RadianceKit User Guide

What is RadianceKit?

RadianceKit turns photos or videos of real-world objects into interactive 3D models using Gaussian Splatting — a modern technique that represents scenes as millions of tiny, colored 3D ellipsoids (called *Gaussians*) rather than traditional triangle meshes.

The result is a photorealistic 3D reconstruction you can view from any angle and export in various formats.

Quick Start

1. **Import** — Drop photos or a video of your scene into the app
2. **Process** — RadianceKit aligns your cameras and trains a Gaussian Splatting model
3. **Preview** — Explore the 3D result in the interactive viewport
4. **Export** — Save as PLY, SPZ, glTF, or other formats

That's it. In Simple Mode, the entire workflow is a single button click after importing.

Import View — drag & drop your photos or video

Importing Media

Photos

For best results:

- Use **10–50 images** taken around the object from different angles
- Overlap between consecutive images should be at least 60%
- Avoid motion blur and overexposed areas
- Consistent lighting produces the best results
- Supported formats: JPG, PNG, HEIC, TIFF

You can drag & drop images, use *File > Browse Files*, or drop an entire folder.

Video

Drop a video file (MP4, MOV) and RadianceKit will automatically extract frames. Adjust the **sampling density** to control how many frames are extracted per second of video.

- Higher density = more images = better quality, but longer processing
- A 10-second video at 2 fps density yields ~20 frames

Existing Scenes

You can also open previously exported scene files:

- **.radiancescene** — RadianceKit's native scene bundle (includes Gaussians + camera data)
- **.ply / .spz / .splat** — Gaussian Splatting files from other tools

---

Processing Pipeline

Camera Alignment (Structure from Motion)

RadianceKit first determines where each photo was taken from. This step, called *Structure from Motion* (SfM), analyzes visual features across your images to compute camera positions and orientations.

Two backends are available:

- **Apple Photogrammetry** — Built-in, no installation needed. Works well for most scenes.
- **COLMAP** — External tool, better for large outdoor scenes. Requires separate installation.

Gaussian Splatting Training

Once cameras are aligned, training begins. The algorithm:

1. Places initial Gaussians at detected 3D points
2. Iteratively refines their positions, colors, sizes, and orientations
3. Periodically adds and removes Gaussians (densification) to capture detail

You can watch the 3D model improve in real time in the viewport.

Training Presets

Preset	Iterations	Use Case
Quick	1,000	Fast test, low quality
Preview	5,000	Quick preview
Balanced	20,000	Good quality, reasonable time
Quality	40,000	Best quality

Two densification strategies are available:

- **Classic** — Original clone/split/prune approach. Faster, produces more Gaussians.
- **MCMC** — Stochastic Gradient Langevin Dynamics (NeurIPS 2024). Fewer Gaussians, slower, but more compact results.

3D Preview — explore the reconstructed scene

The Viewport

Navigation

Input	Action
Mouse Drag	Orbit around the scene
Shift+Drag or Right-Drag	Pan the camera
Scroll Wheel	Zoom in/out
Double-click	Re-center on a point
Cmd+Scroll	Adjust field of view

Fly-Through Mode

Press **F** to switch between Orbit and Fly-Through mode. In Fly-Through:

- **WASD** — Move forward/back/left/right
- **Q / E** — Move up/down
- Mouse controls look direction

Camera Views

- **0–9** — Jump to training camera positions (1 = first 10%, 0 = last)
- **Left/Right Arrow** — Step through training cameras
- **R** — Reset camera to default position
- **T** — Toggle auto-rotation (turntable)
- **B** — Cycle background color (dark gray / black / white)

Capturing

- **S** — Save a screenshot to the Desktop
- **V** — Record a 360° turntable video
- **C** — Copy camera position info to clipboard

Editing

Press **Tab** or use *Viewport > Enter Edit Mode* to activate the Gaussian editor.

- **Click / Drag** — Paint-select Gaussians with a brush
- **Option+Click** — Deselect Gaussians
- **[/]** — Decrease / increase brush size
- **X** or **Delete** — Delete selected Gaussians
- **Cmd+Z** — Undo last deletion
- **Esc** — Clear selection

This is useful for removing floating artifacts or unwanted parts of the scene.

Exporting

Export View — choose from multiple 3D and media formats

RadianceKit supports multiple export formats:

3D Formats

Format	Extension	Description
PLY	.ply	Standard point cloud format. Widely supported.
Compressed PLY	.ply	

Format	Extension	Description
		Quantized attributes for smaller file size.
SPZ	.spz	Google's compact Gaussian format. Very small files.
glTF	.glb	Web-ready 3D format. Works with three.js and other viewers.
.splat	.splat	Lightweight format for web viewers.
SOG	.sog	Compact sorted Gaussian format.

Media

Format	Description
Orbit Video	360° turntable video (MP4)
Web Viewer	Self-contained HTML file with interactive 3D viewer

Post-Processing

Compactification can be enabled in the Enhancements section. It removes nearly-invisible Gaussians after training, reducing file size by ~55% with no visual quality loss.

Expert Mode

Expert Mode — full control with navigator, viewport, and inspector

Switch to Expert Mode via *Mode > Expert Mode* (Cmd+2) for full control:

- **Navigator** (left sidebar) — Browse imported images, camera list, and log
- **Inspector** (right sidebar) — Training presets, configuration, live metrics, loss chart, enhancements, and export
- **Viewport** — Full interactive 3D view with all controls
- Drag inspector sections to reorder them; collapse sections you don't need

---

Tips for Best Results

1. **Overlap is key** — Ensure at least 60% overlap between consecutive images
2. **Move around the object** — Cover all sides, including top if possible
3. **Consistent lighting** — Avoid mixed lighting or strong shadows that change between shots
4. **Steady shots** — Avoid motion blur; tripod or stable handheld
5. **Neutral background** — Simple backgrounds help the algorithm focus on the object
6. **More images help** — 30–50 images usually produce excellent results
7. **Use Balanced or Quality presets** — Quick/Preview are for testing; final results need more iterations
8. **Try MCMC for compact exports** — If file size matters, MCMC produces ~70% fewer Gaussians

Keyboard Shortcuts Reference

Navigation

Key	Action
Mouse Drag	Orbit / Look around
Shift+Drag / Right-Drag	Pan camera
Scroll	Zoom / Move forward
WASD	Move camera
Q / E	Move up / down
F	Toggle Orbit / Fly-Through
Double-click	Re-center on point
Cmd+Scroll	Adjust field of view

Views

Key	Action
R	Reset camera
T	Toggle auto-rotation

Key	Action
P	Toggle camera playback
B	Cycle background
0–9	Jump to training camera
Left/Right Arrow	Previous/next camera

Capture

Key	Action
S	Save screenshot
V	Record turntable video
C	Copy camera info

Editor

Key	Action
Tab	Toggle edit mode
Click / Drag	Select Gaussians
Option+Click	Deselect
X / Delete	Delete selected
Cmd+Z	Undo
[/]	Brush size
Esc	Clear selection

Other

Key	Action
Cmd+1	Simple Mode
Cmd+2	Expert Mode

Key	Action
Cmd+O	Open Scene
Cmd+S	Save Scene
Cmd+Shift+S	Save Screenshot
Cmd+Shift+T	Start Training
Cmd+?	Keyboard Shortcuts
H	Toggle help overlay