

Day 1:- Session 3Image and Video Manipulation with Generative AI

Generative AI is transforming how we **edit, enhance, and create** images and videos — going far beyond traditional tools like Photoshop or Premiere. Here's a practical and up-to-date look at what it can do and what tools are available, especially open-source and free-access options.

What Is Image & Video Manipulation in AI?

Image and video manipulation with AI means using **machine learning models** (especially **generative models**) to:

- **Edit** (e.g. remove background, change style, enhance quality)
- **Transform** (e.g. age a face, animate a photo)
- **Generate** new content (e.g. text-to-image, video from prompts)

Key Capabilities

Image Manipulation Tasks

Task	Description
Inpainting	Fill in missing or damaged parts of an image
Outpainting	Extend images beyond their original borders
Style Transfer	Apply one image’s style to another
Super-Resolution	Enhance image resolution
Face Editing	Change expressions, age, gender, etc.
Background Removal	Automatically isolate subjects
Prompt-Based Editing	Modify image using text (e.g., “make it snowy”)

☐ Video Manipulation Tasks

Task	Description
Video Inpainting	Remove or replace objects over time
Frame Interpolation	Smooth motion by generating in-between frames
Video Super-Resolution	Enhance video clarity and sharpness
Text-to-Video	Generate video from text prompts
Face Swapping / Deepfakes	Replace one face with another in motion
Style Transfer	Apply artistic filters frame by frame

☐ Popular Open Source Tools

☐ For Images:

Tool	Capabilities	Notes
Stable Diffusion	Inpainting, outpainting, style editing	Highly customizable with extensions
ControlNet	Fine-grained control via pose, edge, or depth	Add-on to Stable Diffusion
FaceFusion	Face swapping	Open-source alternative to deepfakes
GFPGAN	Face restoration	Works with low-quality photos
RemBG	Background removal	Fast and lightweight

☐ For Video:

Tool	Capabilities	Notes
VideoCrafter2	Text-to-video synthesis	Open-source from Tencent
Runway ML	Video editing, inpainting, gen-2 video	Has free/paid options (not fully open-source)
PyFrameInterp	Frame interpolation	Smoother slow motion
Deforum	Stable Diffusion animations	Turn prompts into motion
EbSynth	Stylize video using a reference image	Frame-guided painting

☐ Advanced Techniques

Technique	Used For	Backed By
Latent Diffusion	Efficient image/video generation	Stable Diffusion
DreamBooth	Personalizing models	Photos of specific people/things
ControlNet	Structured control over generation	Depth maps, segmentation, etc.
LoRA (Low-Rank Adaptation)	Lightweight model fine-tuning	Personal styles or characters

☐ Ethics & Legal Concerns

Issue	Description
Deepfakes	Can be misused for impersonation or misinformation
Copyright	Who owns the generated or manipulated content?
Consent	Using real people's faces, voices, or likenesses
Watermarking	Many platforms now watermark AI-generated content for safety and traceability

☐ Want to Try It Out?

You can experiment locally or in the browser:

☐ Browser-Based:

- **Photo Editing:** Clipdrop, Runway ML
- **Image Generation:** Hugging Face Spaces, CivitAI
- **Video Synthesis:** Pika Labs, Kaiber

☐ Local Tools:

- Use `AUTOMATIC1111` + **ControlNet** for powerful image manipulation.
 - Use **Deforum** or **VideoCrafter2** to explore video generation.
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