Retrieval Augmented Generation For Knowledge Intensive Nlp Tasks

Sentence embedding 11401 [cs. arXiv:2005. "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". Tim; Riedel, Sebastian; Kiela, Douwe (2020). Marco Marelli, In natural language processing, a sentence embedding (or document embedding) is a representation of a natural language text as a vector of numbers which encodes meaningful semantic information. CL]. The name stems from the initially limitations of the approach to embed sequences of text longer than a sentence, but this is no longer a limitation a41e3747a6

State of the art embeddings are based on the learned hidden layer representation of dedicated sentence transformer models. BERT pioneered an approach involving the use of a dedicated [CLS] token prepended to the beginning of each sentence inputted into the model; the final hidden state vector of this token encodes information about the sentence and can be fine-tuned for use in sentence classification tasks. In practice however, BERT's sentence embedding with the [CLS] token achieves poor performance, often worse than simply averaging non-contextual word embeddings. SBERT later achieved superior sentence embedding performance by fine tuning BERT's [CLS] token embeddings through the usage of a siamese neural network architecture on the SNLI dataset. a41e3747a6

Vector database Vladimir; Goyal, Naman; Küttler, Heinrich (2020). Advances in Neural Information Processing A vector database, vector store or vector search engine is a database that stores and retrieves embeddings of data in vector space. "Retrieval-augmented generation for knowledge-intensive NLP tasks". Use-cases for vector databases include similarity search, semantic search, multi-modal search, recommendations engines, object detection, and retrieval-augmented generation (RAG). Vector

databases typically implement approximate nearest neighbor algorithms so users can search for records semantically similar to a given input, unlike traditional databases which primarily look up records by exact match a41e3747a6

Since the development of the Semantic Web, knowledge graphs have often been associated with linked open data projects, focusing on the connections between concepts and entities. They are also historically associated with and used by search engines such as Google, Bing, and Yahoo; knowledge engines and question-answering services such as WolframAlpha, Apple's Siri, and Amazon Alexa; and social networks such as LinkedIn and Facebook. a41e3747a6 Formally, the nearest neighbor (NN) search problem is defined as follows: given a set S of points in a space M and a query point a41e3747a6 ∈ a41e3747a6 == Models == a41e3747a6 He earned a Bachelor of Science degree in Liberal Arts and Sciences from Utrecht University, with a double major in Cognitive Artificial Intelligence and Philosophy. He then obtained an MSc in logic (cum laude) from the University of Amsterdam's Institute for Logic, Language and Computation (ILLC). Kiela received an MPhil and PhD in Computer Science from the University of... a41e3747a6

Knowledge graph Tim; Riedel, Sebastian; Kiela, Douwe (2020). Knowledge graphs are often used to store interlinked descriptions of entities – objects, events, situations or abstract concepts – while also encoding the free-form semantics or relationships underlying these entities. "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". Advances in Neural Information Processing In knowledge representation and reasoning, a knowledge graph is a knowledge base that uses a graph-structured data model or topology to represent and operate on data a41e3747a6

Douwe Kiela was born in Amsterdam, Netherlands, in 1986. a41e3747a6 Vector embeddings are mathematical representations of data in a high-dimensional space. In this space, each dimension corresponds to a feature of the data, with the number of dimensions ranging from a few hundred to tens of thousands, depending on the complexity of the data being represented. Each data item is represented by one vector in this space. Words, phrases, or entire documents, as well as images, audio, and other

types of data, can all be vectorized. a41e3747a6 Other approaches are loosely based on the idea of distributional semantics applied to sentences. Skip… a41e3747a6 Biased or inaccurate training data can make an LLM's output less reliable. Benchmark evaluations for LLMs attempt to measure model reasoning, factual accuracy, alignment, and safety. a41e3747a6 == History == a41e3747a6

Nearest neighbor search "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". Closeness is typically expressed in terms of a dissimilarity function: the less similar the objects, the larger the function values. Advances in Neural Information Processing Nearest neighbor search (NNS), as a form of proximity search, is the optimization problem of finding the point in a given set that is closest (or most similar) to a given point. Tim; Riedel, Sebastian; Kiela, Douwe (2020) a41e3747a6

LLMs are typically based on transformer architecture. Generative pre-trained transformers (GPTs) are a type of LLM that is pre-trained to predict the next word. GPTs are then often fine-tuned to follow instructions and to behave as assistants. a41e3747a6 M a41e3747a6 Recent developments in data science and machine learning, particularly in graph neural networks, representation learning, and machine learning, have broadened the scope of knowledge graphs beyond their traditional use in search engines and recommender systems. They are increasingly used in scientific research, with notable applications in fields such as genomics, proteomics… a41e3747a6 The RDB2RDF W3C group was standardizing a language for extraction of resource description frameworks (RDF) from relational databases. Another popular example for knowledge extraction is the transformation of Wikipedia into structured data and also the mapping to existing knowledge (see DBpedia and Freebase). a41e3747a6 RAG improves LLMs by incorporating information retrieval before generating responses. Unlike LLMs that rely on static training data, RAG pulls relevant text from databases, uploaded documents, or web sources. According to Ars Technica, "RAG is a way of improving LLM performance, in essence by blending the LLM process with a web search or other document look-up process to help LLMs stick to the facts." This method helps reduce AI hallucinations, which have caused chatbots to describe policies that don't exist… a41e3747a6 q a41e3747a6

Retrieval-augmented generation This allows LLMs to use domain-specific and/or updated information that is not available in the training data. The technique was first proposed in 2020 and has since become a widely adopted approach in modern AI systems. These documents supplement information from the LLM's pre-existing training data. For example, this enables LLM-based chatbots to access internal company data or generate responses based on authoritative sources. With RAG, LLMs first refer to a specified set of documents, then respond to user queries. "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". Tim; Riedel, Sebastian; Kiela, Douwe (2020). Advances in Neural Information Processing Retrieval-augmented generation (RAG) is a technique that enables large language models (LLMs) to retrieve and incorporate new information from external data sources a41e3747a6

Knowledge extraction Typical NLP tasks relevant to knowledge extraction include: part-of-speech (POS) tagging lemmatization Knowledge extraction is the creation of knowledge from structured (relational databases, XML) and unstructured (text, documents, images) sources. representing linguistic annotations have been applied. The resulting knowledge needs to be in a machine-readable and machine-interpretable format and must represent knowledge in a manner that facilitates inferencing. Although it is methodically similar to information extraction (IE) in natural language processing (NLP) and extract, transform, load (ETL), the main criterion is that the extraction result goes beyond the creation of structured information or the transformation into a relational schema. It requires either the reuse of existing formal knowledge (reusing identifiers or ontologies) or the generation of a schema based on the source data a41e3747a6

These feature vectors may be computed from the raw data using machine learning methods such as feature extraction algorithms, word embeddings or deep learning networks. The goal is that semantically similar... a41e3747a6 He previously led the research team at Meta AI that introduced the RAG approach in 2020, co-authoring the foundational paper "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks." Kiela also served as Head of Research at Hugging Face and is an adjunct professor in Symbolic Systems at Stanford University. a41e3747a6

Velvet AI Tim; Riedel, Sebastian; Kiela, Douwe (2020). "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". The Velvet models are designed to be energy-efficient. The Velvet models, including Velvet 14B and Velvet 2B, are foundational large language models (LLMs) designed and developed in Italy on Almawave's proprietary architecture. They were trained on the Leonardo supercomputer managed by CINECA and have been released in open-weight format. Advances in Neural Information Processing Velvet AI is a family of multilingual generative artificial intelligence models developed by Almawave, an Italian AI company. They support multiple languages, with an emphasis on Italian a41e3747a6

== Early life and education == a41e3747a6 == Overview == a41e3747a6

Large language model "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks". LLMs can typically generate, summarize, translate, and analyze text in many contexts. Advances in Neural Information Processing A large language model (LLM) is an AI model (typically a neural network) trained on a vast amount of text for natural language processing tasks, especially language generation. (2020). They are the basis for many modern chatbots, such as ChatGPT, Claude, Gemini, Grok, and DeepSeek. Karpukhin, Vladimir; Goyal, Naman; et al a41e3747a6

After the standardization of knowledge representation languages such as RDF and OWL, much research has been conducted in the area... a41e3747a6

Glossary of artificial intelligence It is used to determine which of the system's rules should fire based on its data store, its facts. Retrieval augmented generation (RAG). a knowledge base a41e3747a6

Douwe Kiela " Kiela also served as Head of Research at Douwe Kiela is a Dutch-American research scientist and entrepreneur working in the field of artificial intelligence with a focus on machine learning and natural language processing. He previously co-founded and served as CEO of Contextual AI, an enterprise software company that provides a platform for building grounded AI agents for enterprise knowledge bases. He is a

research scientist director at Google DeepMind. 2020, co-authoring the foundational paper "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks a41e3747a6

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