



NV-BOOST

Real-time night-vision enhancement — User guide

NV-BOOST brightens and cleans up a live video feed in real time so that dark scenes become usable. Open a source (camera, file or network stream), pick a processing pipeline, and watch the enhanced image side by side with the original. This guide walks through every part of the window: the video source, the processing pipeline and its stages, the parameter sliders, recording, the performance readout and the interface language. No knowledge of the underlying algorithms is required — everything is driven from the control panel.

Document	User manual
Version	2.0 “FAST” — 2026
Product	NV-BOOST
Audience	User / operator

1. Overview

NV-BOOST takes a video feed and passes each frame through a chain of lightweight image-processing stages designed for low light. The result is a brighter, cleaner picture with more visible detail, produced fast enough to run live: the recommended pipeline reaches around 47 FPS on a single CPU core and comfortably exceeds 60 FPS on a desktop machine. You can view the enhanced feed, compare it against the untouched original, tune the effect with sliders, and record the enhanced video to a file.

▶ Live low-light enhancement	▶ Camera / file / network stream	▶ Choice of enhancer (LUT · DNN)	▶ Record the enhanced feed
------------------------------	----------------------------------	----------------------------------	----------------------------

The window at a glance

The application opens a single window (default size 1280×780, resizable). It is organised into four areas:

Area	What it contains
Title bar (top)	Logo, the “Night Vision Enhancement” subtitle, a blinking REC indicator while recording, and a live FPS badge.
Video area (left)	The image itself. Until a source is open it shows a placeholder (“No source open”). A small counter in the top-left corner shows current FPS and latency.
Control panel (right)	A scrollable column of sections: Video Source, Processing Pipeline, Parameters, Recording and a compact Performance readout.
Status bar (bottom)	A state dot, the current status message, the version, and the language selector at the far right.

Getting started

— Étape 1 — Open a source

In the Video Source panel, choose Camera, File or URL, enter the value (a camera index such as **0**, a file path, or a stream URL) and click Open. Processing and the live view start immediately.

— Étape 2 — Choose a pipeline

In the Processing Pipeline panel, keep the recommended stages enabled and pick one enhancer — Auto-LUT, Zero-DCE++ or SCI (they are mutually exclusive). Toggle Side-by-side view in Parameters to compare the enhanced image against the original.

— Étape 3 — Tune with the sliders

Use the Parameters sliders to adjust strength and behaviour while watching the image. Every change applies instantly to the live feed.

— Étape 4 — Record (optional)

In the Recording panel, set a folder and file name, then click Record. NV-BOOST writes the enhanced feed to the file; click Stop recording to finish.

2. “Video Source” panel

This panel selects what NV-BOOST reads and controls playback. Pick a source type with the three radio buttons, then fill in the field that appears below them.

Type	Field	What to enter
Camera	Index	A device index — 0 for the first camera, 1, 2 ... for others. Defaults to 0 .
File	Path	A path to a video file, or use the ... button to browse (mp4, avi, mkv, mov, wmv, flv, webm, ts).
URL	URL	A network stream address — rtsp:// , http:// or rtmp:// .

Playback buttons

Button	Action
Open / Close	Starts reading the selected source (button becomes Close while running). Click again to stop and release the source.
Pause / Resume	Freezes the feed without closing it; click again to resume. Available only while a source is open.
Restart (↺)	Rewinds / re-opens the current source from the start — useful for a file that has reached its end.

The status bar at the bottom of the window reports what is happening — for example “Connecting to: ...”, “Source closed.”, “End of video.”, or an error such as “Cannot open: ...”. A coloured dot on the left shows the state: grey (stopped), green (running), amber (paused).

3. “Processing Pipeline” panel

The pipeline is the heart of NV-BOOST: a series of stages, each with an on/off toggle, applied in a fixed, optimised order. Hover any toggle to see a tooltip describing what it does and its rough cost per frame. The panel is split into a recommended block (the fast, night-effective stages) and an optional block for specific stream problems.

Recommended stages

Stage	What it does	Cost	Default
A · Temporal denoising	Motion-adaptive averaging across frames: static areas are strongly cleaned (SNR $\times 3-4$) while moving areas stay sharp — no ghosting. The foundation for everything else, since every brightness boost also amplifies noise.	~5 ms	ON
B · Adaptive Auto-LUT	A single tone curve (contrast stretch + adaptive gamma + highlight roll-off), smoothed over time to avoid flicker. Replaces three older algorithms at a fraction of the cost.	~1–2 ms	ON
C · Zero-DCE++ (DNN)	A small neural network that estimates a brightening curve. Higher quality than Auto-LUT. Mutually exclusive with B and C2.	~5–15 ms	off
C2 · SCI extreme darkness (DNN)	Estimates the scene’s illumination and lifts black areas far more than Zero-DCE++ while preserving light sources. For very dark scenes. Mutually exclusive with B and C.	~4–6 ms	off
D · Chroma denoising	Smooths the colour channels to remove magenta/green colour-noise blotches; luminance detail is untouched.	~1–2 ms	ON
E · CLAHE (local contrast)	Adaptive local contrast on the luminance channel — brings out detail in uneven lighting.	~3 ms	ON
F · Sharpening	A light unsharp mask ($\sigma 1.5$) with reduced halos around light sources.	~3 ms	off

B, C and C2 are mutually exclusive. Turning one on automatically turns the other two off — you always run exactly one main enhancer (or none).

Optional stages

Enable these only when the stream needs them; each adds cost.

Stage	When to use it	Cost
Fast-LIME (illumination)	An alternative brightening method (illumination-map based). Use instead of B/C/C2 if you prefer its look.	~6–9 ms
Defog (low-res DCP)	Reduces haze/fog using a dark-channel prior. Turn on for hazy scenes.	~8–14 ms
Deblock (DCT artefacts)	Removes blocky compression artefacts — useful on heavily compressed RTSP streams.	~4–6 ms
Guided denoise (spatial)	Spatial denoising on luminance, for when temporal denoising alone is not enough (e.g. mostly static noise).	~4 ms

Recommended order (handled automatically): temporal denoise → [deblock] → [defog] → Auto-LUT | Zero-DCE++ | SCI → chroma denoise → CLAHE → [sharpening]. Denoising comes before brightening so that noise is not amplified.

4. Choosing the main enhancer

Stages B, C and C2 all brighten the image but suit different conditions. Only one runs at a time. Use this table to pick:

Enhancer	Best for	Character	Cost
B · Auto-LUT	Any scene where every millisecond counts.	Fast, stable, flicker-free. The sensible default.	~1–2 ms
C · Zero-DCE++	Low light where you want the best-looking result.	Neural curve, higher quality than Auto-LUT, balanced.	~5–15 ms
C2 · SCI	Very dark scenes (below ~5 lux).	Lifts near-black areas hardest while keeping lamps from blowing out.	~4–6 ms

Rule of thumb: SCI for heavy darkness, Zero-DCE++ for balanced low light, Auto-LUT when speed matters most. Whichever you pick, keep temporal denoising (A) and chroma denoising (D) on — strong brightening needs clean input.

5. “Parameters” panel

Each slider fine-tunes a stage. Sliders take effect live. The value on the right of each slider shows the current setting. A slider only has an effect when its stage is enabled in the pipeline.

Slider	Range	Default	Role	Stage
Temporal denoise	0.00 – 0.95	0.60	Strength of frame-to-frame averaging. Higher = cleaner static areas; too high can smear.	A
Auto-LUT strength	0.00 – 1.00	0.70	How aggressively the tone curve brightens the scene.	B
Zero-DCE strength	0.00 – 1.50	1.00	Gain of the neural brightening curve.	C
Zero-DCE interval	1 – 10 fr	3 fr	Frames between two network inferences. Higher = cheaper, still flicker-free (curve is smoothed).	C
SCI strength	0.00 – 1.50	1.00	Illumination-gain exponent. 1.00 reproduces SCI exactly; below 1 softens, above 1 pushes harder.	C2
SCI interval	1 – 10 fr	2 fr	Frames between two SCI inferences.	C2
CLAHE clip	1.0 – 8.0	2.5	Local-contrast clip limit. Higher = punchier local contrast (and more noise).	E
LIME γ	0.40 – 0.90	0.60	Illumination gamma for Fast-LIME. Lower brightens more.	LIME
Defog ω	0.50 – 1.00	0.85	Fog-removal strength.	Defog
Defog patch	5 – 15 px	7 px	Dark-channel patch size (odd steps).	Defog
Deblock strength	0.5 – 3.0×	1.0×	Strength of compression-artefact removal.	Deblock

SCI “pitch dark” mode

A checkbox in the Parameters panel switches the SCI weights. Checked uses the “difficult” weights, tuned for scenes below ~5 lux (the default). Unchecked uses the “medium” weights — a gentler render for ordinary low light. It can be switched live.

Display options

Option	Effect
Pipeline overlay	Draws labels on the image (Original / Enhanced, FPS and latency, a REC marker). On by default.
Side-by-side view	Shows the original and the enhanced image next to each other so you can judge the effect at a glance. On by default.

6. “Recording” panel

NV-BOOST can save the enhanced feed to a video file while it plays. Recording is only available while a source is open.

Field / button	Use
Folder	Destination folder. Type a path or use the ... button to browse. Left as ~ it defaults to the current folder.
File	Output file name. Defaults to enhanced.mp4 .
Record / Stop recording	Starts writing to folder/file ; the button turns into Stop recording. A blinking red dot and the REC label appear while recording.

When recording stops, a green line confirms how many frames were written and to which file (e.g. “✓ 1240 frames → enhanced.mp4”). If the file cannot be created, the status bar shows “Cannot open the file — check the codec and the path.”

7. Performance readout

NV-BOOST shows its live speed in three places: the FPS badge in the title bar, a small counter in the top-left corner of the video, and the Performance box at the bottom of the control panel (FPS and latency in milliseconds).

Reading	Colour	Meaning
FPS	green	Above 20 FPS — smooth, comfortably real-time.
FPS	amber	10–20 FPS — usable but heavy; consider a lighter enhancer or fewer optional stages.
FPS	red	Below 10 FPS — too slow; reduce the load (see Troubleshooting).
Latency	—	Processing time per frame, in milliseconds. Lower is better.

8. Interface language

The interface is available in five languages. The language selector sits at the bottom-right of the status bar (a small globe and the current language name). Click it and a menu opens upward; pick a language and the entire interface switches instantly — no restart. The video feed and your settings are not affected.

Code	Language	Note
FR	Français	French — the default when no preference is saved.
EN	English	English.
ES	Español	Spanish.
PT	Português	Portuguese.
ZH	Chinese (Simplified)	Simplified Chinese.

*Your choice is saved and reapplied on the next launch. At first start, NV-BOOST follows your system language if it matches one of the five, and falls back to French otherwise. If a label is missing in a translation it appears in English rather than breaking the interface. On a minimal Linux machine, Chinese ideograms need a CJK font installed (e.g. **fonts-noto-cjk**).*

9. Recommended settings by condition

Indicative starting points. Adjust while watching the image: brighten gradually, then back off if noise or smearing becomes distracting.

Condition	Enhancer	Temporal denoise	CLAHE clip	Chroma
Dusk / low light	Zero-DCE++	0.50	2.5	ON
Night (dark)	Zero-DCE++	0.60	3.0	ON
Very dark (<5 lux)	SCI (difficult)	0.70	2.5	ON
Speed-critical CPU	Auto-LUT	0.60	2.0	ON
Hazy scene	Auto-LUT + Defog	0.60	2.5	ON
Compressed RTSP	Auto-LUT + Deblock	0.60	2.5	ON

Temporal denoising (A) and chroma denoising (D) stay on in every case. Sharpening (F) is optional — add it last, lightly, if the image looks soft.

10. Neural models & deployment

Zero-DCE++ and SCI rely on small ONNX model files shipped in a `models/` folder. Keep this folder next to the executable — NV-BOOST looks for it in the application directory first, then in the current folder.

File	Used by	Notes
<code>zero_dce_pp_curve.onnx</code>	Zero-DCE++ (C)	Brightening-curve network.
<code>sci_difficult_illum.onnx</code>	SCI (C2)	“Pitch dark” weights (default).
<code>sci_medium_illum.onnx</code>	SCI (C2)	Gentler low-light weights.

If a model file is missing, NV-BOOST says so in the status bar and falls back automatically to Auto-LUT, so the feed keeps working — for example “SCI: ONNX model not found ... — falling back to Auto-LUT.”

11. Troubleshooting

Symptom	What to check
“No source open” / nothing plays	Confirm the source type and value (camera index, file path or URL), then click Open. Read the status bar for the exact error.
Empty-source message	The field was blank — enter an index, a file or a URL before opening.
Cannot open a file	Check the path and that the format is supported; try the ... browse button.
FPS is red / very low	Switch to a lighter enhancer (Auto-LUT), turn off optional stages (Defog, Deblock, Guided), raise the Zero-DCE/SCI interval, or lower the source resolution.
Flicker or pumping brightness	Raise the enhancer interval slightly; the curves are time-smoothed, so a larger interval is usually still flicker-free.
Colour blotches (magenta/green)	Keep Chroma denoising (D) enabled; it targets exactly this colour noise.

Smearing on moving objects	Lower Temporal denoise — static areas stay clean while motion keeps its detail.
DNN enhancer seems inactive	The ONNX model may be missing; the status bar will say so and NV-BOOST falls back to Auto-LUT. Restore the <code>models/</code> folder next to the executable.
Chinese text shows as boxes	Install a CJK font on the machine (e.g. <code>fonts-noto-cjk</code> on Linux).
Recording won't start	Recording needs an open source; check the folder path and file name, and the codec for the chosen extension.