

Hands-on AI Image Generation

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Thursday, June 6, 2024

**AI Workshop in Neurotechnology, Brain Function and
Cognition**

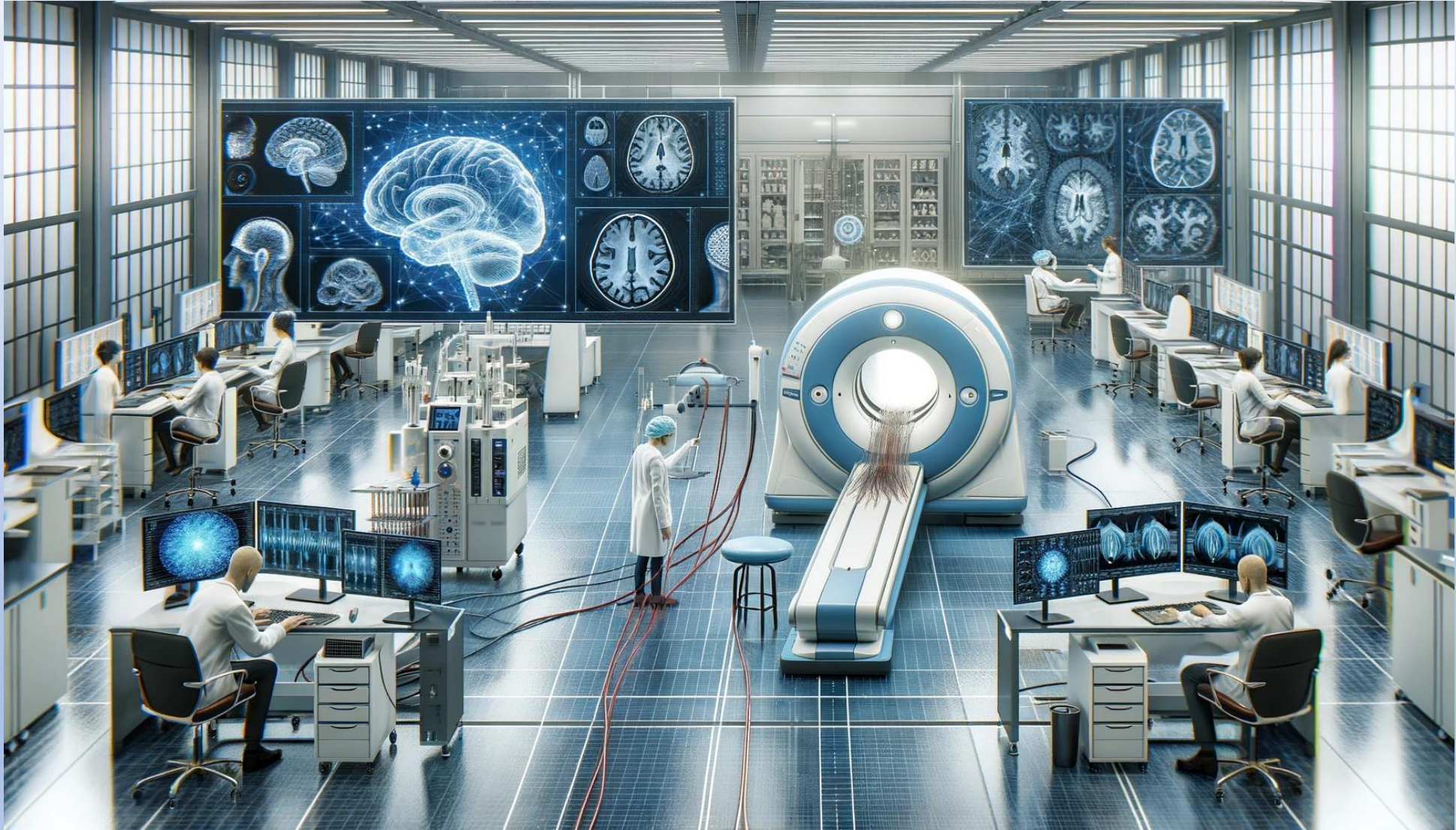
Data Science and Artificial Intelligence Strategic Initiative

**National Courts and Sciences Institute
State Justice Institute**









What can be done to modify an image?

ChatGPT-4 :

Cropping: Changing the dimensions of an image by cutting away the outer parts to focus on a specific area.

Resizing: Altering the size of the image, either by scaling it up or down, which can affect its resolution and detail.

Color Adjustments: Modifying color settings such as brightness, contrast, saturation, hue, and lightness to enhance the image's visual appeal.

Filters and Effects: Applying various filters and effects to achieve a specific look or style, such as a vintage effect, black and white conversion, or blur effects.

Retouching: Removing unwanted elements from an image, like blemishes, dust spots, or even larger objects, to clean up the photo.

Adding Text or Graphics: Incorporating text, shapes, or other graphic elements into an image to convey information or create a composite image.

Rotation and Flipping: Changing the orientation of an image by rotating it at various angles or flipping it horizontally or vertically.

Adjusting Sharpness and Clarity: Enhancing the details in an image to make it look crisper or adjusting the clarity to add or reduce haze and softness.

Color Correction: Adjusting the colors in an image to make them more accurate or to achieve a desired look, often used to correct color casts or balance.

Layering and Compositing: Combining multiple images or elements into a single composite image, often used in graphic design and digital art.

HDR (High Dynamic Range): Combining multiple photos of the same scene taken at different exposures to create a single image with greater dynamic range in luminosity.

Background Removal or Replacement: Erasing or replacing the background of an image to isolate the subject or change the scene.

Perplexity : There are numerous ways to modify an image using online photo editors like BeFunky, Fotor, Adobe Express, iLoveIMG, and Pixlr. Here are some key capabilities:

- Crop, resize, and rotate images for perfect composition and sizing
- Change the color of objects or apply filters/effects like black & white, vintage, cartoonizer, etc.
- Remove backgrounds or unwanted objects using AI tools
- Add text, stickers, frames to personalize images
- Upscale and enhance image quality, clarity, and details using AI
- Convert between image formats like JPG, PNG, GIF
- Create photo collages and animations
- Use generative AI to expand images, swap faces, generate images from text prompts

What can be done with artificial intelligence to modify an image?

ChatGPT-4 :

Image Restoration: AI can restore old or damaged photos, repairing scratches, tears, and fading. This is particularly useful for historical photographs or family heirlooms.

Colorization: AI algorithms can add color to black-and-white images, making them appear as though they were originally taken in color.

Enhancement and Upscaling: AI can enhance the resolution of images, increasing their clarity and detail without the usual pixelation or blurriness associated with traditional upscaling methods.

Style Transfer: AI can apply the style of one image (like a painting) to another, allowing for creative reimaginings of photos in the styles of famous artists or aesthetic themes.

Background Replacement: AI can detect and isolate subjects in a photo, allowing for the removal or replacement of backgrounds with remarkable accuracy.

Facial Editing and Modification: AI tools can alter facial features, expressions, and even age, either subtly for portrait enhancement or dramatically for creating entirely new identities.

Object Removal or Addition: AI can intelligently remove unwanted elements from a photo or add new elements that blend seamlessly with the original content.

Photo Animation: AI can bring still photos to life by animating elements such as water, hair, and even creating realistic facial movements and expressions from a single image.

Lighting and Atmospheric Changes: AI can simulate different lighting conditions, weather effects, or times of day in an image, altering the mood and setting.

Synthetic Image Creation: Beyond modifying existing images, AI can generate entirely new images based on textual descriptions or by learning from a dataset of images, creating realistic or fantastical visuals from scratch.

Predictive Editing: AI can suggest edits or transformations based on the content of an image and learned preferences, helping users achieve desired outcomes with minimal input.

Deepfake Generation: On the more concerning side, AI can be used to create deepfakes, where one person's face or voice is convincingly replaced with another's, raising ethical and legal concerns.

Perplexity :

Add and Remove Content: AI can add new elements or remove unwanted objects from images using tools like Generative Fill in Photoshop

Background Editing: AI can replace, remove, or create new backgrounds based on text prompts or predefined templates

Image Enhancement: AI can upscale image resolution, enhance clarity, and remove blurs and blemishes

Text-to-Image Generation: AI can create new images from text descriptions, allowing for creative transformations

Batch Processing: AI can automate repetitive tasks like cropping, resizing, and converting formats for multiple images at once

Face and Object Replacement: AI can swap faces or replace objects while maintaining a natural look

Color and Time of Day Changes: AI can change colors of objects or alter the time of day in images

**How can a judge tell if an image has been modified by
Artificial Intelligence?**

ChatGPT-4 :

Metadata Analysis: Reviewing an image's metadata, which contains information about how, when, and with what device an image was created, can sometimes reveal inconsistencies or signs of tampering. However, metadata can also be altered or stripped from an image.

Expert Consultation: Consulting with digital forensic experts or specialists in AI and image analysis can provide insights into whether an image has been modified. These experts use a combination of tools and techniques to detect anomalies and assess the integrity of digital images.

AI Detection Tools: There are AI-based tools designed to detect AI-generated or modified content. These tools analyze various aspects of an image, such as texture, consistency, and patterns, to identify signs of AI manipulation. However, as AI technologies evolve, the effectiveness of these tools may vary.

Visual Inspection: In some cases, careful visual inspection can reveal inconsistencies or anomalies in an image, such as unnatural lighting, unusual shadows, distorted features, or artifacts around edges. However, high-quality AI modifications may not have visible flaws.

Consistency Checks: Comparing the disputed image with other known authentic images from the same context or time period can sometimes reveal discrepancies. This can include analyzing background details, clothing, or environmental factors for consistency.

Chain of Custody Verification: Examining the chain of custody and the original source of the image can provide context and evidence regarding its authenticity. This includes how the image was obtained, who has had access to it, and how it has been stored or transmitted.

Statistical and Technical Analysis: Advanced techniques, such as error level analysis, frequency analysis, and machine learning algorithms, can be used to detect subtle inconsistencies or modifications in images.

Perplexity:

Metadata Analysis: Examining the metadata of an image can reveal information about the software and tools used for editing. AI-generated images often have specific metadata signatures that can be identified

Visual Artifacts: AI modifications can sometimes leave visual artifacts or inconsistencies that are detectable upon close inspection. These might include unnatural textures, lighting inconsistencies, or unusual patterns that differ from human-made edits

Comparison with Original Data: Comparing the suspect image with known originals or datasets can help identify modifications. AI tools often use large datasets for training, and similarities can be detected

AI Detection Tools: Specialized software and algorithms are being developed to detect AI-generated content. These tools analyze patterns and features that are typical of AI-generated images

Expert Testimony: Expert witnesses in digital forensics and AI can provide insights and analysis on whether an image has been modified using AI techniques

When DALL-E creates an image, why are the words contained in the image gibberish?

ChatGPT-4 :

When DALL-E creates images that contain text, the words often appear as gibberish or nonsensical strings because the model isn't specifically trained to generate coherent and contextually appropriate text within images.

The primary focus of DALL-E is to understand and generate visual concepts based on the descriptions provided. While it can recognize that certain parts of an image might contain text (like signs, books, or screens), its ability to accurately replicate specific textual content is limited.

The training data for models like DALL-E includes a vast array of images, many of which contain text. However, the model's objective is to learn patterns and features across these images, not to understand or generate legible text.

As a result, when the model tries to generate images that include text, it often produces letter-like shapes that don't form meaningful words. This limitation is partly due to the model's design, which optimizes for visual patterns rather than linguistic coherence, and partly to avoid misuse, such as creating misleading images or impersonating specific handwriting or typography.

Perplexity :

When AI creates an image, the words contained in the image often appear as gibberish because the AI lacks an understanding of language and the specific structure of letters.

AI image generators, like Midjourney and DALL-E, generate images by predicting pixel patterns that resemble objects, but they do not comprehend the semantic meaning or the precise form of letters and words.

This results in text that looks like random characters rather than coherent language. Some tools, like Storia Lab, are being developed to address this issue and improve text generation in AI images.

If DALL-E cannot make use of correctly spelled words included in its data prompt, how can a user be sure that it is correctly using other data?

ChatGPT-4 :

Clear and descriptive prompts: Providing DALL-E with clear, detailed, and descriptive prompts can significantly enhance the accuracy and relevance of the generated images. The more specific the details in the prompt, the better DALL-E can understand and visualize the intended concept.

Understanding DALL-E's strengths: DALL-E is particularly adept at recognizing and generating visual concepts, patterns, and elements. It is good at combining objects, styles, and scenarios in creative ways based on the patterns it learned during training.

Iterative refinement: Users often need to refine their prompts iteratively to get the desired outcome. This might involve adjusting the level of detail, experimenting with different descriptions, or clarifying ambiguous terms to guide the model towards the intended result.

Visual feedback: Since DALL-E generates visual content, users can directly assess the accuracy and relevance of the output by comparing it to their expectations. This immediate feedback loop helps in fine-tuning prompts and understanding how DALL-E interprets various commands.

Leveraging examples: Providing examples or referring to well-known concepts, objects, or styles can help DALL-E generate more accurate representations, as these are likely to be well-represented in its training data.

Perplexity :

Training Data Quality: AI models are trained on vast datasets that include both accurate and inaccurate information. This mixed quality can lead to errors in outputs, including misspelled words and factual inaccuracies

Pattern Recognition, Not Understanding: AI models generate content based on patterns in the training data without understanding the meaning. This can result in plausible-sounding but incorrect outputs, as seen with gibberish text in images

Lack of Explainability: AI systems often lack transparency in how they arrive at their conclusions. This makes it difficult to verify the accuracy of their outputs, as they rely on probabilistic associations rather than causal reasoning

Human Oversight: Given these limitations, it is crucial for users to critically evaluate AI outputs. Cross-referencing with reliable sources and using human judgment are essential to ensure accuracy and mitigate biases

What do you notice about these images?

Prompt: Create an image of a lawyer, a doctor, a CEO and an athlete.





Prompt: Create an image of a lawyer, a doctor, an engineer and a scientist.





Prompt: Create an image of a group of brides.







