often in response to ...
- [What is Generative AI? - AWS](#): Generative artificial intelligence (generative AI) is a type of AI that can create new content and ideas, including conversations, stories, images, videos, ...
- [What is Generative AI \(GenAI\)? - Definition from Techopedia](#): Generative AI is a subset of machine learning (ML) that focuses on creating new data samples that resemble real-world data.
- [Explained: Generative AI | MIT News](#): Generative AI can be thought of as a machine-learning model that is trained to create new data, rather than making a prediction about a specific ...
- [What is generative AI? An AI explains - The World Economic Forum](#): Generative AI is a category of AI algorithms that generate new outputs based on training data, using generative adversarial networks to ...
- [What is generative AI and why is it so popular? Here's ... - ZDNET](#): Generative AI refers to models or algorithms that create brand-new output, such as text, photos, videos, code, data, or 3D renderings, ...
- [What Is Generative AI? Definition, Applications, and Impact - Coursera](#): Generative artificial intelligence (AI) is a type of AI that generates images, text, videos, and other media in response to inputted prompts.

“Generative AI current applications”

- [Top Generative AI Industry Applications & Use Cases - Turing](#):
 1. Image generation and manipulation. One of the most common use cases of generative AI is image generation, which is typically text-to-image conversion.
- [What is generative AI and what are its applications? - Google Cloud](#): Generative AI works by using an ML model to learn the patterns and relationships in a dataset of human-created content. It then uses the learned patterns to ...
- [Generative AI: What Is It, Tools, Models, Applications and Use Cases](#): Generative AI is a type of AI

(such as ChatGPT) that can generate new forms of creative content, such as audio, code, images, text, simulations and videos.

- [Top 100+ Generative AI Applications / Use Cases in 2024](#): In this article, we have gathered the top 70+ generative AI applications that can be used in general or for industry-specific purposes.
 - [Top Generative AI Use Cases and Applications - XenonStack](#): Generative AI applications can ensure the creation of new realistic animated materials, text, and images in minutes. It offers various ...
 - [Top Generative AI Tools 2024 - Simplilearn.com](#): Best Generative AI Tools 1. GPT-4 2. ChatGPT 3. AlphaCode 4. GitHub Copilot 5. Bard 6. Cohere Generate 7. Claude 8. Synthesia.
 - [Top 14 Generative AI Applications in 2023 - SEO.ai](#): Top 14 Best Generative AI Applications in 2023 1) Monkeylearn 2) ChatGPT 3) Ubersuggest AI Writer 4) SEO.ai 5) Notion AI 6) TLDR This.
 - [Top 100+ Generative AI Applications: Use Cases - LinkedIn](#)
1. Art Generation. Generative AI can create artwork, including paintings, drawings, and digital art. Artists and designers can use AI to explore ...
- [Top 10 Insane Generative AI Applications - Vegavid Technology](#): Top 10 Insane Generative AI Applications 1. Content Generation 2. Art and Design 3. Language Translation 4. Medical Imaging Analysis 5.

“RAG definition”

- [Rag Definition & Meaning - Merriam-Webster](#): Kids Definition 1 of 3 noun. rag. 1. : a waste or worn piece of cloth. 2. plural : shabby or very worn clothing. dressed in rags. 3. : ...
 - [RAG | definition in the Cambridge English Dictionary](#): rag noun [C] (NEWSPAPER). informal. a newspaper or magazine that is considered to be of bad quality: He had his picture taken for some local rag.
 - [RAG Definition & Usage Examples - Dictionary.com](#): a worthless piece of cloth, especially one that is torn or worn. rags, ragged or tattered clothing: The tramp was dressed in rags.
 - [Rag Definition & Meaning | Britannica Dictionary](#): from being poor to being wealthy : from a state of having very little money to a state of having a lot of money. She went from rags to riches overnight.
 - [RAG definition in American English - Collins Dictionary](#): A rag is a piece of old cloth which you can use to clean or wipe things. He was wiping his hands on an oily rag. Synonyms: cloth, piece of cloth More Synonyms ...
 - [Rag - Definition, Meaning & Synonyms - Vocabulary.com](#): /rg/ noun. a small piece of cloth or paper noun. newspaper with half-size pages verb. treat cruelly verb. censure severely or angrily verb. harass ...
 - [rag - Wiktionary, the free dictionary](#): Verb edit To scold or tell off; to torment; to banter. (Britain slang) To drive a car or another vehicle in a hard, fast or unsympathetic manner. To tease ...
 - [rag - definition and meaning - Wordnik](#): noun Slang A newspaper, especially one specializing in sensationalism or gossip. noun The stringy central portion and membranous walls of a citrus fruit.
 - [What is the origin of “rag” meaning newspaper?](#)
6. 1. In my experience ‘rag’ is slang for magazine. I’ve never heard it used to refer to a newspaper- although I see it is listed in several ...

“RAG use cases in Generative AI”

- [What Is Retrieval-Augmented Generation \(RAG\)? - Oracle](#): These use cases are appropriate to chat-bots, email, text messaging, and other conversational applications. In the future, possible directions ...
- [What Is Retrieval-Augmented Generation aka RAG | NVIDIA Blogs](#): Retrieval-augmented generation (RAG) is a technique for enhancing the accuracy and reliability of generative AI models with facts fetched from ...
- [What is RAG in Generative AI?. Defining Retrieval ... - Medium](#): Retrieval augmented generation (RAG) is a natural language processing (NLP) technique that combines the strengths of both retrieval-based ...

- [How RAG makes generative AI tools even better - Computerworld](#): Retrieval augmented generation, or ‘RAG’ for short, creates a more customized and accurate generative AI model that can greatly reduce anomalies ...
- [What is retrieval augmented generation? | Glossary - Cohesity](#): RAG, short for retrieval augmented generation, works by integrating retrieval-based techniques with generative-based AI models. Retrieval-based models excel at ...
- [What is retrieval-augmented generation? | IBM Research Blog](#): Retrieval-augmented generation (RAG) is an AI framework for improving the quality of LLM-generated responses by grounding the model on external ...
- [What is Retrieval-Augmented Generation \(RAG\)? - Analytics Vidhya](#): Retrieval Augmented Generation (RAG) is a transformative concept in AI and NLP. By harmonizing retrieval and generation components, RAG addresses the ...
- [Improving Gen AI Accuracy With Retrieval Augmented Generation](#): An optimal way to improve accuracy is to use an approach called RAG, which stands for Retrieval Augmented Generation. RAG enables the LLM to ...
- [The Power Of RAG: How Retrieval-Augmented Generation ... - Forbes](#): RAG is an AI framework that allows a generative AI model to access external information not included in its training data or model parameters to ... Show results with:cases

“RAG advantages”

- [The advantages of RAG AI \(Retrieval Augmented Generation\) over ...](#):
 1. Timeliness: real-time access to information. The retrieval component of RAG means it has real-time access to information. Timeliness of ...
- [10 Reasons Why You Need to Implement RAG A Game-Changer ...](#): Another key benefits of RAG (Retrieval-Augmented Generation) is its ability to process vast amounts of data in real-time. This advantage ...
- [Introduction to Retrieval-Augmented Generation \(RAG\) - Medium](#): Advantages and Applications of RAG ... RAG offers several advantages, including access to the latest, reliable facts, reduction in sensitive data ...
- [Secondary Advantages of using RAG | by Simon Attard - Medium](#): Another advantage of RAG, is the ability to store metadata alongside the data records in your vector databases. This metadata could include the ...
- [What is RAG? - Retrieval-Augmented Generation Explained - AWS](#): RAG technology brings several benefits to an organization’s generative AI efforts. Cost-effective implementation. Chatbot development typically begins using a ...
- [What is Retrieval Augmented Generation? The Benefits of ... - Tonic.ai](#): Retrieval Augmented Generation, aka RAG, is a technique for augmenting LLMs’ capabilities via a document store that is separate from the LLM ...
- [Retrieval Augmented Generation: What Is It and How Do Enterprises ...](#): Benefits of Using RAG With LLMs Up-to-date information. A retrieval-based approach ensures models have access to the most current, reliable ...
- [Retrieval Augmented Generation Tools: Pros and Cons Breakdown](#): Salesforce’s RAG offers a range of benefits for businesses looking to enhance their information retrieval and content generation capabilities.
- [What is Retrieval-Augmented Generation \(RAG\)? - Analytics Vidhya](#): Benefits of Retrieval-Augmented Generation (RAG). Enhanced LLM Memory. RAG addresses the information capacity limitation of traditional Language Models (LLMs).

“RAG disadvantages”

- [Disadvantages of RAG. This is the first part of the RAG... | by Kelvin Lu](#): Generally speaking, the chunking process disregards the content of the text, and that causes a problem. The ideal content of

the chunk should be ...

- [Retrieval Augmented Generation: Grounding AI Responses in ...](#): Disadvantages of RAG Dependent on Semantic Search: The effectiveness of RAG is highly reliant on the quality of the semantic search. Requires ...
- [RAG || !2 RAG - LinkedIn](#): These drawbacks are based on Complexity and Latency. Introducing an external retrieval system adds complexity to the overall architecture.
- [The limitations of vector retrieval for enterprise RAG - Writer](#): Vector retrieval has limitations in enterprise use cases, but graph-based RAG offers a superior approach for accurate knowledge retrieval.
- [Retrieval-Augmented Generation \(RAG\) vs. LLM Fine-Tuning](#): Key Disadvantages. RAG: Dependence on External Sources: The quality of RAG's output is directly tied to the relevance and accuracy of the ...
- [Losing your RAG: the dangers of project status reporting - Tools](#): Now we have looked at some of the pros and cons of tracking projects in ... RAG statuses. At first glance, one might think that each issue in such a 'JIRA ...
- [Understanding LLM Limitations and the Advantages of RAG](#): This article delves into two significant limitations of LLMs outdated information and the absence of data sources and compares their ...
- [When to use retrieval augmented generation for LLMs](#): Disadvantages of retrieval augmented generation May add additional latency. One of the main advantages of RAG is that it may add additional ...
- [RAG vs. Finetuning: Enhancing LLMs with new knowledge](#): Disadvantages of RAG. As promising as RAG seems, it's not without challenges. As we touched on earlier, researchers are still figuring out ...

“Fine-Tuning definition”

- [Fine-tune Definition & Meaning - Merriam-Webster](#): The meaning of FINE-TUNE is to adjust precisely so as to bring to the highest level of performance or effectiveness. How to use fine-tune in ...
- [Meaning of fine-tune in English - Cambridge Dictionary](#): FINE-TUNE meaning: 1. to make very small changes to something in order to make it work as well as possible: 2. to... Learn more.
- [FINE-TUNE Definition & Usage Examples | Dictionary.com](#): to make minor adjustments in so as to produce stability, improvement, or the precise results desired: to fine-tune the nation's economy.
- [Fine-tuned Definition & Meaning - Merriam-Webster](#): The meaning of FINE-TUNED is precisely adjusted for the highest level of performance, efficiency, or effectiveness. How to use fine-tuned in a sentence.
- [FINE-TUNING | definition in the Cambridge English Dictionary](#): to make very small changes to something in order to make it work as well as possible: She spent hours fine-tuning her speech.
- [FINE-TUNE definition in American English - Collins Dictionary](#): transitive verb. If you fine-tune something, you make very small and precise changes to it in order to make it as successful or effective as it possibly can be.
- [Fine-tune - Definition, Meaning & Synonyms - Vocabulary.com](#): make fine adjustments or divide into marked intervals for optimal measuring. synonyms: calibrate, graduate. see moresee less. type of: adjust, correct, set.
- [Fine-Tuning - Stanford Encyclopedia of Philosophy](#): The term fine-tuning is used to characterize sensitive dependences of facts or properties on the values of certain parameters.
- [Fine-tuning - Wikipedia](#): Fine-tuning may refer to: Fine-tuning (deep learning) Fine-tuning (physics). See also edit Tuning (disambiguation) Disambiguation icon.
- [fine-tuning - Merriam-Webster Thesaurus](#): Synonyms for FINE-TUNING: adjusting, regulating, putting, matching, adapting, tuning, modeling, shaping; Antonyms of FINE-TUNING: misadjusting.

“Fine-Tuning use cases in Generative AI”

- [The Power Of Fine-Tuning In Generative AI - Forbes](#): Fine-tuning reduces dependence on prompt design, enhancing model robustness and consistency across different input formats and styles. It also ...
- [Fine-tuning Pre-Trained Models for Generative AI Applications](#): Fine-tuning facilitates customization

of the pre-trained model to industry-specific use cases, which improves performance and accuracy. It is especially useful ...

- [Fine-Tuning Pre-Trained Models For Generative AI - LinkedIn](#): The fine-tuning technique is used to optimize a model's performance on a new or different task. It is used to tailor a model to meet a specific ...
- [Fine-tuning the Base Models in Generative AI - Oracle Help Center](#): Create custom models by fine-tuning the base models with your own dataset. You can create new custom models or create new versions of existing ...
- [Fine-Tuning Vs RAG in Generative AI - In Plain English](#): Fine-tuning LLMs: Fine-tuning involves taking a pre-trained LLM (such as GPT-3 or BERT) and adapting it to specific tasks. RAG: RAG models are designed for ...
- [Generative AI - How to Fine Tune LLMs | by Sascha Heyer | Medium](#): Fine-tuning LLMs on Google Cloud uses PEFT. Instead of retraining the entire model, PEFT focuses on adjusting a small subset of the model's ...
- [Unlocking the Potential of Fine-Tuning in Generative AI - LinkedIn](#): Fine-tuning refers to the process of customizing a pre-trained model to our specific data and know-how for advanced tasks. Fine-tuning also ...
- [Fine-Tuning Llama 2 | Generative AI Series - YouTube](#): ... Fine-tuning: We compare RAG and fine-tuning along with the use cases - AutoTrain ... Duration: 32:59 Posted: Dec 19, 2023
- [Artificial Intelligence in Plain English](#): In essence, Fine-tuning in generative AI is a process that allows us to tailor pre-trained language models for specific tasks or domains. It's like taking a ...

“Fine-Tuning advantages”

- [Fine-Tuning the Model: What, Why, and How | by Amanatullah](#): It offers benefits such as time and resource efficiency, improved performance, and data efficiency. By following a systematic approach and ...
- [Training vs. Fine-tuning: What is the Difference? - Encord](#): A lower learning rate is often preferred because it makes the fine-tuning process more stable. This ensures the model retains the previously ...
- [How to Fine-Tune Pretrained Models in Neural Networks - LinkedIn](#): 4 What are the benefits? ... Fine-tuning can be beneficial for improving the efficiency and effectiveness of a model. It can reduce training time ...
- [Fine tuning: what is it good for? - OpenAI Developer Forum](#): Improving reliability at producing a desired output; Correcting failures to follow complex prompts; Handling many edge cases in specific ways ...
- [Fine-tuning has one huge advantage though: it is far more effective ...](#): Fine-tuning has one huge advantage though: it is far more effective at guiding a model's behavior than prompting, so you can often get away with a much ...
- [The Power Of Fine-Tuning In Generative AI - Forbes](#): Fine-tuning reduces dependence on prompt design, enhancing model robustness and consistency across different input formats and styles. It also ...
- [What is Fine Tuning in Deep Learning? How Does It Work | Intellipaat](#): Benefits: The fine-tuned model can produce legally accurate and coherent text. It saves time for legal professionals and reduces the chances of errors in legal ...
- [Guide to Fine-Tuning LLMs: Definition, Benefits, and How-To](#): Fine-tuning LLMs enables businesses to harness the power of pre-trained large language models and customize them for their specific needs and ...
- [Advantages and disadvantages of fine tuning a model. - Medium](#): Advantage: Fine-tuning allows you to leverage pre-trained models on large datasets for a similar or related task. This transfer learning can ...

“Fine-Tuning disadvantages”

- [How to Fine-Tune Pretrained Models in Neural Networks - LinkedIn](#): In my experience, another drawback of fine-tuning a pre-trained model is Bias. Pretrained models may have inherent ...
- [Training vs. Fine-tuning: What is the Difference? - Encord](#): Disadvantages of Bayesian Optimization Model Assumptions: The performance ... performance through meticulous fine-tuning.
- [What are the advantages and disadvantages of transfer learning ...](#): Disadvantages of Fine-Tuning: 1. Increased ... fine-tuning. Not much I can add to his already well-written answer ...
- [What’s the most accurate? Fine tuning vs Prompt Stuffing](#): One good rule of thumb is that if you can’t multi-shot train in the prompt, usually due to space limitations, you need ...
- [Fine-Tuning LLMs. Benefits, Costs, Challenges - Addepto](#): Overfitting: This is an undesirable behavior in fine-tuning that occurs when an LLM performs well on the training data ...
- [Fine-Tuning In A Nutshell - FourWeekMBA](#): The most obvious limitation is that it cannot be used for models with vastly different tasks and datasets. What is this ...
- [What is fine-tuning in machine learning and AI? - TechTarget](#): Fine-tuning is the process of taking a pretrained machine learning model and further training it on a smaller, targeted data set.
- [To fine-tune or not to fine-tune. | by Michiel De Koninck | ML6team](#): Disadvantages: No transparency: many unanswered questions. Which techniques (such as the ones referred to above) are ...
- [Fine-tuning GPT-3 for Industries: Benefits and Limitations - Eightify](#): Fine-tuning GPT-3 improves accuracy for various tasks, but it still has limitations and requires proper training and data.

“RAG vs Fine-Tuning capability comparison”

- [RAG Vs Fine-Tuning Vs Both: A Guide For Optimizing LLM ... - Galileo](#): Conclusion: RAG leans towards moderate technical expertise, mainly in data integration and retrieval mechanisms. Fine-tuning, on the other hand, ...
- [RAG vs. Fine-Tuning in Large Language Models: A Comparison](#): RAG is more suited for tasks that can benefit from external information retrieval, while Fine-Tuning is best for adapting models to specific ...
- [Differences Between RAG and Fine Tuning - LinkedIn](#): RAG combines traditional text generation with a retrieval mechanism. It means the model generates text, but it retrieves relevant information ...
- [Fine-tuning vs Context-Injection \(RAG\) - OpenAI Developer Forum](#): I finished my research work on comparing fine-tuning with context-injection (as an implementation of retrieval-augmented generation). A lot ...
- [RAG vs. Fine-Tuning : r/LangChain - Reddit](#): RAG is to link document sources and can be updated almost instantly depending on your connectors. LLMs are not really meant to be search engines ...
- [RAG vs Finetuning Which Is the Best Tool to Boost Your LLM ...](#): While RAG focuses primarily on information retrieval, finetuning can help the LLM adjust its responses to the company’s internal vernacular or ...
- [Fine-Tuning Vs RAG in Generative AI - In Plain English](#): RAG models are specialized for tasks that require a combination of information retrieval and text generation, while fine-tuning LLMs are adapted to specific NLP ...
- [Fine-tuning vs RAG: An opinion and comparative analysis - Symbl.ai](#): Fine-tuning requires more compute power and time than RAG, but it may result in more accurate and customized responses for the cloud computing ...
- [Full Fine-Tuning, PEFT, Prompt Engineering, or RAG? - Deci AI](#): While RAG is proficient in data retrieval, it may not capture domain-specific patterns, vocabulary and nuances as well as a fine-tuned model.

“RAG vs Fine-Tuning differentiation comparison”

- [RAG Vs Fine-Tuning Vs Both: A Guide For Optimizing LLM ... - Galileo](#): Conclusion: RAG leans towards moderate technical expertise, mainly in data integration and retrieval mechanisms. Fine-tuning, on the other hand, ...

- [Differences Between RAG and Fine Tuning - LinkedIn](#): RAG combines traditional text generation with a retrieval mechanism. It means the model generates text, but it retrieves relevant information ...
- [RAG vs. Fine-Tuning in Large Language Models: A Comparison](#): RAG is more suited for tasks that can benefit from external information retrieval, while Fine-Tuning is best for adapting models to specific ...
- [RAG vs. Fine-Tuning : r/LangChain - Reddit](#): RAG is to link document sources and can be updated almost instantly depending on your connectors. LLMs are not really meant to be search engines ...
- [RAG vs Finetuning Which Is the Best Tool to Boost Your LLM ...](#): While RAG focuses primarily on information retrieval, finetuning can help the LLM adjust its responses to the company's internal vernacular or ...
- [Is RAG better with fine tuning on same data or pure RAG FTW?](#): I'm looking at getting more accurate answers based on the LLM's training data compared to a combination of training data and RAG context data.
- [RAG vs. Fine-tuning: Here's the Detailed Comparison - FabricHQ](#): RAG is recommended for connecting LLMs to specific contexts while fine-tuning is suitable for lasting changes in behavior. Businesses can ...
- [Fine-Tuning Vs RAG in Generative AI - In Plain English](#): RAG models are specialized for tasks that require a combination of information retrieval and text generation, while fine-tuning LLMs are adapted to specific NLP ...
- [Full Fine-Tuning, PEFT, Prompt Engineering, or RAG? - Deci AI](#): While RAG is proficient in data retrieval, it may not capture domain-specific patterns, vocabulary and nuances as well as a fine-tuned model.

“RAG best use cases in CPG R&D”

- [Retrieval Augmented Generation: Best Practices and Use Cases](#): Legal research: Legal professionals can use RAG to quickly pull relevant case laws, statutes, or legal writings, streamlining the research ...* [10 ways to accelerate CPG research and development with AI ...](#): Research commissioned by Forbes estimates top digital and analytics use cases will contribute between \$490 and \$940 billion by the end of 2023.
- [Richard Kurtzer on LinkedIn: #gtc24 #generativeai](#): Start building applications that deliver serious #LLM-based RAG applications ... best AI use cases for CPG companies driving value.
- [A Beginner's Guide to Retrieval Augmented Generation \(RAG\)](#): RAG is, the advantages and real-time use cases. We'll also walk you ... It tries to provide the best possible response based on the information it ...* [2024 CPG Tech Budget Priorities | Consumer Goods Technology](#): The outlook for 2024 has become somewhat of a familiar theme, and CPGs are no exception: Cut or maintain spending next year except when it ...
- [A Spotlight on 6 Practical Retrieval Augmented Generation Use Cases](#): Here are 6 use cases that RAG forms a pivotal part of. If you're ... What are the best practices for testing and improving voice and chatbot m- ...* [Predictive Analytics in CPG Industry: Use Cases and Examples](#): Predictive Analytics Use Cases In CPG Industry 1. Personalized Offers To Increase Engagement With The Brand 2. Revamp The Business Model With Data-Driven ...
- [How AI in CPG gets products to market faster - Starmind](#): We'll also explore common R&D use cases and how the right AI solution helps your company reach its goals faster.
- [Innovations In Retrieval Augmented Generation | by Skanda Vivek](#): Self-RAG Eval. Self-RAG performs the best among non-proprietary models, and in most cases the larger 13B parameter outperforms the 7B model.* [Digital Transformation Trends for CPG | Deloitte US](#): Invest in solutions with improved digital technologies for prioritized business use cases along with the larger transformation programs; Receive senior ... Show results with:RAG

“Fine-Tuning best use cases in CPG R&D”

- [10 ways to accelerate CPG research and development with AI ...](#): Research commissioned by Forbes estimates top digital and analytics use cases will contribute between \$490 and \$940 billion by the end

of 2023.* [How AI in CPG gets products to market faster - Starmind](#): AI use cases in CPG product development. Integrating AI for CPG R&D in your enterprise organization. Consumer packaged goods (CPG) companies ...

- [Key Practical Applications of AI Transforming R&D in the Consumer ...](#): ... CPG company in the world, here are key use cases. ... Companies can fine-tune their marketing strategies based on trending ...
- [The Innovator's Guide to Generative AI - NIQ](#): One method is fine-tuning, which involves training an existing model with your unique datasets. ... tuning a less-scalable, less-nimble option for ...
- [Accelerating CPG Innovation with a Product Innovation Platform](#): Leading CPG companies know how to survive challenging market conditions. They recognize that consumers reward fresh ideas and innovative ...* [When It Comes to Investing in Product Innovation, Large CPG ...](#): New research suggests that, instead of aiming for big breakthroughs, large companies should focus on incremental but meaningful improvements.* [Will innovation finally add up for consumer-goods companies?](#): CPG companies can significantly boost the performance of innovation by managing it more strategically, including measuring it more effectively.* [An Innovation Wake-Up Call for CPG Companies | BCG](#): There is a timely and compelling case for CPG companies to double down on growth through innovation. Macroeconomic factors, business ...* [\[PDF\] CPG operations: How to win in a rapidly changing environment](#): The company should use historical performance as a benchmark for setting ... includes top use cases for implementation at the pilot locations.
- [What is AI fine-tuning? Here are top 5 use cases - LinkedIn](#): Another popular use case for fine-tuning with the OpenAI API is sentiment analysis. By training a language model to identify positive, negative, ... Missing: CPG R&D

“Factors contributing to profitability in CPG R&D”

- [How CPG companies can sustain profitable growth in the next normal](#): Ongoing cost pressure will compel leading companies to look for opportunities to find efficiencies (for example, reduce nonworking spending and ...
- [\[PDF\] How CPG companies can sustain profitable growth in the next normal](#): Revenue growth management. Over the past five to ten years, most CPG companies have built basic capabilities in RGMthe discipline of achieving ...
- [What matters on the path to profitability for emerging CPG brands](#): Profitability for fledgling brands is a balancing act between controlling costs and managing growth, gross margin and repeat purchase rates.
- [5 key drivers for CPG brands. | Manoli Kulutbanis posted on the topic](#): The level of Sales Contribution Dollars is determined by 5 key drivers: 1) Price-to-Wholesaler/Retailer (Taking into account SRP and retailer/ ...
- [\[PDF\] Shifting Focus to the Bottom Line: Addressing Profitability at a ... - IRI](#): CPG market stalled during the first half of 2017 (see exhibit 1). Many factors contributed to this, including a negative shopper response to ...
- [Driving CPG success from ideation to profitability with the power of AI](#): Driving CPG success from ideation to profitability with the power of AI Hyper-automation High lead time Inadequate use of data Demand and supply challenges.
- [\[PDF\] Trends that will shape the consumer goods industry - McKinsey](#): The shift to value has major implications for the CPG industry's profit formula. Not least, it could erode the pricing power of brands. Indeed, our analysis ...
- [It's time for a CPG Digital Transformation - Jabil.com](#): The following factors will contribute to ecosystem stickiness, driving improved market share and profitability for CPG brands: Reduced purchase friction ...
- [An Innovation Wake-Up Call for CPG Companies | BCG](#): There is a timely and compelling case for CPG companies to double down on growth through innovation. Macroeconomic factors, business advantages, ...
- [\[PDF\] FROM CHALLENGE TO PROFIT IN A CHANGING CPG MARKET](#): This is a period of unusual uncertainty in management of supply chains, and the main factors for this are both political

and environmental. Globalisation has ...

“RAG evaluation for profitability in CPG R&D”

- [\[PDF\] A Study in Consumer Packaged Goods Multinationals - DSpace@MIT](#): The Consumer Packaged Goods (CPG) industry faces challenges that are making it increasingly harder for CPG multinational companies to ...
- [RAG Evaluation. Retrieval Augmented Generation \(RAG\) is. ...](#): Ragas uses LLMs to evaluate a RAG pipelines while also providing actionable metrics using as little annotated data as possible. Ragas ... * [\[PDF\] Coalition for Epidemic Preparedness and Innovations \(CEPI\)](#): The preliminary findings of a recent PSMB effectiveness review (2020) show progress in these areas, but also highlight continuing areas for improvement.,.
- [Consumer Packaged Goods \(CPG\) Market: Top Players, Trends and ...](#): The market research report on Consumer Packaged Goods (CPG)s provides a comprehensive view of the competitive landscape in the global market.* [How P&G Tripled Its Innovation Success Rate](#): At the start of the 2000s only about 15% of P&G’s innovations were meeting revenue and profit targets. So the company launched its now well-known Connect + ...
- [An Overview on RAG Evaluation | Weaviate - Vector Database](#): RAG is the process of augmenting inputs to a Large Language Model (LLM) with context retrieved from a vector database, like Weaviate. RAG ... * [5 Ways Brands Are Becoming Sustainable While Maintaining ...](#): Another way that brands are growing profitability with their sustainability efforts is by incorporating sustainability and other ESG initiatives ...
- [25 Best Project Portfolio Management \(PPM\) Tools In 2024](#): Discover the best project portfolio management tools for your team. Compare features, pros + cons, pricing, and more in my complete guide.
- [What matters on the path to profitability for emerging CPG brands](#): Profitability for fledgling brands is a balancing act between controlling costs and managing growth, gross margin and repeat purchase rates.* [\[PDF\] Economic Analysis of the FMCG Industry In China \(Fast Moving ...](#): Profitability Analysis of Packaged Food and Beverages ... the Yuanqi Forest R&D Center was established; from 2015 to 2016, the company entered the.

“Fine-Tuning evaluation for profitability in CPG R&D”

- [How CPG companies can sustain profitable growth in the next normal](#): As part of efforts to achieve profitable growth, executives should evaluate, at a minimum, all four capabilities. Portfolio and innovation ... * [When It Comes to Investing in Product Innovation, Large CPG ...](#): New research suggests that, instead of aiming for big breakthroughs, large companies should focus on incremental but meaningful improvements.* [Will innovation finally add up for consumer-goods companies?:](#) CPG companies can significantly boost the performance of innovation by managing it more strategically, including measuring it more effectively.* [\[PDF\] How CPG companies can sustain profitable growth in the next normal](#): We previously described how companies can benchmark their overall innovation performance using measures of R&D-to- product conversion and ...
- [An Innovation Wake-Up Call for CPG Companies | BCG](#): BCG experts analyze the consumer-packaged goods (CPG) industry, revealing that despite the vital role innovation plays, a majority of CPG ... * [\[PDF\] CPG Innovation & Growth: - Consumer Goods Technology](#): Consciously addressing each capability, process and tool enhances product profitability as revenue increases from new product success rates and better product.* [\[PDF\] Advanced Analytics in R&D - Kalypso](#): can be leveraged to review performance data to identify previously ... The model is built to learn and fine-tune those contexts over time so the answers to those.
- [The Tried and True Tenets of Flavor Creation - Intellex](#): Then, a panel of trained tasters will evaluate that product flavor, and you can fine-tune it accordingly. A data-driven model allows for real-time adjustments ...
- [Expanding To Global Markets With Digital Twin Technology](#): Unpacking how a digital twin can supercharge product research for CPG food companies.

- [\[PDF\] How to survive and thrive in a turbulent CPG market](#): channel data, it is possible to further fine tune and generate leading indicators of consumer demand. These are key inputs for the CPG innovation pipeline ...

How Was This Done?

Generated by [Michael L. Thompson](#) with OpenAI's GPT-4 (gpt-4-turbo-preview).

- **Python-based Jupyter Lab Notebook:** The contents of this document were generated through coded prompting of **OpenAI's GPT-4** using the Python package [instructor](#) by Jason Liu.
 - Input: the text string “Which gives a Generative AI-based application the greatest capability and differentiation over competitors: RAG or Fine-Tuning?”.
 - Output: this report as an R Markdown text file.
- **GPT-4 Plan Generation:** GPT-4 autonomously generated the query plan (using code based off of an [instructor](#) example).
- **GPT-4 Plan Execution:** GPT-4 then autonomously executed the plan, which involved the following:
 - writing search queries and initiating calls to [Serper \(Google Search API\)](#) for searching,
 - generating responses to the questions in the plan using the searches as context, and
 - creating all text in the Outline, Summary, and Sub-Propositions sections.
- **Python Report Generation:** The Python code then consolidated GPT-4 responses into an R Markdown text file.
- **Manual Rendering:** Manually, this section was written, the Query Plan Outline was re-formatted, and, via **RStudio**, the PDF document was rendered. No other content was manually generated or edited.