# Video denoising for the hierarchical coding structure in video coding

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Highlight

- Video denoising on AV1 for lossy video compression obtained a significant compression efficiency gain.

- Applied temporal filtering on frames at low layers in the hierarchical coding structure.

- Denoising significantly reduces required bits to encode filtered frames while still maintaining or improving temporal correlation.
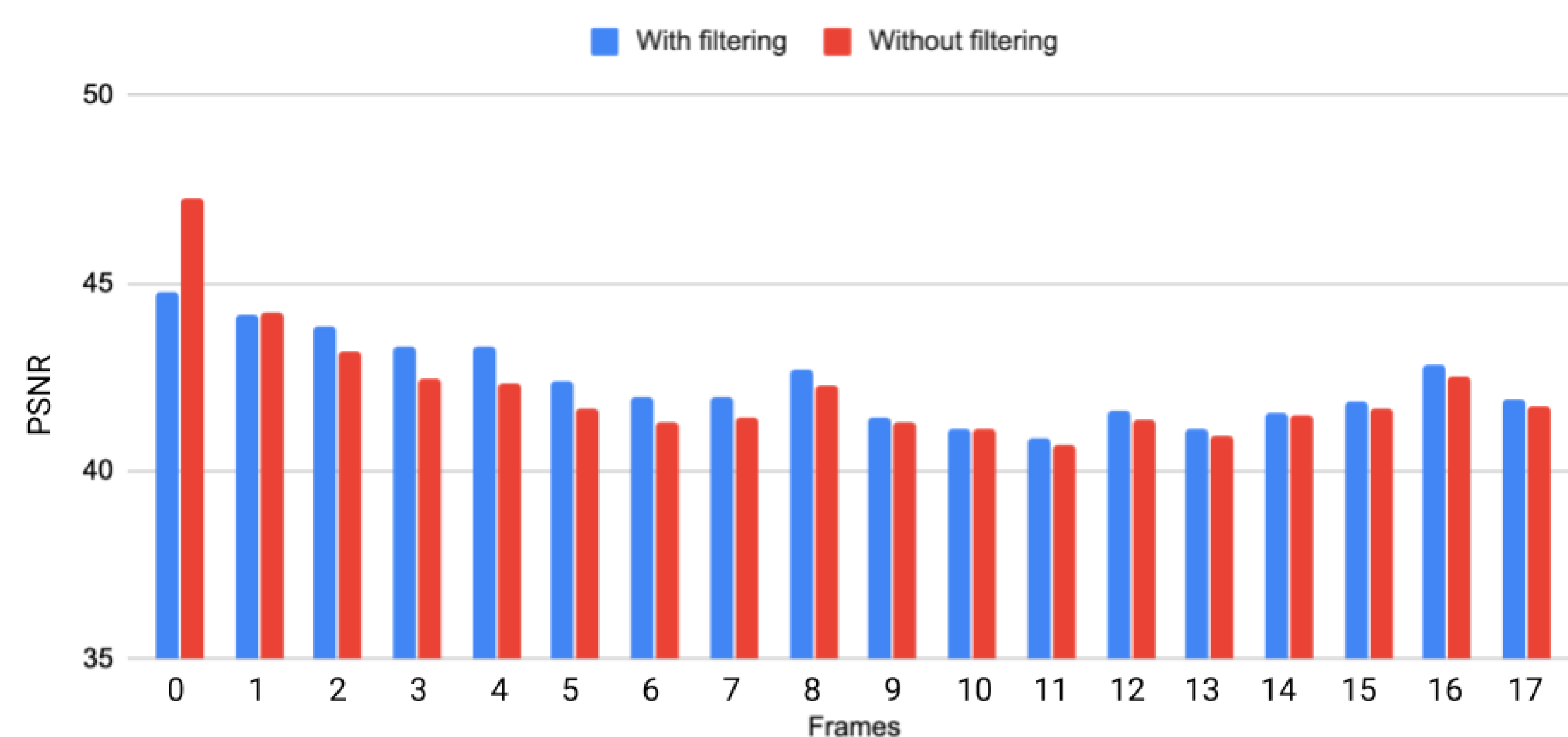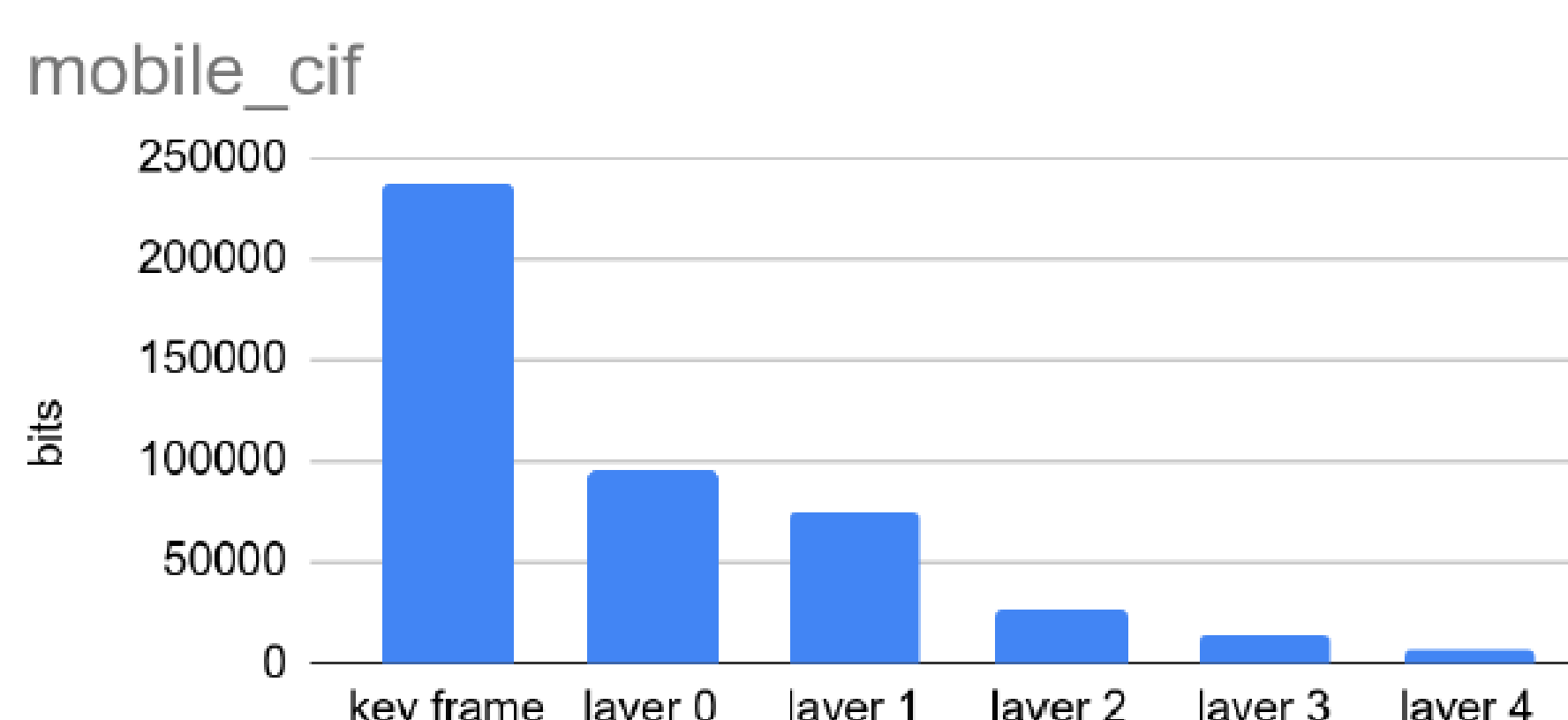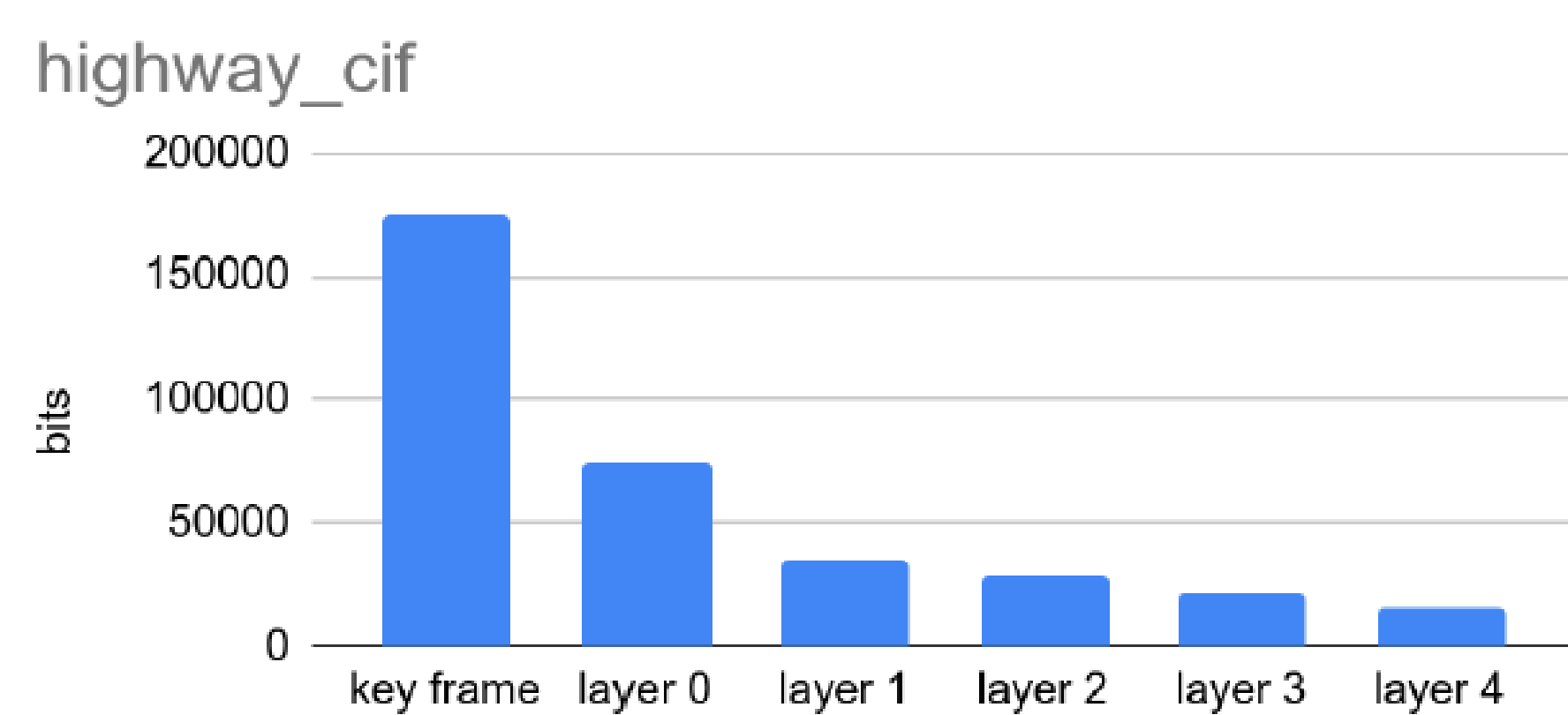

Compression performance gain

| %	Avg_PSNR	SSIM	VMAF
CIF/240P	-6.40	-5.32	-7.07
4CIF/480P	-4.92	-3.81	-5.16
HD/720p	-9.33	-8.11	-10.22

Hierarchical coding structure

- The out-of-order coding structure is one of the most important coding tools in video coding.

- The encoder spends a large percentage of overall bits on the low layers.

Temporal filtering

- Divide to-filter frame to 32x32 blocks. Find candidate patches from -3 (previous) and +3 (future) frames.

- Hierarchical motion search: first search one candidate block (32x32), then search four sub blocks (16x16). Pick the layer with smaller sum of squared error.

- Generate filtered frame using a non-local mean algorithm.
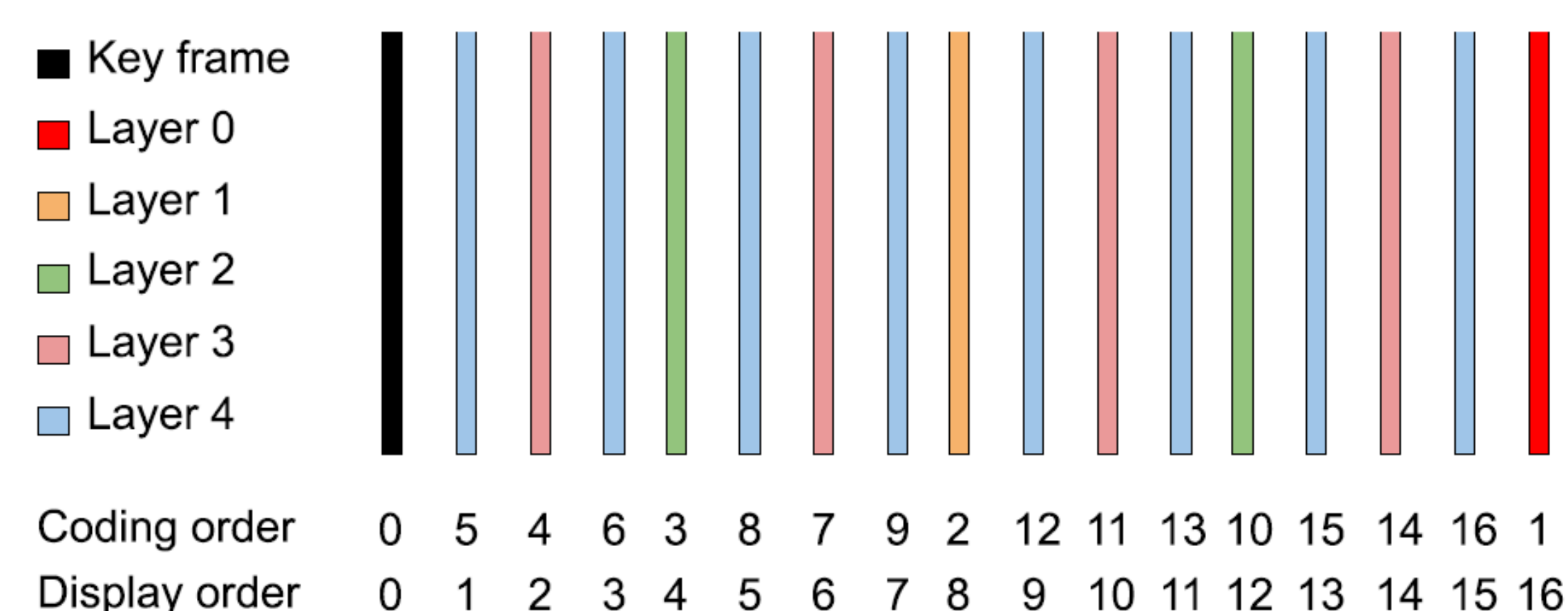
Visual example

- Source, filtered, and difference image.