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Modelos multimodais: tudo o que você precisa saber

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Equipe Editorial 20 de setembro de 2024

Conteúdo

Compartilhamento Social

Modelos multimodais são um tipo de aprendizado de máquina (https://kanerika-com.translate.goog/glossary/machine-learning/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) que pode processar e analisar vários tipos de dados, ou modalidades, simultaneamente. Essa abordagem está se tornando cada vez mais popular no campo da inteligência artificial (https://kanerika-com.translate.goog/services/ai-ml-gen-ai/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) devido à sua capacidade de melhorar o desempenho e a precisão em diversas aplicações. Ao combinar múltiplas modalidades, como imagens, áudio e texto, os modelos multimodais podem fornecer uma compreensão mais abrangente dos dados e permitir tarefas mais complexas.

A compreensão de modelos multimodais requer um conhecimento básico de aprendizado profundo (https://kanerika-com.translate.goog/glossary/deep-learning/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) , que é um subconjunto do aprendizado de máquina que envolve o treinamento de redes neurais (https://kanerika-com.translate.goog/glossary/neural-networks/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) com múltiplas camadas. O aprendizado profundo é particularmente adequado para modelos multimodais, pois pode lidar com conjuntos de dados grandes e complexos. Além disso, eles frequentemente dependem de técnicas avançadas, como aprendizado de representação e aprendizado de transferência, para extrair características significativas dos dados (https://kanerika-com.translate.goog/blogs/data-integration/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) e melhorar o desempenho.

Compreendendo o Modelo Multimodal

Modelos multimodais são um tipo de modelo de inteligência artificial (https://kanerika-com.translate.goog/glossary/artificial-intelligence/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) capaz de processar e integrar informações em diversas modalidades, como imagens, vídeos, texto, áudio, gestos corporais, expressões faciais e sinais fisiológicos. Esses modelos aproveitam os pontos fortes de cada tipo de dado, produzindo previsões ou classificações mais precisas e robustas.

A aprendizagem multimodal é o processo de combinar múltiplos modos de dados para criar uma compreensão mais abrangente de um objeto, conceito ou tarefa específica. Essa abordagem é particularmente útil em áreas como reconhecimento de imagem e fala, processamento de linguagem natural (PLN) (https://kanerika-com.translate.goog/glossary/natural-language-processing/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) e robótica (https://kanerika-com.translate.goog/glossary/robotics/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) . Ao combinar diferentes modalidades, a aprendizagem multimodal pode criar uma representação mais completa e precisa do mundo.

Algoritmos de inteligência artificial e aprendizado de máquina (https://kanerika-com.translate.goog/blogs/ml-algorithms/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) podem ser treinados em conjuntos de dados multimodais, permitindo que aprendam a reconhecer padrões e fazer previsões com base em múltiplas fontes de informação. Isso pode levar a modelos mais precisos e confiáveis, que podem ser usados em uma ampla gama de aplicações, incluindo carros autônomos, diagnósticos médicos, etc.

Leia mais – ML OPS: aproveite ao máximo o aprendizado de máquina (https://kanerika-com.translate.goog/blogs/machine-learning-operations/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc)

Multimodal models are typically black-box neural networks, which makes it challenging to understand their internal mechanics. However, recent research has focused on visualizing and understanding these models to promote trust in machine learning (https://kanerika-com.translate.goog/blogs/machine-learning-model-management/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) models. This research aims to empower stakeholders to visualize model behavior and perform model debugging.

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Types of Modalities in Multimodal Models

Multimodal models are designed to process and find relationships between different types of data, known as modalities. These modalities can include text, images, audio, and video. In this section, we will explore the different types of modalities used in multimodal models.

1. Text Modality

Text modality is one of the most commonly used modalities in multimodal models. It involves processing textual data, such as natural language text, to extract relevant information. And, text modality is often used in applications such as sentiment analysis (https://kanerika-com.translate.goog/glossary/sentiment-analysis/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), text classification, and language translation.

2. Image Modality

Image modality involves processing visual data (https://kanerika-com.translate.goog/blogs/data-visualization-tools/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), such as photographs or graphics. It has been used in a wide range of applications, including object recognition, facial recognition, and image captioning. Additionally, image modality is particularly useful for tasks that require visual understanding (https://kanerika-com.translate.goog/blogs/data-visualization/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), such as recognizing objects in images or identifying facial expressions.

3. Audio Modality

Audio modality involves processing audio data, such as speech or music. It has been used in a variety of applications, including speech recognition (https://kanerika-com.translate.goog/glossary/speech-recognition/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), music classification, and speaker identification. Furthermore, audio modality is particularly useful for tasks that require an understanding of sound, such as recognizing speech or identifying music genres.

Read More – Everything You Need to Know About Building a GPT Models (https://kanerika-com.translate.goog/blogs/gpt-models/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc)

4. Video Modality

Video modality involves processing moving images, such as videos or movies. It has been used in a variety of applications, including action recognition, video captioning, and video summarization. Moreover, video modality is particularly useful for tasks that require an understanding of motion and dynamics, such as recognizing actions in videos or summarizing long videos.

In multimodal models, these modalities often combine to form a more complete understanding of the input data. For example, a multimodal model might combine the text, image, and audio modalities to recognize emotions in a video clip. By combining different modalities, multimodal models can achieve better performance than models that use only a single modality.

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Deep Learning in Multimodal Models

Multimodal models are machine learning models that process and find relationships between different types of data or modalities. These modalities can include images, video, audio, and text. Deep learning enables the creation of complex models capable of processing large amounts of data.

1. Multimodal Deep Learning

Multimodal deep learning is a subfield of machine learning that combines information from multiple modalities to create more accurate and robust models. This approach involves training deep neural networks on data that includes multiple modalities. The goal is to learn representations that capture the relationships between modalities and enable the model to make better predictions (https://kanerika-com.translate.goog/glossary/predictive-modeling/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc).

Multimodal deep learning has been used in a wide range of applications, including speech recognition, image captioning, and video analysis. One of the key benefits (https://kanerika-com.translate.goog/blogs/benefit-of-business-intelligence/?

_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) of this approach is that it allows the model to leverage the strengths of each modality to make more accurate predictions.

Read More – What is Cloud Networking? Benefits, Types and Real Life Use Cases (https://kanerika-com.translate.goog/blogs/cloud-networking/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc)

2. Deep Neural Networks in Multimodal Models

Deep neural networks are a type of artificial neural network that consists of multiple layers. These layers enable the model to learn increasingly complex representations of the input data. In multimodal models, deep neural networks are used to combine information from multiple modalities.

One approach to building multimodal models with deep neural networks is to use a shared representation. In this approach, each modality is processed by its own neural network, and the resulting representations are combined and passed through a final neural network that makes the prediction. Another approach is to use a single neural network that processes all modalities simultaneously.

Both of these approaches have been shown to be effective in multimodal deep learning. The choice of approach depends on the specific application and the nature of the input data.

Overall, deep learning has enabled significant advances in multimodal models, allowing for more accurate and robust predictions across a wide range of applications.

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Representation and Translation in Multimodal Models

Multimodal models are designed to work with multiple types of data and modalities. To achieve this, they need to be able to represent and translate between different modalities effectively. In this section, we will explore two important aspects of multimodal models: representation learning and text-to-image generation.

Representation Learning

Representation learning is a crucial aspect of multimodal models. It involves learning a joint representation of multiple modalities that can be used for various tasks such as classification, retrieval, and generation. One popular approach to representation learning is to use image-text pairs to train the model. This involves pairing an image with a corresponding caption or text description. The model then learns to represent the image and the text in a joint space where they are semantically similar.

Text-to-Image Generation

Text-to-image generation is another important task in multimodal models. It involves generating an image from a given text description. This task is challenging because it requires the model to understand the semantics of the text and translate it into a visual representation. One approach to text-to-image generation is to use a conditional generative model that takes a text description as input and generates an image that matches the description. This approach requires the model to learn a joint representation of the text and image modalities.

In summary, representation learning and text-to-image generation are important aspects of multimodal models. They enable the model to work with multiple modalities and perform tasks such as classification, retrieval, and generation. By learning a joint representation of multiple modalities, the model can understand the semantics of different modalities and translate between them effectively.

Architectures and Algorithms in Multimodal Models

Multimodal models are a class of artificial intelligence models (https://kanerika-com.translate.goog/blogs/ai-in-accounting/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) capable of processing and integrating information across diverse modalities. These models seamlessly work with data in the form of images, videos, text, audio, body gestures, facial expressions, and physiological signals, among others. In this section, we will discuss the architectures and algorithms that are commonly used in multimodal models.

1. Encoders in Multimodal Models

Encoders in multimodal models are used to encode the input data into a feature space that can be used for further processing. Individual encoders are used to encode the input data from different modalities. For example, an image encoder can be used to encode image data, while a text encoder can be used to encode textual data. The encoded data is then fed into a fusion mechanism that combines the information from different modalities.

2. Attention Mechanisms in Multimodal Models

Attention mechanisms in multimodal models are used to selectively focus on certain parts of the input data. These mechanisms are used to learn the relationships between the different modalities. For example, in image captioning tasks, the attention mechanism can be used to focus on certain parts of the image that are relevant to the text description.

3. Fusion in Multimodal Models

Fusion in multimodal models is the process of combining information from different modalities. There are different types of fusion mechanisms that can be used in multimodal models. Some of the commonly used fusion mechanisms include late fusion, early fusion, and cross-modal fusion. Late fusion combines the outputs of individual encoders, while early fusion combines the input data from different modalities. Cross-modal fusion combines the information from different modalities at a higher level of abstraction.

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Applications of Multimodal Models

Multimodal models have a wide range of applications in various fields, from healthcare to autonomous vehicles (https://kanerika-com.translate.goog/glossary/autonomous-vehicles/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc). In this section, we will discuss some of the most common applications of multimodal models.

1. Visual Question Answering

Visual Question Answering (VQA) is a task that involves answering questions about an image. Multimodal models can improve the accuracy of VQA systems by combining information from both visual and textual modalities. For example, a multimodal model can use both the image and the text of the question to generate a more accurate answer.

2. Speech Recognition

Speech recognition is the task of transcribing spoken language into text. Multimodal models can improve the accuracy of speech recognition systems by combining information from multiple modalities, such as audio and video. For example, a multimodal model can use both the audio of the speech and the video of the speaker’s mouth movements to generate a more accurate transcription.

3. Sentiment Analysis

Sentiment analysis (https://kanerika-com.translate.goog/glossary/text-analytics/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) is the task of determining the emotional tone of a piece of text. Multimodal models can improve the accuracy of sentiment analysis systems by combining information from multiple modalities, such as text and images. For example, a multimodal model can use both the text of a tweet and the images included in the tweet to determine the sentiment of the tweet more accurately.

4. Emotion Recognition

Emotion recognition is the task of detecting emotions in human faces. Multimodal models can improve the accuracy of emotion recognition systems by combining information from multiple modalities, such as images and audio. For example, a multimodal model can use both the visual information of a person's face and the audio of their voice to determine their emotional state more accurately.

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Advances and Challenges in Multimodal Models

Recent Advances in Multimodal Models

Multimodal models have seen significant advances in recent years. One major area of improvement is in generalization, where models are able to perform well on a wide range of tasks and datasets. Experts have achieved this by employing transfer learning (https://kanerika-com.translate.goog/glossary/transfer-learning/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), where models trained on one task can apply their knowledge to another. Additionally, advancements in contrastive learning have trained models to develop representations resistant to specific transformations, effectively enhancing the performance of multimodal models

Another important area of advancement is interpretability. As models become more complex, it is important to be able to understand how they are making their predictions. Recent work has focused on developing methods for interpreting the representations learned by multimodal models. This has led to a better understanding of how these models are able to integrate information from different modalities.

Challenges in Multimodal Models

Despite these recent advances, there are still several challenges. One major challenge is data (https://kanerika-com.translate.goog/blogs/big-data-challenges/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) scarcity. Many modalities, such as audio and video, require large amounts of labeled data (https://kanerika-com.translate.goog/blogs/data-labeling-tools/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) to train effective models. This can be difficult to obtain, especially for rare or specialized tasks.

Another challenge is in achieving good performance on tasks that require integrating information from multiple modalities. While multimodal models have shown promise in this area, there is still a need for better methods for fusing information from different modalities. Additionally, there is a need for better methods for handling missing or noisy data in multimodal datasets.

Finally, there is a need for better methods for evaluating the performance of multimodal models (https://kanerika-com.translate.goog/blogs/multimodal-rag/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc). Many existing evaluation metrics are task-specific and may not be appropriate for evaluating the performance of multimodal models on a wide range of tasks. Additionally, there is a need for better methods for visualizing and interpreting the representations learned by multimodal models. This will be important for understanding how these models are able to integrate information from different modalities and for identifying areas where they may be making errors.

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Examples of Multimodal Models

Multimodal models have been successfully applied in various fields, including natural language processing, computer vision (https://kanerika-com.translate.goog/glossary/computer-vision/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc), and robotics. In this section, we will discuss two case studies of multimodal models (https://kanerika-com.translate.goog/blogs/mistral-vs-llama-3/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc): Google Research's Multimodal Model and DALL-E: A Multimodal Model.

1. Google Research's Multimodal Model

Google Research has developed a multimodal model that combines text and images to improve image captioning. The model uses a large language (https://kanerika-com.translate.goog/infographics/the-impact-of-large-language-models/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) model to generate a textual description of an image and a visual model to predict the image's salient regions. The two models are then combined to produce a caption that is both accurate and informative.

The multimodal model has been tested on the COCO dataset, and the results show that it outperforms previous state-of-the-art models. The model's ability to combine textual and visual information makes it a powerful tool for tasks that require a deep understanding of both modalities.

2. DALL-E: A Multimodal Model

DALL-E (https://translate.google.com/website?sl=en&tl=pt&hl=pt&client=srp&u=https://openai.com/dall-e-2) is a multimodal model developed by OpenAI that can generate images from textual descriptions. The model is based on GPT-3, a large language model (https://kanerika-com.translate.goog/blogs/small-language-models/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) that can generate coherent and diverse text. DALL-E extends GPT-3 by adding a visual encoder that can encode images into a vector representation.

To generate an image from a textual description, DALL-E first encodes the text into a vector representation using GPT-3. The vector is then passed through the visual encoder to produce a latent space representation. Finally, the decoder generates an image from the latent space representation.

DALL-E has been trained on a large dataset of textual descriptions and corresponding images. The model can generate a wide range of images, including objects that do not exist in the real world. DALL-E’s ability to generate images from textual descriptions has many potential applications, including in the creative arts and advertising.

In conclusion, these two case studies demonstrate the power and versatility of multimodal models. By combining textual and visual information, these models can perform tasks that would be difficult or impossible for unimodal models. As research in this field continues, we can expect to see even more impressive applications of multimodal models in the future (https://kanerika-com.translate.goog/blogs/vision-language-models/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc).

Also Read- The Ultimate Process Automation Tools Comparison Guide (https://kanerika-com.translate.goog/blogs/process-automation-tools/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc)

3. Facebook’s Multimodal Content Moderation:

Facebook (now Meta) needed to improve its content moderation to better understand the context of posts that include both images and text.

Moderating content that includes multiple modalities can be challenging, as the meaning often lies in the combination of text and image, not in either modality alone.

Facebook developed a multimodal model that analyzes posts by considering the text and images together, allowing for a more nuanced understanding of the content.

The improved content moderation system has been more effective in identifying and taking action against policy violations, leading to a safer online community.

4. IBM’s Watson Assistant

IBM aimed to enhance its Watson Assistant (https://translate.google.com/website?sl=en&tl=pt&hl=pt&client=srp&u=https://www.ibm.com/watson)

to better understand and respond to user inquiries that may include both text and visual elements.

In customer service, users often need to describe issues that are best explained with a combination of text and images (e.g., technical issues, product defects).

IBM integrated multimodal capabilities into Watson Assistant, enabling it to process and respond to inquiries that include pictures and descriptive text.

The Watson Assistant became more versatile in handling customer support tickets, improving resolution times and customer satisfaction rates.

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_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) We believe that AI is not just a technology, but a strategic imperative for businesses looking to stay competitive in today's fast-paced digital (https://kanerika-com.translate.goog/blogs/digital-transformation-journey/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) landscape. With Kanerika as your AI strategy partner, you can be confident that you are leveraging the latest AI technologies to drive innovation and growth (https://kanerika-com.translate.goog/blogs/llm-agents/?_x_tr_sl=en&_x_tr_tl=pt&_x_tr_hl=pt&_x_tr_pto=tc) in your organization.

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FAQs

Is ChatGPT a multimodal model?

No, ChatGPT isn’t multimodal in its current form. It primarily focuses on text; it understands and generates human-like text but doesn’t directly process or generate other data types like images or audio. Multimodal models integrate several data types, a capability ChatGPT lacks. Future iterations might incorporate this.

What is the difference between LLMs and MLLMs?

LLMs (Large Language Models) are powerful AI systems trained on massive text datasets, able to generate human-like text. MLLMs (Multimodal Large Language Models) build upon this by incorporating other data types like images and audio, understanding and generating content across different modalities. Essentially, MLLMs are LLMs with a broader sensory “understanding” of the world. This allows for richer, more contextually aware responses and capabilities.

What is an example of a multimodal?

Multimodal communication simply means using more than one way to convey information at once. Think of a cooking show: It uses spoken words, on-screen text, visuals of the chef's actions, and even background music – all working together to explain a recipe. This combined approach is multimodal.

What are multimodal models in AI?

Multimodal AI models are like Swiss Army knives for understanding data. Instead of relying on just one type of input (like text or images), they process information from multiple sources simultaneously – text, images, audio, even video. This allows them to grasp context and meaning far richer than unimodal models, leading to more insightful and robust applications. Think of it as using all your senses instead of just one to understand the world.

Is GPT-4 multimodal?

No, GPT-4 isn't multimodal in the way some other models are. While it excels at understanding and generating text, it primarily processes information in textual form. It doesn't directly "see" images or hear audio like truly multimodal models do; its abilities are confined to text-based input and output. Future iterations may incorporate this, though.

Is GPT-3 multimodal?

No, GPT-3 isn't multimodal in the way some AI models are. It primarily processes text; it understands and generates words, not images, videos, or audio directly. While it can *describe* these things based on text prompts, it doesn't inherently "see" or "hear" them. Think of it as a highly advanced text-only expert.

What is multimodal?

Multimodal refers to communication that uses multiple ways to convey information, not just words. Think of it as a richer, more engaging experience – combining text, images, audio, video, and even gestures to create meaning. This approach taps into different learning styles and makes information more accessible and memorable. It’s essentially communication that works smarter, not harder.

What is multimodal in NLP?

Multimodal NLP goes beyond just text; it incorporates other data types like images, audio, and video to understand meaning. Instead of relying solely on words, it leverages the combined information from these different modalities to create a richer, more nuanced interpretation. This allows for more comprehensive and accurate understanding of complex scenarios that text alone can’t fully capture. Think of it as giving computers “sensory experiences” beyond reading.

What is the difference between generative AI and multimodal AI?

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A IA generativa concentra-se na *criação* de novos conteúdos – como texto, imagens ou música – com base em padrões aprendidos. A IA multimodal, por outro lado, destaca-se na compreensão e no processamento de *vários* tipos de informação simultaneamente (texto, imagens, áudio, etc.), frequentemente para executar uma tarefa ou fazer uma previsão. Pense na IA generativa como uma criadora e na IA multimodal como uma intérprete de dados diversos. Embora possam se sobrepor, abordam diferentes funcionalidades principais.

O que é melhor, GPT-4 ou GPT-4o?

Não existe um "GPT-4o" oficial. O "o" provavelmente se refere a um mal-entendido ou a uma versão específica e não oficial. O GPT-4 em si é um modelo poderoso, e quaisquer variações provavelmente seriam internas ou representariam um ajuste fino específico – não uma atualização distinta e disponível publicamente. Continue com o GPT-4 para obter o melhor desempenho disponível atualmente.

Qual é um exemplo de modelo multimodal?

Um modelo multimodal não se resume apenas a palavras; é um sistema inteligente que entende e combina diferentes tipos de informação, como texto, imagens e sons. Pense nele como se tivesse múltiplos sentidos – ele pode "ver" uma imagem, "ouvir" um áudio e "ler" um texto para obter uma compreensão completa. Um bom exemplo seria uma IA que descreve um vídeo, incorporando tanto o conteúdo visual quanto as palavras faladas. Essa compreensão integrada é fundamental para seu poder.

A Kanerika é uma fornecedora líder de soluções completas de IA, análise e automação, com anos de experiência em implementação.

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