**Stable Diffusion** is a [deep learning](https://de.wikipedia.org/wiki/Deep_Learning) text [-to-image generator](https://de.wikipedia.org/wiki/Text-zu-Bild-Generator) . The [open-source](https://de.wikipedia.org/wiki/Open_Source)[software](https://de.wikipedia.org/wiki/Software) is primarily used to generate detailed images based on text descriptions, but can also be used for other tasks such as [inpainting](https://de.wikipedia.org/wiki/Inpainting) , [outpainting](https://de.wikipedia.org/wiki/Outpainting" \o "Outpainting) , and generating [image-to-image translations](https://de.wikipedia.org/w/index.php?title=Bild-zu-Bild-%C3%9Cbersetzung&action=edit&redlink=1) based on a written [*prompt*](https://de.wikipedia.org/wiki/Prompt) .

Stable Diffusion uses a [latent](https://de.wikipedia.org/wiki/Latentes_Variablenmodell) diffusion model as a variant of a deep generative [neural network](https://de.wikipedia.org/wiki/K%C3%BCnstliches_neuronales_Netz) , developed by the CompVis group at [LMU Munich](https://de.wikipedia.org/wiki/Ludwig-Maximilians-Universit%C3%A4t_M%C3%BCnchen)[[ 2 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-2) in collaboration between [Stability AI , CompVis LMU, and Runway, with support from EleutherAI and LAION.](https://de.wikipedia.org/wiki/Stability_AI)[[ 3 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-3)[[ 4 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-4)

In October 2022, *Stability AI* raised $101 million in a [funding round](https://de.wikipedia.org/wiki/Wagniskapital) led by Lightspeed Venture Partners and [Coatue Management .](https://de.wikipedia.org/wiki/Coatue_Management)[[ 5 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-5)

The [code](https://de.wikipedia.org/wiki/Code) and model weights of Stable Diffusion have been published [[ 6 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-6) and can be run on many consumer hardware systems equipped with a GPU with at least 8 GB [of graphics memory](https://de.wikipedia.org/wiki/Grafikspeicher) . It can now be run on less powerful hardware or without GPU acceleration, but at a significantly slower rate. This open approach represents a departure from proprietary text-to-image models such as [DALL-E](https://de.wikipedia.org/wiki/DALL-E) and [Midjourney](https://de.wikipedia.org/wiki/Midjourney) , which are only accessible via [cloud services](https://de.wikipedia.org/wiki/Cloud_Computing) . [[ 7 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:2-7)[[ 8 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-8)

Technology

**Training data**

[ [Edit](https://de.wikipedia.org/w/index.php?title=Stable_Diffusion&veaction=edit&section=2) | [Edit source](https://de.wikipedia.org/w/index.php?title=Stable_Diffusion&action=edit&section=2) ]

Stable Diffusion was trained on image and caption pairs from LAION-5B, a publicly available dataset derived from common crawl data from the internet. It filtered 5 billion image-text pairs into separate datasets based on their language, resolution, predicted probability of containing a watermark, and predicted aesthetic rating (e.g., subjective visual quality). [[ 9 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:1-9) The dataset was created by LAION, a German [non-profit](https://de.wikipedia.org/wiki/Gemeinn%C3%BCtzigkeit) organization funded by Stability AI. [[ 9 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:1-9)[[ 10 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-10) The Stable Diffusion model was trained on three subsets of LAION-5B: laion2B-de, laion-high-resolution, and laion-aesthetics v2 5+. A third-party analysis of the model's training data found that, of a smaller subset of 12 million images from the larger dataset originally used, approximately 47% of the images came from 100 different domains, with [Pinterest](https://de.wikipedia.org/wiki/Pinterest) accounting for 8.5% of the subset, followed by sites such as [WordPress](https://de.wikipedia.org/wiki/WordPress) , [Blogger](https://de.wikipedia.org/wiki/Blogger.com) , [Flickr](https://de.wikipedia.org/wiki/Flickr) , [DeviantArt](https://de.wikipedia.org/wiki/DeviantArt) , and [Wikimedia Commons](https://de.wikipedia.org/wiki/Wikimedia_Commons) . [[ 9 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:1-9)[[ 11 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-11)

An investigation by [Bayerischer Rundfunk](https://de.wikipedia.org/wiki/Bayerischer_Rundfunk) showed that the LAION datasets located on [Hugging Face](https://de.wikipedia.org/wiki/Hugging_Face) contain large amounts of private and sensitive data. [[ 12 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-12)

Due to criticism from artists, photographers, and other creatives, Stability AI 2024 used the option created by the Spawning association for artists to opt out of training for Stable Cascade and Stable Diffusion 3. Likewise, data from institutions and individuals who contacted Stability AI directly would have been excluded. [[ 13 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-13)[[ 14 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-14)

**use**

[ [Edit](https://de.wikipedia.org/w/index.php?title=Stable_Diffusion&veaction=edit&section=3) | [Edit source](https://de.wikipedia.org/w/index.php?title=Stable_Diffusion&action=edit&section=3) ]

Stable Diffusion claims no rights to the generated images and grants users the right to use any images generated from the model, provided the image content is not illegal or harmful to individuals. The freedom granted to users in using the images has led to controversy over the ethics of ownership, as Stable Diffusion and other generative models are trained on copyrighted images without the owner's consent. [[ 15 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:0-15)

Because visual styles and compositions are not subject to copyright, it is often perceived that users of Stable Diffusion who generate images of works of art do not infringe the copyright of visually similar works. However, individuals depicted in the generated images may be protected by publicity rights if their likeness is used, and intellectual property such as recognizable brand logos remains protected by copyright. Nevertheless, visual artists have expressed concern that the widespread use of [image synthesis](https://de.wikipedia.org/wiki/Bildsynthese) software such as Stable Diffusion could result in human artists, as well as photographers, models, cinematographers, and actors, gradually losing commercial viability to AI-based competitors. [[ 16 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-16)

Compared to other commercial products based on generative AI, Stable Diffusion is significantly more permissive in terms of the type of content users are allowed to create, such as violent or sexually explicit images. [[ 17 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-17) Emad Mostaque, CEO of Stability AI, counters concerns that the model could be used for abusive purposes: "It is the responsibility of the people whether they use this technology in an ethical, moral and legal way," and that despite possible negative consequences, the technology would provide a net benefit if Stable Diffusion's capabilities were made available to the public. [[ 7 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:2-7) Furthermore, Mostaque argues that the intention behind Stable Diffusion's open availability is to end the control of companies over such technologies, which have so far only developed closed AI systems for image synthesis. This is reflected in the fact that any restrictions Stability AI places on user-generated content can be easily circumvented due to the open-source nature of the license under which Stable Diffusion was released. [[ 15 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-:0-15) More recent versions such as Stable Diffusion 2 and 3, and Stable Cascade, have been trained with filtered datasets to prevent the creation of sexual or violent images, a decision that is highly controversial in the open-source community. [[ 18 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-18)

In July 2023, Stability AI introduced *MindEye* , an AI model that can reconstruct and extract subjects' visual memories using stable diffusion and [functional magnetic resonance imaging (fMRI).](https://de.wikipedia.org/wiki/Funktionelle_Magnetresonanztomographie)[[ 19 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-19) In March 2024, MedARC released *MindEye2.* The improved model is expected to deliver high-quality reconstructions after just one hour of training with patient data. [[ 20 ]](https://de.wikipedia.org/wiki/Stable_Diffusion#cite_note-20)