Datasheet v20220510

iSIZE

iSIZE BitSave: High-Quality Video Streaming at Lower Bitrates

iSIZE's innovative BitSave technology comprises an AI-based perceptual preprocessing solution that allows conventional, third-party encoders to produce higher quality video at lower bitrate. BitSave achieves this by preprocessing the video content **before it reaches the video encoder** (Fig. 1), such that the output after compressing with any standard video codec is perceptually optimized with less motion artifacts or blurring, for the same or lower bitrate. BitSave neural networks are able to isolate areas of perceptual importance, such as those with high motion or detailed texture, and optimize their structure so that they are preserved better at lower bitrate by any subsequent encoder. As shown in our recent paper, when integrated as a preprocessor prior to a video encoder, BitSave is able to **reduce bitrate requirements for a given quality level by 10% to 25% versus that encoder. When aiming for high-quality conversational services (MOS>4.5 out of 5.0) BitSave allows for up to 53% bitrate reduction at no quality compromise in comparison to leading AVC, HEVC, AV1 and VVC encoders**. Lower bitrates equate to smaller filesizes, lower storage, lower transmission latency and distribution costs, reduced energy consumption and more satisfied customers.

Fast and easily integrated with any encoder including AVC, HEVC, VP9 and AV1, without breaking standards or requiring any changes on the client device

Single-pass through the content with frame latency

Supports multi-codec, multi-recipe, multi-bitrate and multi-resolution ABR ladders

Deep neural network models provide 10 to 25% bitrate savings on top of the codec

Next generation sustainable results and a significant reduction in costs for video delivery

Source → BitSave → Encoder → Delivery

AI-based pre-processing prior to encoding (AVC, HEVC, VP9, AV1)

One frame latency

Single pass processing per content for an entire ABR ladder

Improves encoding quality as measured by standard perceptual quality metrics (VMAF, SSIM, VIF) and subjective quality testing (ITU-T P.910)

Integrated within Intel OpenVINO, ONNX and Dolby Vision, easy to plug&play within any existing workflow

Figure 1. iSIZE's BitSave pipeline for preprocessing and encoding with third-party encoders.

- **Simple integration**−BitSave pre-processes video content without changing the encoding; consequently these gains are attainable without any of the disadvantages associated with replacing components of encoders, streaming infrastructures, or client devices. The BitSave pre-processor can simply be plugged in just before the encoding pipeline without disrupting the existing pipeline.

- **Codec independent**−BitSave is compatible with any existing codec (including MPEG AVC/H.264, HEVC/H.265, EVC, VVC and AOMedia VP9, AV1, AV2), and supports all resolutions up to 8K. The preprocessing accepts all video formats as input and outputs same-resolution lossless video or a transport stream, which can be optionally downscaled, before passing to any standard video encoder. Only a single pass over the content is required (with single frame latency), prior to any number of subsequent encodings with any video encoder.

- **Realtime**−iSIZE's proprietary deep learning-based models can run on all CPU and GPU hardware. The current generation of BitSave models is able to run on 2 CPU cores or higher, achieving real-time preprocessing and AVC encoding on most cloud instances with the average bitrate savings reported in Fig. 2 and 33% average bitrate saving versus a leading quality-based variable bitrate (QVBR) encoding service.

Average bitrate savings on typical HD (720p), full-HD test (1080p) and 4K (2160p) videos are reported in Fig. 2 across multiple encoders (AVC, HEVC, AV1) and VMAF, VMAF_NEG and SSIM. Importantly, all encoded bitstreams are fully standard-compliant and do not require any changes in content packaging, delivery or client side. This means they can be decoded by any device that supports AVC, HEVC or AV1 decoding without requiring any downscaling or upscaling on the client device.
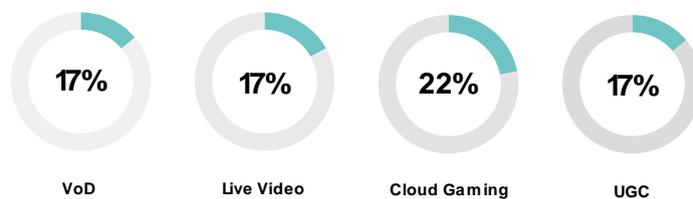
17%	17%	22%	17%
VoD	Live Video	Cloud Gaming	UGC

Figure 2. BitSave bitrate saving results delivered on top of any existing codec savings: http://demo.isize.co/

Third-party AVC QVBR, 4.46mbps
VMAF=43.0, VMAF_NEG=41.8, SSIM=0.925

x264 slow, 4.15mbps
VMAF=50.2, VMAF_NEG=48.5, SSIM=0.927

BitSave + x264 slow, 4.15mbps
VMAF=58.7, VMAF_NEG=54.9, SSIM=0.943

Third-party AVC QVBR, 2.12mbps
VMAF=50.4, VMAF_NEG=48.9, SSIM=0.940

x264 slow, 1.93mbps
VMAF=57.7, VMAF_NEG=55.8, SSIM=0.944

BitSave + x264 slow, 1.93mbps
VMAF=62.4, VMAF_NEG=59.6, SSIM=0.947

Figure 3. *Visual comparison of encodings corresponding to Table 1 (top: 'crowd run'; bottom: 'rush field cuts'). x264 and BitSave + x264 is at approx. 8% lower bitrate than the third-party AVC QVBR.*

Table 1. *Runtime performance for BitSave. Notes: (i) The Intel and NVIDIA benchmarks were carried out on cloud instances. (ii) All GPU results utilize input/output that is read/written to GPU memory. (iii) The Qualcomm Snapdragon benchmarks were carried out in an Oppo X3 Pro phone using AI benchmark (*https://ai-benchmark.com/*) with the Qualcomm QNN HTP delegate.*

BitSave: Frames-per-second (FPS) on single-socket CPU/GPU/NPU hardware								
Input Resolution	Intel 8275CL (24c, 3.0GHz)	AMD EPYC 7R32 (24c, 2.8GHz)	AMD EPYC 7542 (64c, 2.9GHz)	NVIDIA T4 GPU	NVIDIA A10 GPU	NVIDIA A40 GPU	NVIDIA A100 GPU	Qualcomm Snapdragon 888
540p	1428	1123	1666	4347	8333	10416	12658	315
720p	787	602	1098	1960	4694	6578	7936	151
1080p	337	251	483	925	2232	3105	3521	73
1440p	189	142	230	529	1297	1811	2066	42
2160p	87	64	92	235	585	826	981	16

iSIZE BitSave Specification

Inputs and output containers

yuv, y4m, mp4, webm, mov, ts, m2ts, mkv, streaming (http, tcp, udp, m3u8)

Input and output video codecs

raw YUV, AVC, HEVC, VP9, ProRes

Input & output audio codecs

passthrough (optional)

Deliverable/Integration

Linux binary, Docker container, C/C++ Library

iSIZE Technologies:

info@isize.co   https://www.isize.co