

# Quality Assessment of Tone-Mapped and Compressed HDR Videos

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## Introduction

- HDR Video has grown in popularity due to its higher range of color and contrasts.
- Professional streaming services have increased HDR content, iPhones and Samsung phones now support HDR video capture.
- Most displays are capable of only displaying SDR content - tone-mapping required.

## Source Acquisition

- Obtained 20 professionally-generated contents (PGC) from online libraries such as CDVL, 4kMedia, etc.
- Crowd-sourced a set of 20 user-generated contents (UGC) filmed by amateur iPhone users.
- PGC videos encoded using PQ, UGC videos encoded using the HLG transfer function.

## Quality Assessment

- Goal: Study the impact of TMOs on quality.
- Typical distortions - color over/under-saturation, hue shift, abnormally low/high contrast, temporal incoherence (flickering).
- Compression - ever present.
- Conduct **subjective quality** experiments and build efficient **objective quality** models.

## Results of Subjective Quality Assessment

### The LIVE Tone-Mapped HDR Subjective Database

- Created a database of 15,000 tone-mapped and compressed HDR videos.
- Used 10 TMOs, 12 parameter settings, and 3 compression levels.
- Conducted a crowd-sourced subjective quality study on Mechanical Turk.
- Modeled subjective scores using the SUREAL method, which uses Maximum Likelihood Estimation.

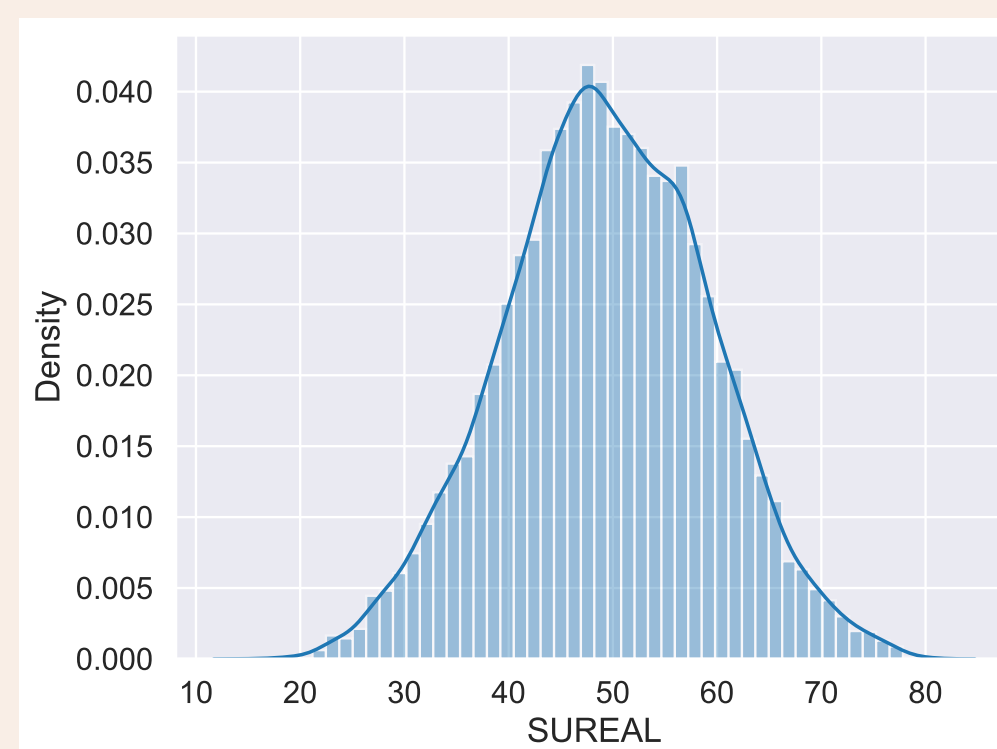


Figure 1: MOS Distribution

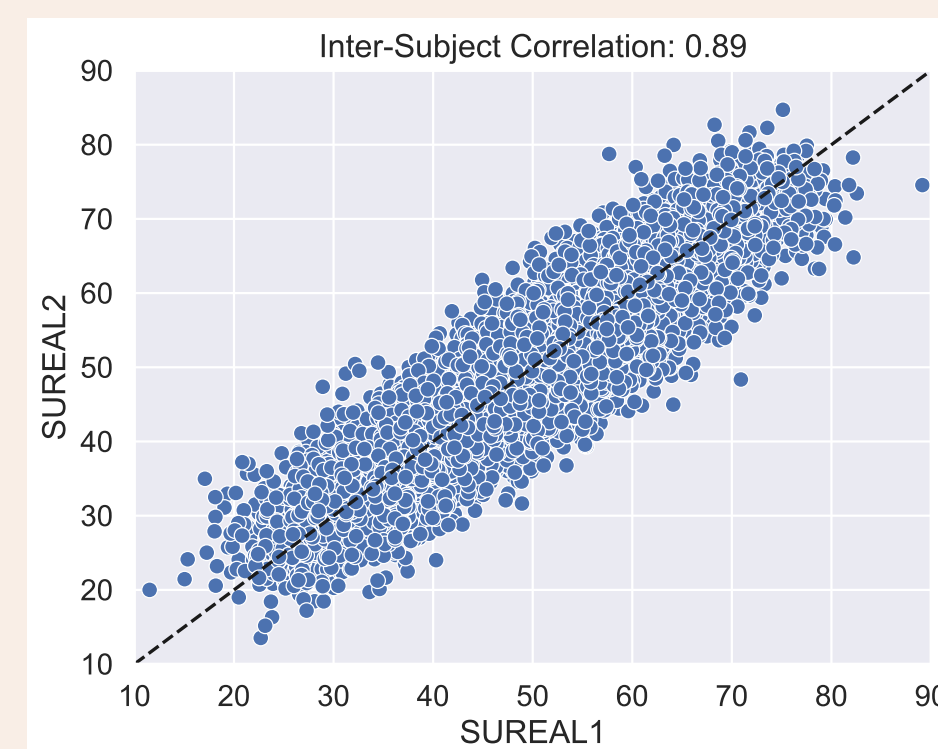


Figure 2: Subject Correlation

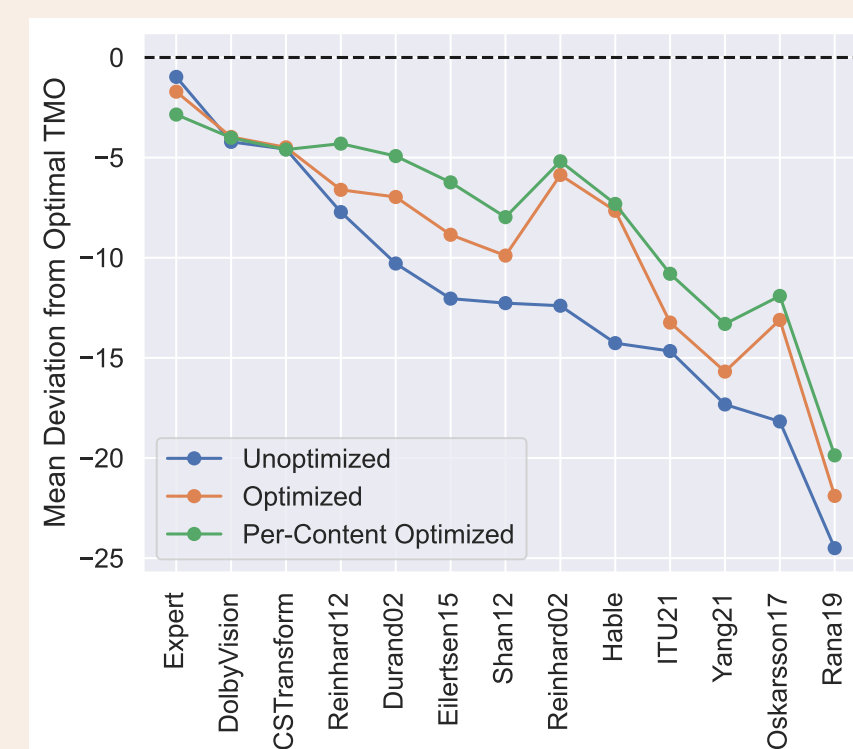


Figure 3: TMO Dependency

## Results of Objective Quality Assessment

### The Tone-Mapped FUNQUE Model

- Based on the FUNQUE framework.
- Soft-classify image regions based on brightness, contrast, temporal variation.
- Worst image regions are considered most salient.
- Full-reference and No-reference metrics capture both distortion and style.

Features	Regressor	PCC	SROCC	RMSE
BTMQI	Linear SVR	0.4485	0.4532	8.9257
FSITM	Linear SVR	0.4555	0.4546	9.0084
TMQI	Linear SVR	0.4754	0.4774	8.8655
TMVQI	Linear SVR	0.4879	0.4906	8.8175
FFTMI	Linear SVR	0.5094	0.5038	8.6866
RcNet	Random Forest	0.5953	0.5844	8.4210
HIGRADE	Random Forest	0.6206	0.6125	8.3184
MSML	Linear SVR	0.7716	0.7672	7.1043
<b>TM-FUNQUE</b>	<b>Random Forest</b>	<b>0.7826</b>	<b>0.7801</b>	<b>6.2311</b>

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