DISPLAY WEEK

MAY 3-8, 2026
LOS ANGELES, CA | USA

Real-time Neural Filtering for Perceptual Enhancement of Digital Experiences

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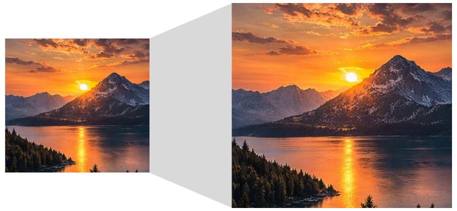
The last mile of displays is computed.



Superresolution

Frame Interpolation

Color Correction

Ambient Adaptation

The last mile of displays is ~~computed~~ AI-driven.

- Samsung Vision AI (NQ8 AI Processor)
  - 8K upscaling
  - Motion enhancement
  - Depth enhancement
  - Real-time content optimization
- LG AI TV (α11 AI Processor)
  - 4K upscaling
  - Depth enhancement
  - AI brightness controls
- TCL (AiPQ Processor)
  - Dynamic backlight and local dimming
  - Ambient illumination adjustment
  - Motion interpolation selection
- Hisense (Hi-View AI Engine)
  - 4K upscaling
  - Motion clarity
  - Depth enhancement
  - Dynamic local dimming and HDR

What rules should display AI follow?

NEED	CONSTRAINTS	DESIGN PATTERN
New experiences demand adaptive presentation	Display filters must be fast, faithful, and bounded	Divide enhancement into low-res analysis and consistent application

New experiences demand smarter pixels

HDR Everywhere

High Framerate E-sports

Display Diversity

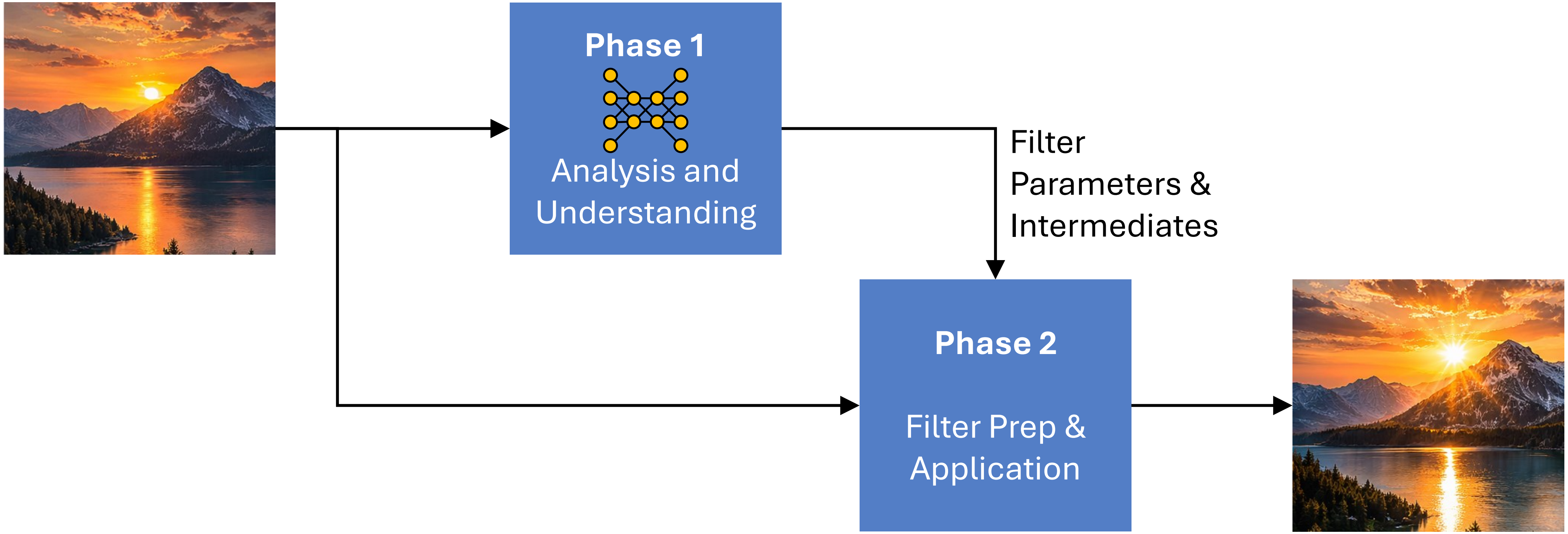
Improving experience while preserving the source intent

Improve Experience
Support and enhance new, upcoming experiences (e.g. HDR display)

Preserve Intent
Output images must preserve input frame intent

Stay Real Time
Efficient, low-latency solutions maintain interactivity

A two-phased algorithmic approach



A two-phased algorithmic approach

Deeper, neural analysis and estimation of filter intermediates; run at low-resolution

Phase 1

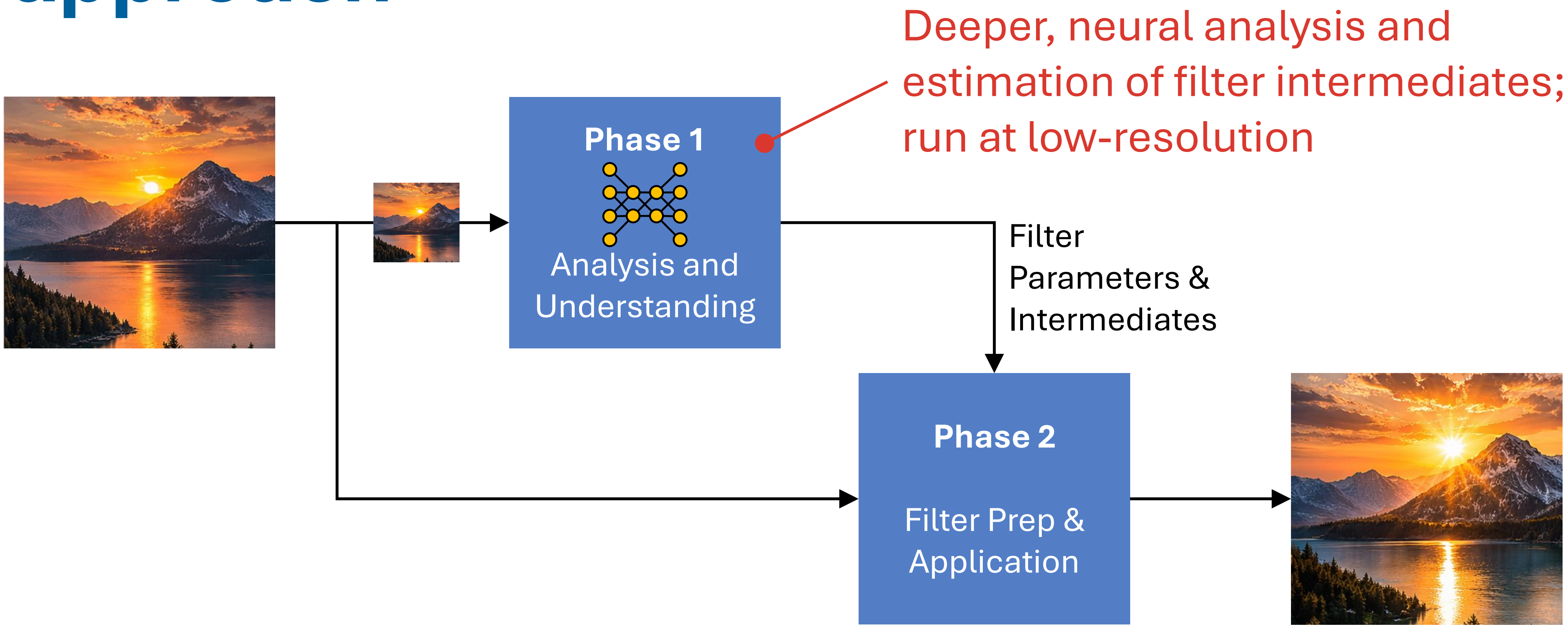
Analysis and Understanding

Filter Parameters & Intermediates

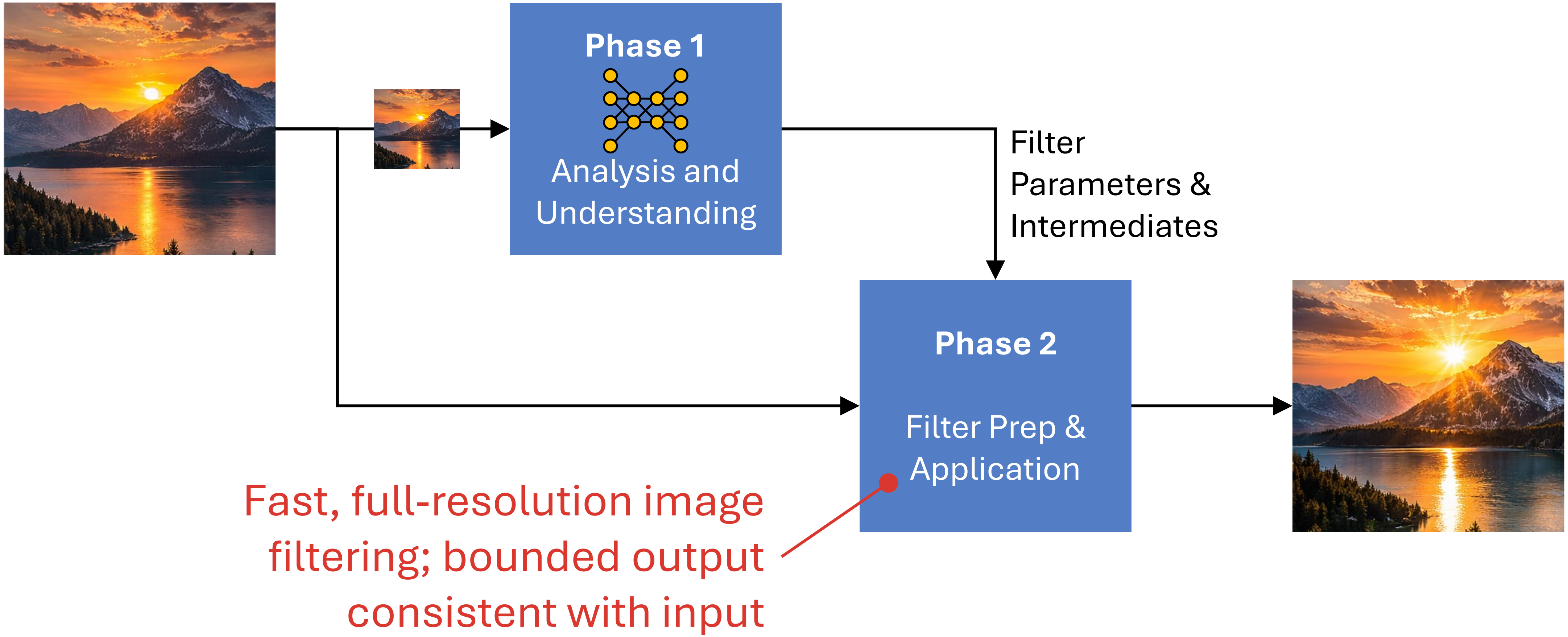
Phase 2

Filter Prep & Application

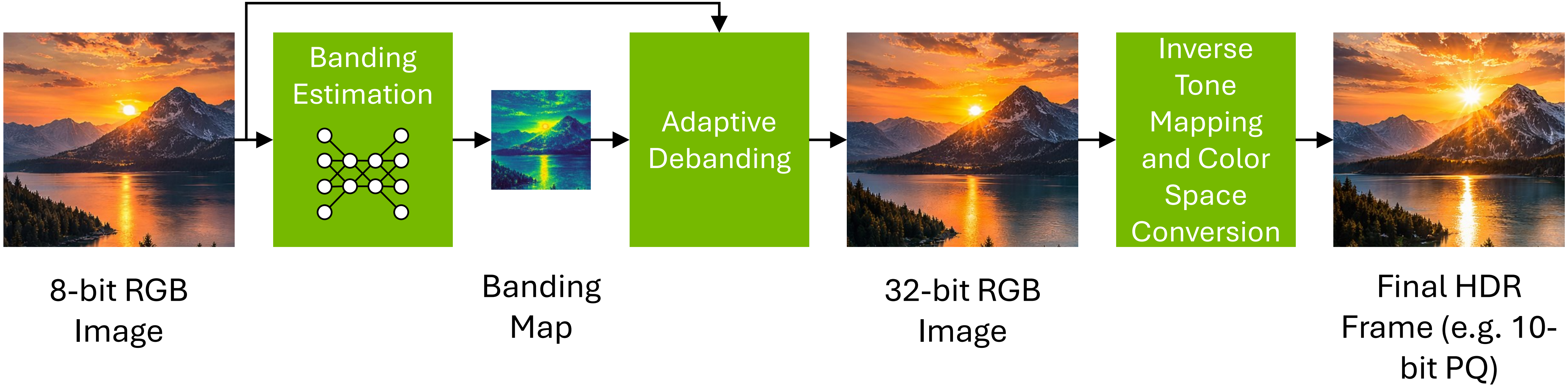
A two-phased algorithmic approach



A two-phased algorithmic approach



Case Study: Real-time HDR conversion



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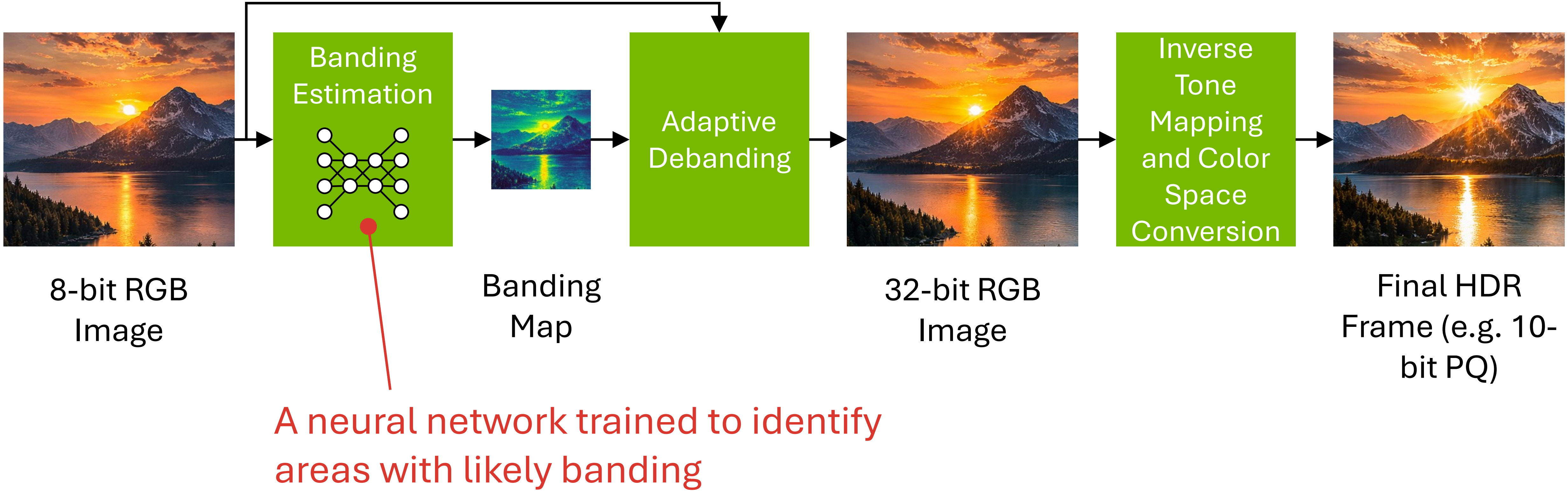
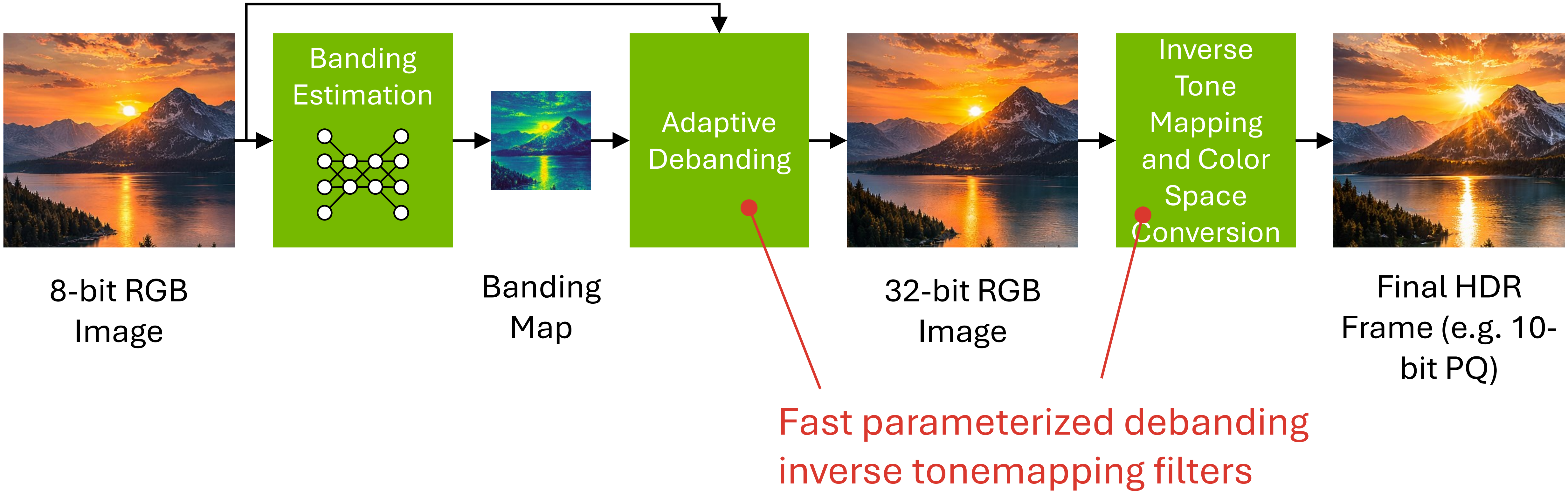
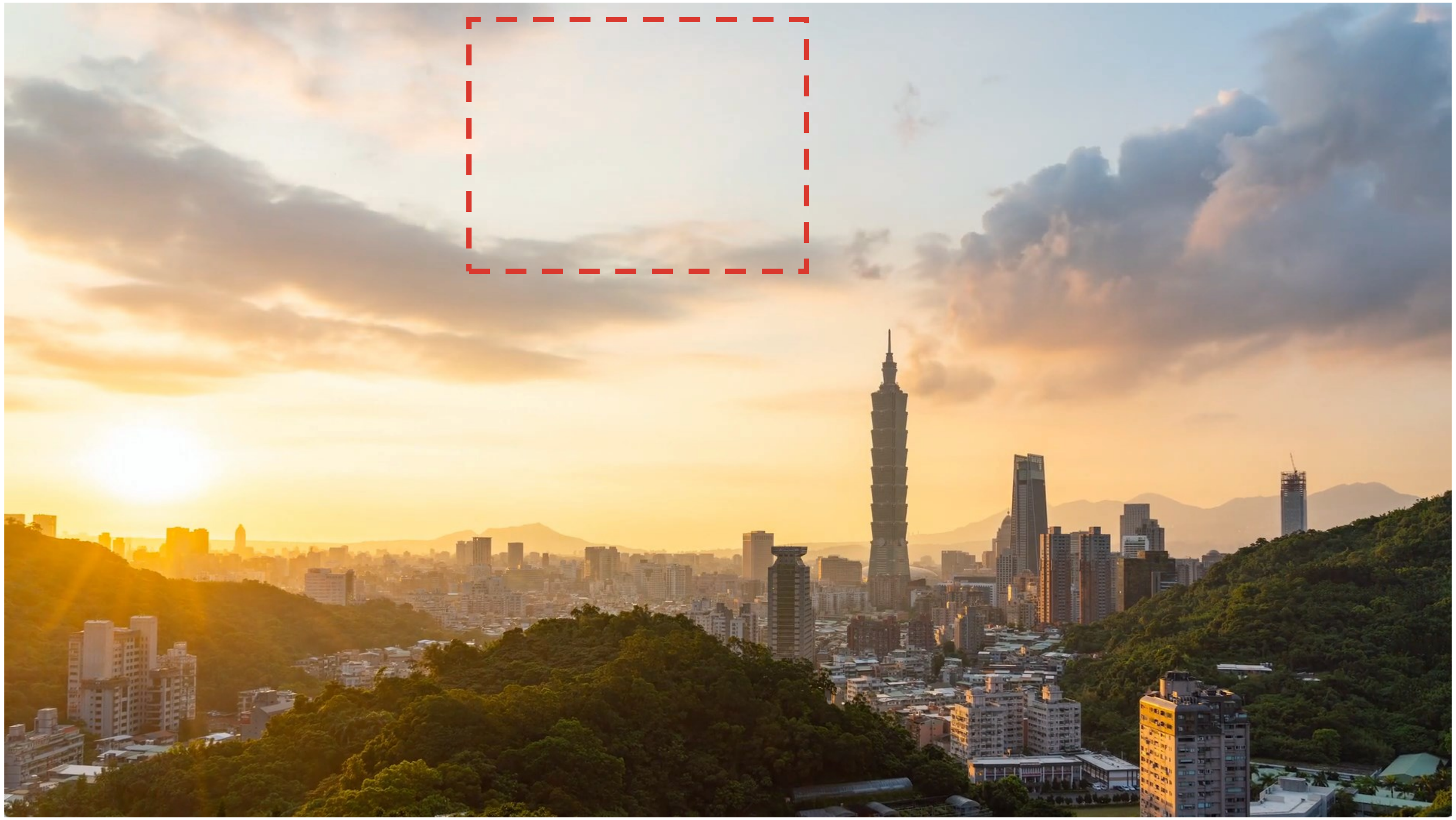


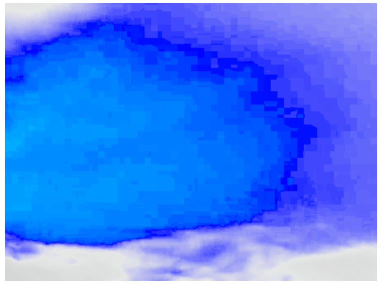
Case Study: Real-time HDR conversion



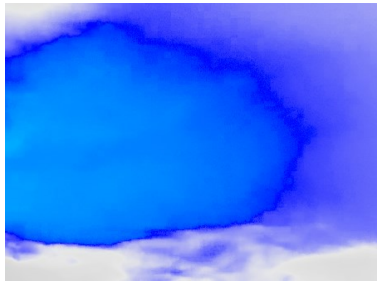
The hard part of HDR conversion is artifact control



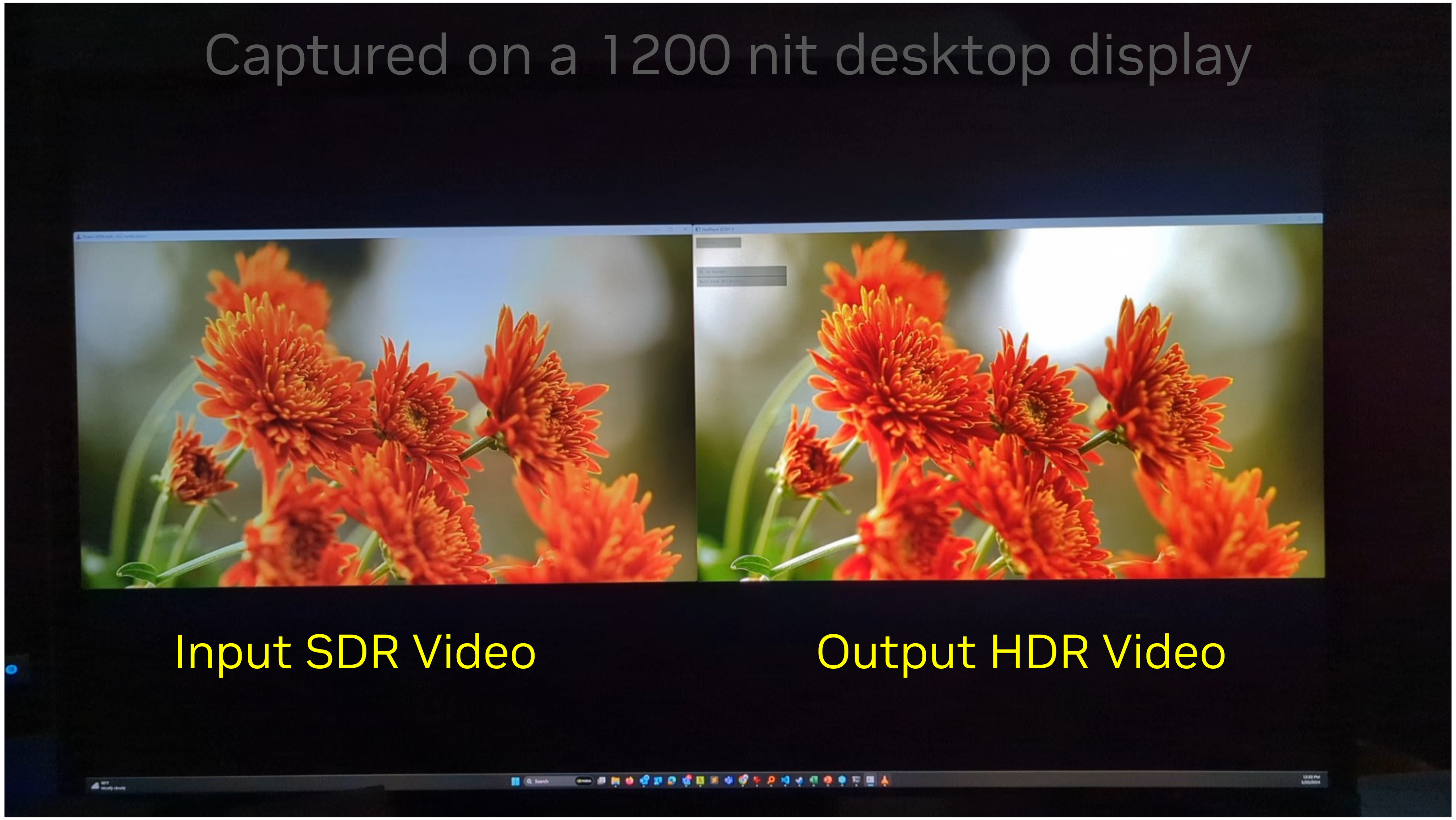
Baseline HDR Conversion



HDR Conversion with Debanding

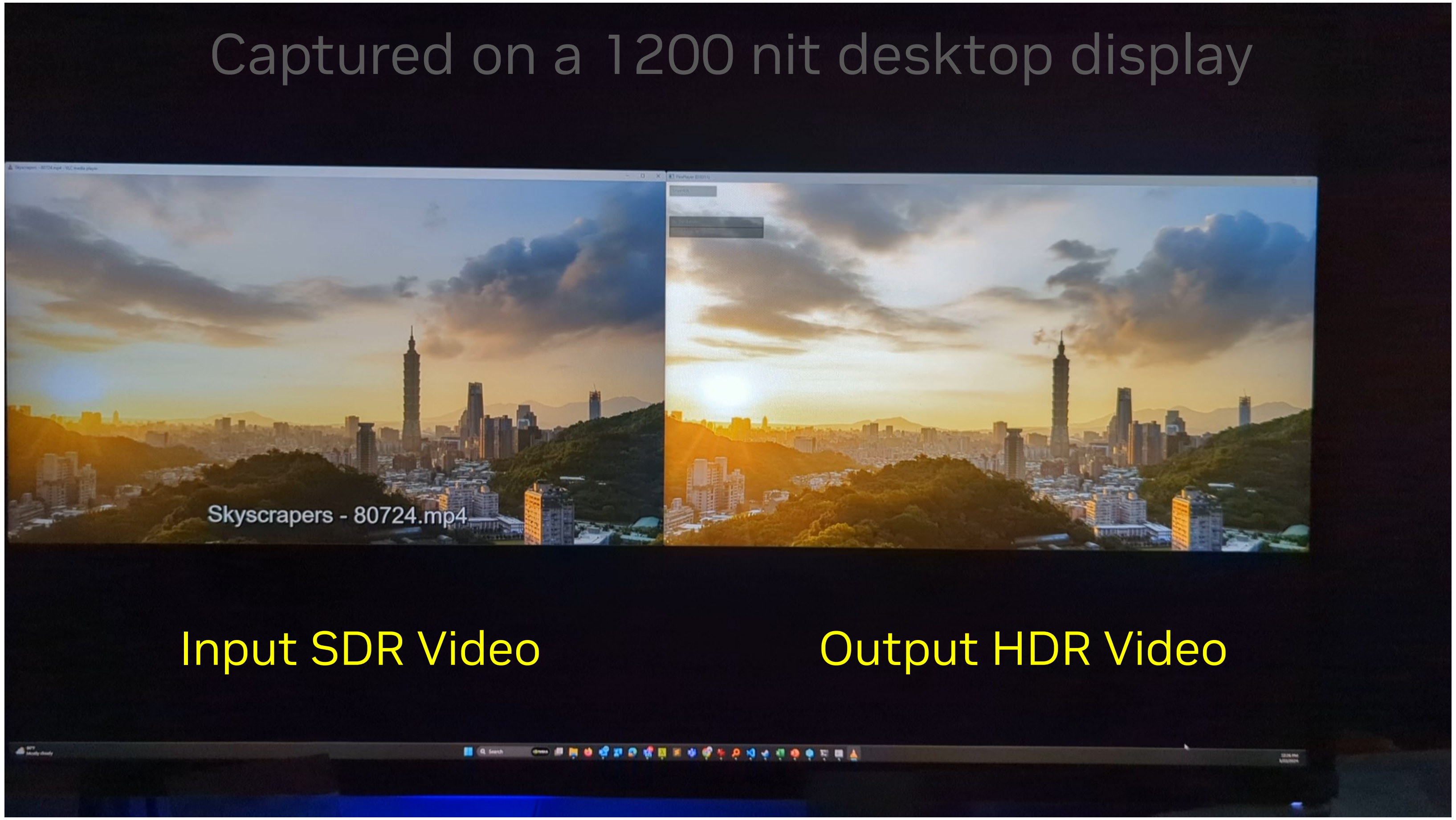


Case Study: Real-time HDR conversion



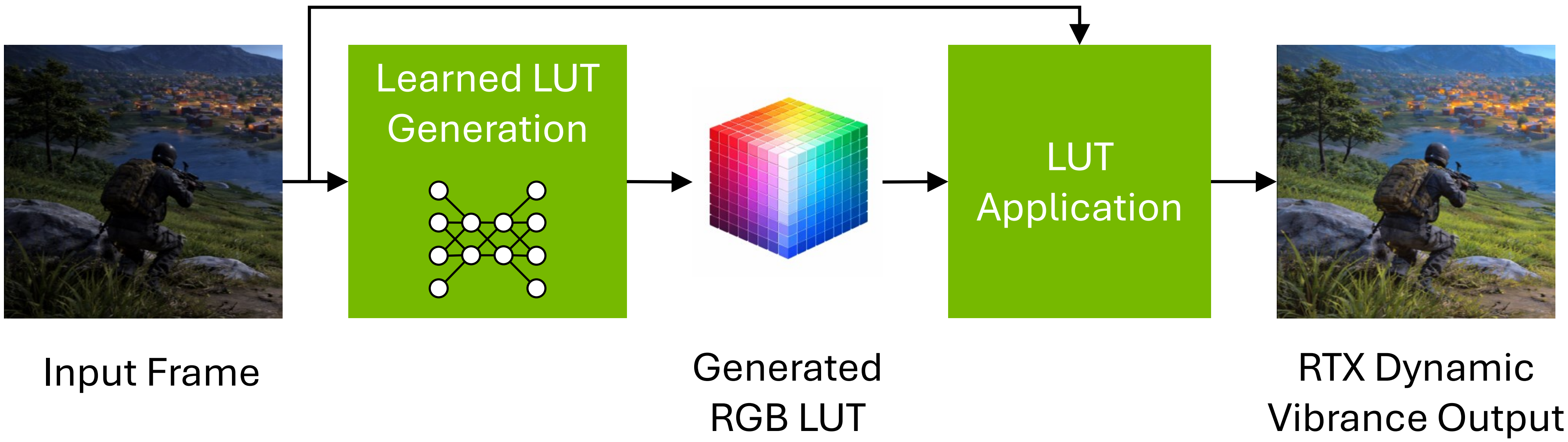
Video by Raman Oza from Pixabay

Case Study: Real-time HDR conversion

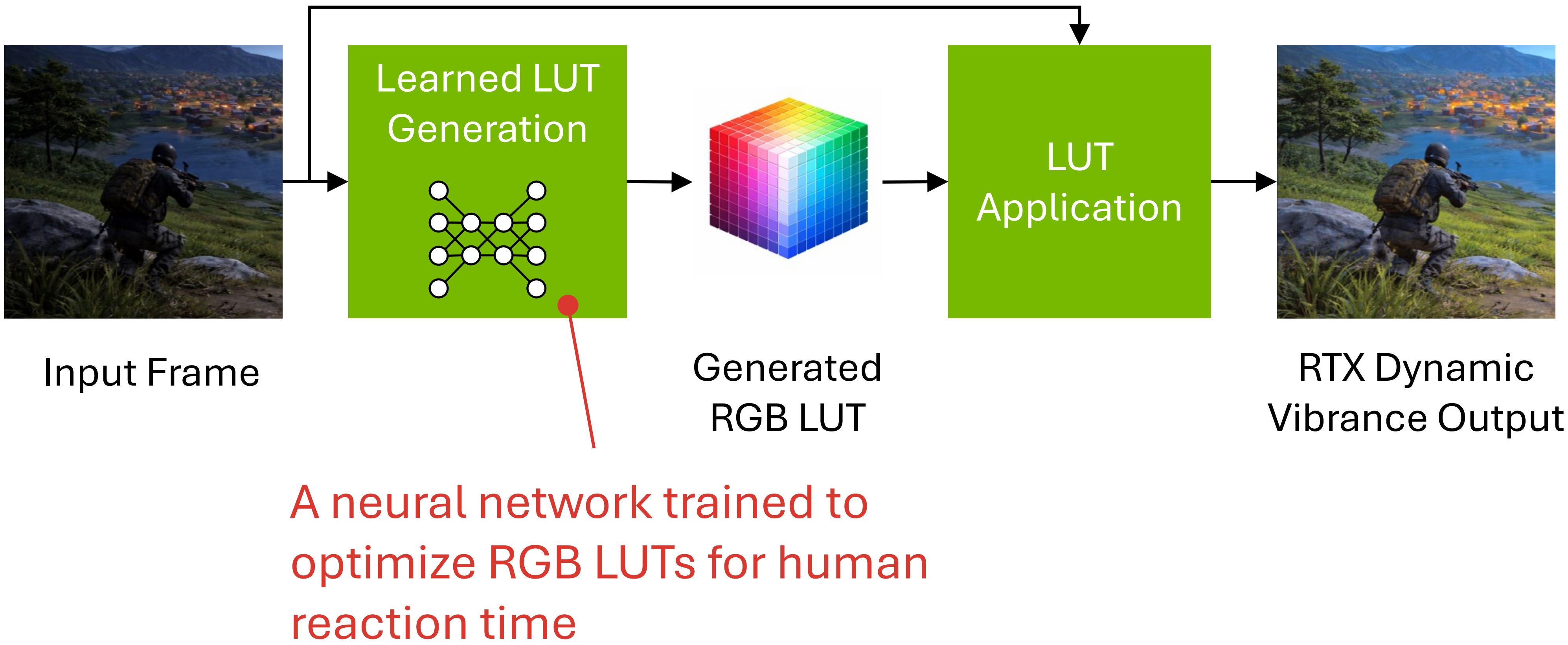


Video by Timo Volz from Pixabay

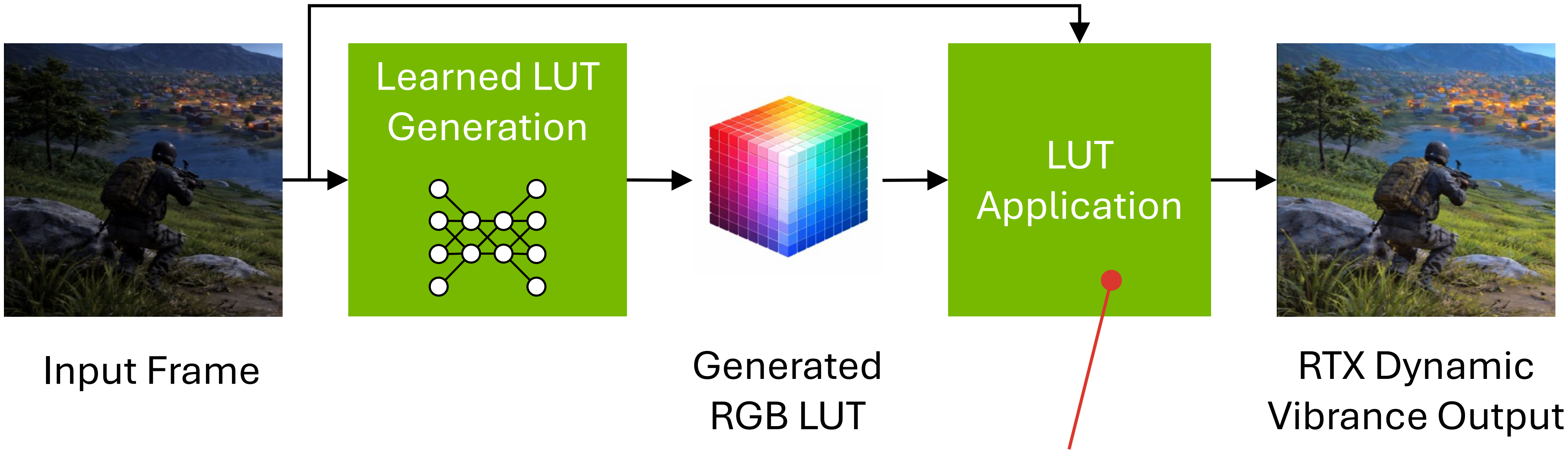
Case Study: Dynamic vibrance improvement in games



Case Study: Dynamic vibrance improvement in games



Case Study: Dynamic vibrance improvement in games



A fast filter that applies the generated RGB LUT

Case Study: Dynamic vibrance improvement in games

RTX Dynamic Vibrance OFF

RTX Dynamic Vibrance ON

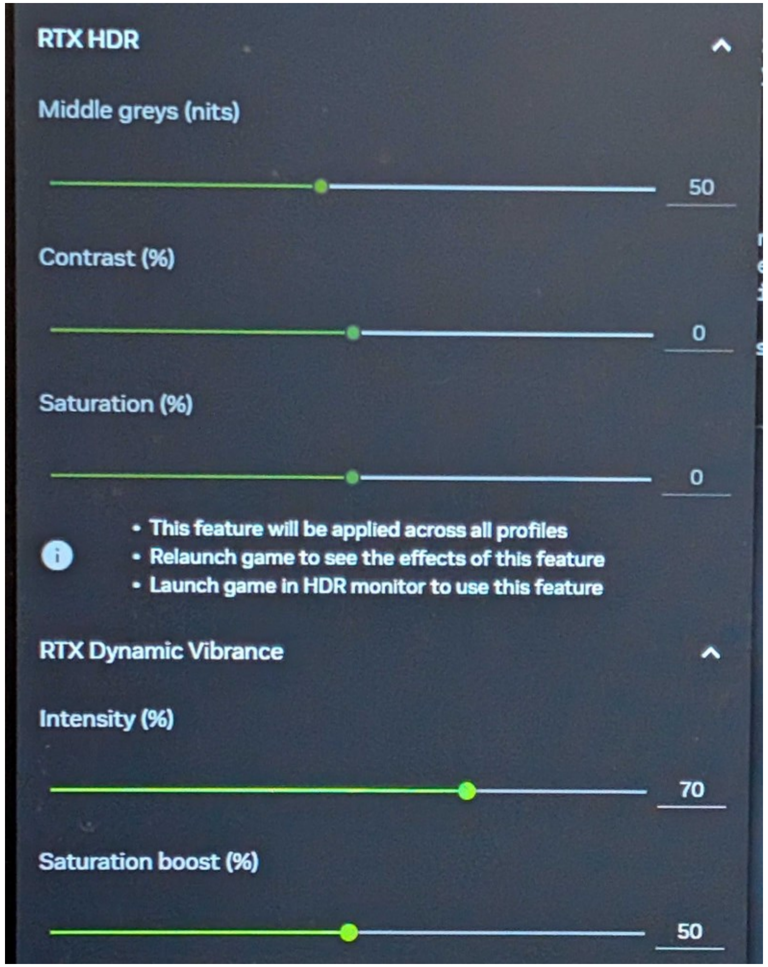
Case Study: Dynamic vibrance improvement in games

RTX Dynamic Vibrance OFF

RTX Dynamic Vibrance ON

Results

- Our approach applies broadly and can be toggled from NVIDIA App for any application
- “RTX HDR vs Native HDR vs SDR - It Is Really Good!” – GamingTech
- “I never cared about HDR content before, but Nvidia’s incredible AI-powered SDR-to-HDR demo has changed my mind” – TechRadar
- “RTX HDR and Dynamic Vibrance can make your games look better” – XDA



Where this approach may not fit

- When unbounded output is desirable, such as stylized creator filters
- When the correction shifts subtle mood beyond source intent
- When compact analysis is impractical, e.g. if the task is generative
- When source intent is ambiguous, personal, or intentionally stylized

Final takeaway

Use AI adaptively, but stay disciplined like display processing

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Thank you

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