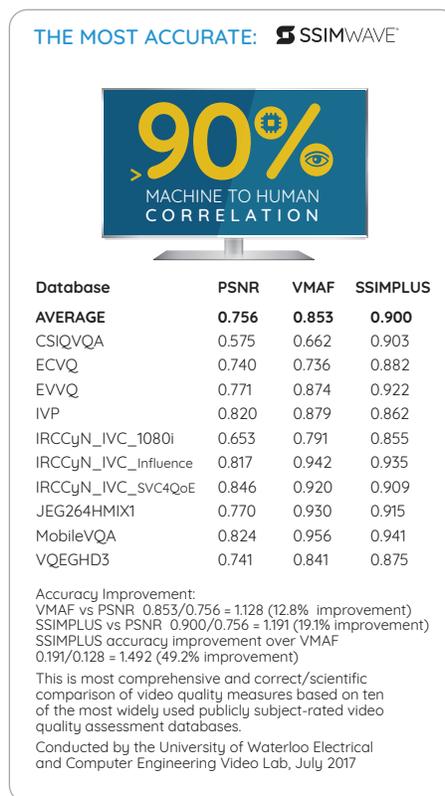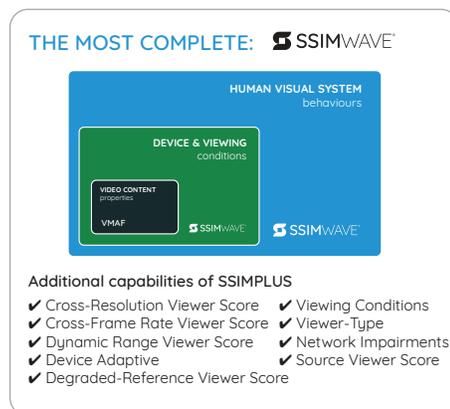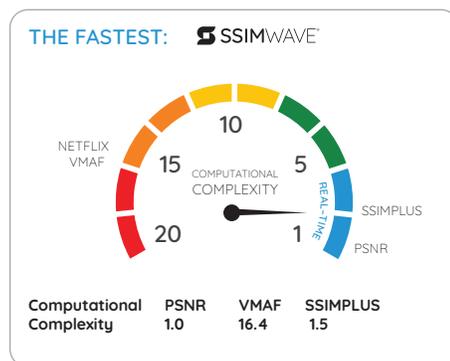# SSIMWAVE®

SSIMPLUS® Outperforms VMAF

SSIMWAVE's perceptual video quality measure beats VMAF for speed, accuracy and completeness.

A lot happens to video as it travels between the glass that captures it and the glass that displays it. It's a complex combination of configurations balancing 'quality' with the realities of bitrates, encoding parameters, servers, delivery networks and consumer devices. What matters most is the quality of what the human viewer sees.

Current processes test configurations and outputs with mathematical difference quality measures and human experts aptly named, 'golden eyes.' The process of relying on humans doesn't scale for today's explosion of video consumption. The question the industry is asking, "Can we trust computers to the task?" Some would argue never, but SSIMWAVE's SSIMPLUS Viewer Score is out to prove otherwise by narrowing the gap between objective (modeling/predicting/measuring) and subjective (human opinion scores).

Researchers and the industry have been working on closing this gap (See Advancements) but to get computers close to how humans perceive video and for them to work in real-world environments, the solution better be comprehensive, highly accurate, real-time fast, and pay attention to how and where individuals experience moving pictures. The results of this test show SSIMPLUS to be 10x faster with a 49% improvement in accuracy beyond VMAF using PSNR as a baseline.

THE FASTEST: SSIMWAVE®

NETFLIX VMAF — COMPUTATIONAL COMPLEXITY — REAL-TIME — SSIMPLUS — PSNR

Computational Complexity	PSNR 1.0	VMAF 16.4	SSIMPLUS 1.5

THE MOST COMPLETE: SSIMWAVE®

HUMAN VISUAL SYSTEM behaviours
DEVICE & VIEWING conditions
VIDEO CONTENT properties
VMAF
SSIMWAVE®

Additional capabilities of SSIMPLUS

- ✔ Cross-Resolution Viewer Score
- ✔ Cross-Frame Rate Viewer Score
- ✔ Dynamic Range Viewer Score
- ✔ Device Adaptive
- ✔ Degraded-Reference Viewer Score
- ✔ Viewing Conditions
- ✔ Viewer-Type
- ✔ Network Impairments
- ✔ Source Viewer Score

THE MOST ACCURATE: SSIMWAVE®

>90% MACHINE TO HUMAN CORRELATION

Database	PSNR	VMAF	SSIMPLUS
AVERAGE	**0.756**	**0.853**	**0.900**
CSIQVQA	0.575	0.662	0.903
ECVQ	0.740	0.736	0.882
EVVQ	0.771	0.874	0.922
IVP	0.820	0.879	0.862
IRCCyN_IVC_1080i	0.653	0.791	0.855
IRCCyN_IVC_Influence	0.817	0.942	0.935
IRCCyN_IVC_SVC4QoE	0.846	0.920	0.909
JEG264HMIX1	0.770	0.930	0.915
MobileVQA	0.824	0.956	0.941
VQEGHD3	0.741	0.841	0.875

Accuracy Improvement:
VMAF vs PSNR 0.853/0.756 = 1.128 (12.8% improvement)
SSIMPLUS vs PSNR 0.900/0.756 = 1.191 (19.1% improvement)
SSIMPLUS accuracy improvement over VMAF
0.191/0.128 = 1.492 (49.2% improvement)

This is most comprehensive and correct/scientific comparison of video quality measures based on ten of the most widely used publicly subject-rated video quality assessment databases.

Conducted by the University of Waterloo Electrical and Computer Engineering Video Lab, July 2017

ADVANCEMENTS

Mathematical Difference, Machine Learning and Viewer Intelligence have created significant advances in measuring video quality and virtualizing human viewing experiences.

MATHEMATICAL DIFFERENCE

PSNR is considered the baseline algorithm. It's a simple ratio between power of a signal and the power of corrupting noise.

MACHINE LEARNING

VMAF Video Multimethod Assessment Fusion introduced by Netflix in 2016 makes use of machine learning to predict subjective quality by combining multiple elementary quality metrics.

VIEWER INTELLIGENCE

SSIMPLUS introduced by SSIMWAVE Inc. in 2014 makes use of Viewer Intelligence and accounts for behaviours of the human visual system, video resolution, frame-rate, dynamic range, display devices, viewing conditions, network impairments, and viewer type.

TEST CRITERIA

The best part of industry and researchers striving towards the same goal is that publicly available datasets are available so that anyone can put the different perceptive quality measures to the test against real videos and real people.
The comparison shown was conducted by the world-renown video lab at the University of Waterloo.

We encourage you to run independent tests. The datasets, tools and resources containing reference videos (representing sports, news, action, cinema, animation) and grades (human opinion scores) of hundreds of thousands of real people are all publicly available. Click here to download instructions.

The most accurate measure of how humans perceive video.

SSIMWAVE®