

Title: Gemma (language model)

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Categories: Category:2024 in artificial intelligence, Category:2024 software, Category:Chatbots, Category:Generative pre-trained transformers, Category:Google DeepMind, Category:Google software, Category:Large language models, Category:Multimodal interaction

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Gemma is a series of open-source large language models developed by Google DeepMind . It is based on similar technologies as Gemini . The first version was released in February 2024, followed by Gemma 2 in June 2024 and Gemma 3 in March 2025. Variants of Gemma have also been developed, such as the vision-language model PaliGemma and the model DolphinGemma for understanding dolphin communication.

History

In February 2024, Google debuted Gemma, a family of free and open-source LLMs that serve as a lightweight version of Gemini. They come in two sizes, with a neural network with two and seven billion parameters , respectively. Multiple publications viewed this as a response to Meta and others open-sourcing their AI models, and a stark reversal from Google's longstanding practice of keeping its AI proprietary. [3] [4] [5]

Gemma 2 was released on June 27, 2024, [6] and Gemma 3 was released on March 12, 2025. [2] [7]

Overview

Based on similar technologies as the Gemini series of models, Gemma is described by Google as helping support its mission of "making AI helpful for everyone." [8] Google offers official Gemma variants optimized for specific use cases, such as MedGemma for medical analysis and DolphinGemma for studying dolphin communication. [9]

Since its release, Gemma models have had over 150 million downloads, with 70,000 variants available on Hugging Face . [10]

The latest generation of models is Gemma 3, offered in 1, 4, 12, and 27 billion parameter sizes with support for over 140 languages. As multimodal models, they support both text and image input. [11] Google also offers Gemma 3n, smaller models optimized for execution on consumer devices like phones, laptops, and tablets. [12]

Architecture

The latest version of Gemma, Gemma 3, is based on a decoder-only transformer architecture with grouped-query attention (GQA) and the SigLIP vision encoder. Every model has a context length of 128K, with the exception of Gemma 3 1B, which has a context length of 32K. [13]

Quantized versions fine-tuned using quantization-aware training (QAT) are also available, [13] offering sizable memory usage improvements with some negative impact on accuracy and precision. [14]

Variants

Google develops official variants of Gemma models designed for specific purposes, like medical analysis or programming. These include:

ShieldGemma 2 (4B): Based on the Gemma 3 family, ShieldGemma is designed to identify and filter violent, dangerous, and sexually explicit images. [15]

MedGemma (4B and 27B): Also based on Gemma 3, MedGemma is designed for medical applications like image analysis. However, Google also notes that MedGemma "isn't yet clinical

grade." [16]

DolphinGemma (roughly 400M): Developed in collaboration with researchers at Georgia Tech and the Wild Dolphin Project, DolphinGemma aims to better understand dolphin communication through audio analysis . [17] [18]

CodeGemma (2B and 7B): CodeGemma is a group of models designed for code completion as well as general coding use. [19] It supports multiple programming languages, including Python , Java , C++ , and more. [20]

Note: open-weight models can have their context length rescaled at inference time. With Gemma 1, Gemma 2, PaliGemma, and PaliGemma 2, the cost is a linear increase of kv-cache size relative to context window size. With Gemma 3 there is an improved growth curve due to the separation of local and global attention. With RecurrentGemma the memory use is unchanged after 2,048 tokens.

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Sergey Brin (co-founder)
David Cheriton
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David Drummond
Alan Eustace
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Larry Page (co-founder)
Patrick Pichette
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Rachel Whetstone

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Bias–variance tradeoff

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Dream Machine

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Yann LeCun
Yoshua Bengio
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Neural Turing machine
Differentiable neural computer
Transformer Vision transformer (ViT)
Vision transformer (ViT)
Recurrent neural network (RNN)
Long short-term memory (LSTM)

Gated recurrent unit (GRU)

Echo state network

Multilayer perceptron (MLP)

Convolutional neural network (CNN)

Residual neural network (RNN)

Highway network

Mamba

Autoencoder

Variational autoencoder (VAE)

Generative adversarial network (GAN)

Graph neural network (GNN)

Category