IMAGE QUALITY IMPROVEMENT BY ARTIFICIAL INTELLIGENCE

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To begin with, let's list the most common types of permissions and terms. The resolution is usually given in the format width x height of the screen in pixels

– 1920 1920 x 1080: Full HD (High Definition)
– 2048 x 1080: 2K (Digital Cinema)
– 3840 x 2160: 4K (UHD - Ultra High Definition)
– 4096 x 2160: 4K (Digital Cinema)
– 7680 x 4320: 8K (UHD)
– 15360 x 8640: 16K (UHD)

Today, the generally accepted resolution standard is 4K, and we are moving towards 8K screens. Youtube started supporting 4K for video downloads back in 2010 — then many manufacturers began to produce inexpensive cameras in this format. Since then, displays and smart TVs with 4K support have dropped significantly in price and gained popularity. Despite the fact that the human eye can hardly physically notice the difference in a picture with a quality over 4K, the race for higher resolution continues.

Owners of Ultra HD displays can most fully experience the capabilities of their screens when viewing native 4K content. And videos with a lower resolution have to be stretched to the whole screen, because, for example, images in 1080p (Full HD) contain only a quarter of the pixels of a 4K picture. You can scale the image immediately on a smart TV, in a media player, or use special programs to improve the video quality.

Video Enhancement is the process of improving the quality of video recordings. Professional video editors usually support the following functions:

- scaling (upscale);
- improved lighting;
- stabilization;
- noise reduction;
- brightness adjustment;
- crop (crop), video rotation, mirror image;
- filters;
- effects and animations.

A video editor to improve the quality can give your old recording a second life.

Video magnification (upscaling) is the process of converting media with a lower resolution to a higher one. Basic scaling is a way to "stretch" a lower-resolution image onto a larger screen, which is usually accompanied by a deterioration in quality and loss of detail. To increase the HD image on a 4K screen, you will have to fill an additional 6 million pixels. Therefore, the upscale program must determine what each of these new pixels will display, based on what the neighboring ones show (interpolation).

Although different algorithms give different image quality, interpolation usually improves the image in low resolution. But the attempt to "finish" the missing pixels in most cases catches the eye. As a result, the image occupies the entire 4K screen, but it may look blurry or muted, or have artifacts (noise halos, squares). When increasing the video resolution with the help of artificial intelligence, a completely different approach is used.

When receiving a low-resolution image, a deep learning algorithm (usually a generative neural network) predicts a higher-resolution image, which after compression would look like our original at the input. To achieve this level of accuracy, neural networks must be pre-trained on millions of images. When processing low-resolution video, the AI model can "finish" the lost pixels by analyzing each frame and

increasing the quality exponentially. This gives an incredible clarity and detail of the picture that no traditional upscaler can recreate: from realistic details to a cleaner and smoother reproduction of movements.

AI models are constantly being improved, and their accuracy increases with each training cycle. In addition, different deep learning models can be used to improve different types of video materials. And neural networks can also be combined: sometimes it gives amazing results.

Unlike traditional (not based on artificial intelligence) video quality improvement tools — more complex and sometimes requiring professional editing skills — artificial intelligence algorithms can automatically improve the quality of your videos. Here are some examples of such solutions.

DVDFab Enlarger AI video enhancement service uses super-resolution technology based on deep learning and can improve video quality from 480p (SD) to 1080p (Full HD), and from 1080p to 4K. The AI engine based on deep learning studies and analyzes low-resolution video frame-by-frame and can create and fill identical neighboring pixels, increasing the frame by 300%. The program also uses intelligent color correction algorithms.

DVDFab Enlarger AI is based on the TensorFlow framework. Millions of videos, films and TV shows have been used to train neural networks. In addition, the program uses the latest GPU acceleration technologies CUDA and cuDNN based on NVIDIA graphics cards.

GDFLab Video Upscaler is a cloud service for improving video quality. The developers promise to upscale videos and images up to 16K by simultaneously increasing resolution and quality:

- 270p ~ 360p up to 720p or FHD;
- 540p up to 4K UHD;
- 4 4K FHD up to 16K.

Artificial intelligence is used to eliminate noise and restore details that are not clear enough in the original image. In addition, using GDFLab Video Upscaler, you can restore old videos — with a cleaner picture and in a better resolution. The program can be used for video from surveillance cameras, filming, social networks, as well as in any areas related to video recording. Users can upload their images and videos simultaneously to all major platforms: YouTube, Facebook, LinkedIn, Twitch and others.

We mentioned this video editor when we wrote about restoring an 1896 documentary to 4K. Topaz Video Enhance AI is considered one of the best programs for improving video quality. It can boost the resolution up to 8K while maintaining realistic details and smooth movements.

Video Enhance AI can increase the resolution from DVD, DSLR, games and HD. You can also improve the quality of old videos for modern use, such as commercials, music videos, movies or recordings from YouTube.

Topaz Video Enhance AI uses deep learning to extrapolate details from video footage. It works on the basis of neural network training: it analyzes thousands of pairs of videos to determine how image details are lost during compression. The neural network can generate the missing details and create a realistic picture based on information from a single video.

Increasing and improving the video using AI creates an effect that can probably be compared to the sensations of a short-sighted person wearing glasses: it turns out that the world is full of details, trees have leaves, and road signs, signage and bus numbers can be easily read. At the moment, Full HD and 4K are still the most popular resolution formats for watching videos on the Internet and on TV, but the upper limit of picture quality has not yet been set.

Reference:
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