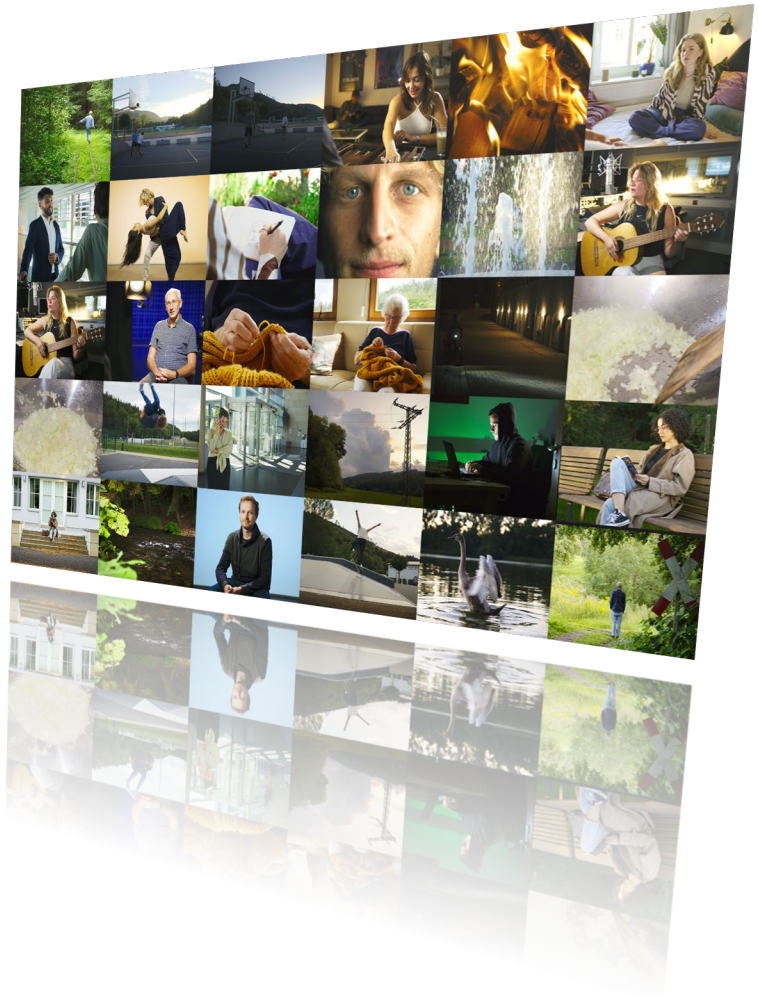
AVT-VQDB-UHD-2-HDR

An open 8K HDR source dataset for video quality research



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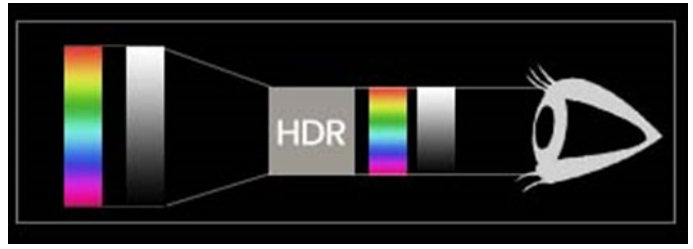
Motivation

- 8K HDR content increasingly available for consumers
- Video quality models
  - automatically measuring and ensuring quality
  - need for training data
- No extensive validation of models for 8K and HDR
- Open content for research very limited

Introduction

- UHD standards → improving perceived quality and immersion
- UHD-1 (4K) and UHD-2 (8K) enhance video clarity
- HDR increasing brightness and contrast for more natural images
- WCG with more, realistic, and vivid colors
- (HFR enabling smoother shots)
- Video quality models mimic human quality ratings
  - require reliable training data and many subjective ratings of a variety of sources
  - limited by codecs, color gamut, and resolution



State of the Art

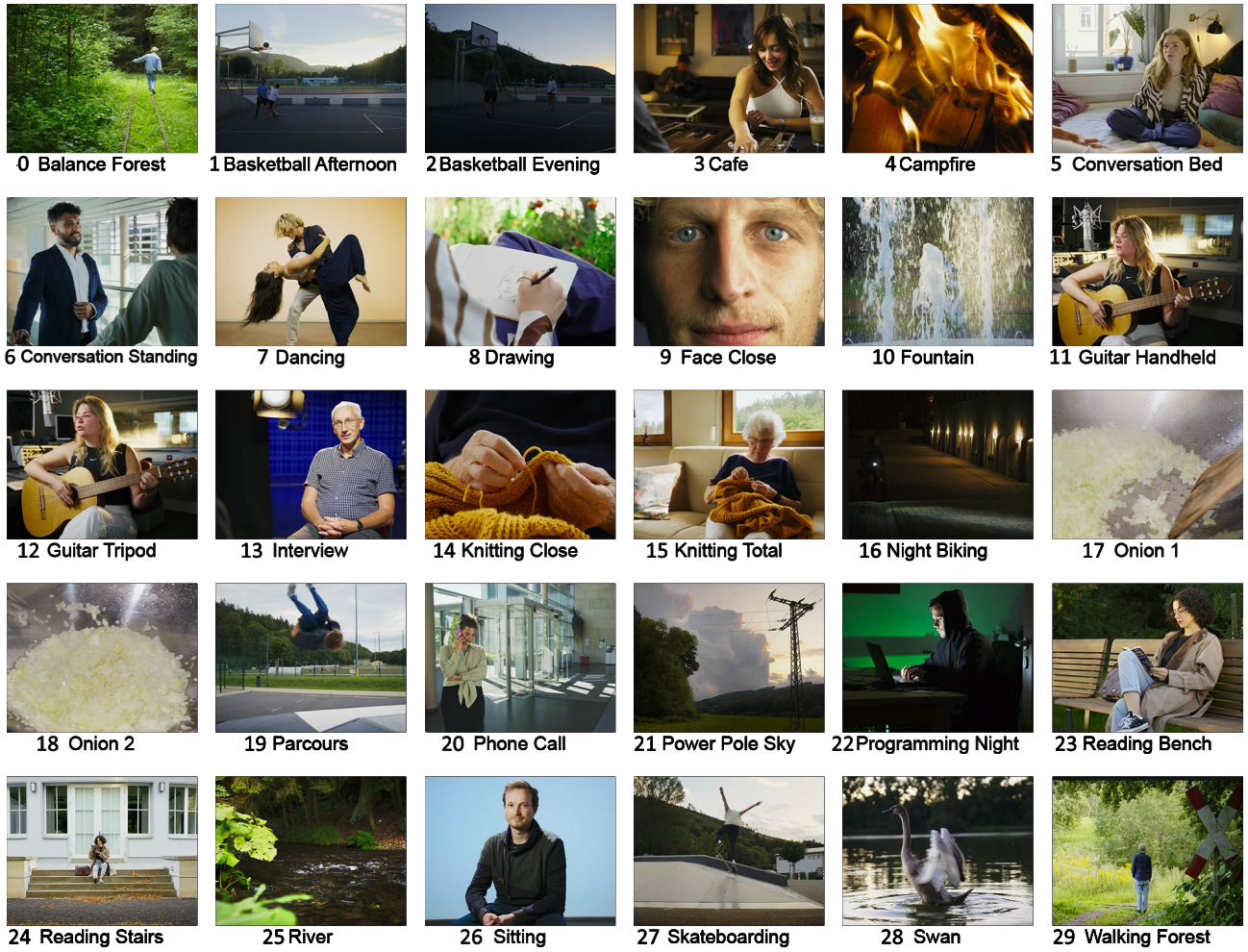
- Several datasets consisting of SDR Full-HD and lower resolutions [20, 21, 22]
- After standardizing UHDTV [2], subjective assessment of SDR UHD-1 [23, 24, 25]
- SDR UHD-1 datasets [26, 27, 28, 29, 30]
- Limited number of SDR 8K datasets openly available [34, 35, 36]
- Even sparser number of HDR 8K stimuli publicly available [37, 38]
- Datasets of HDR 8K content available for purchase

Production of the Dataset

- Followed guidelines provided by Pinson et al. [40]
- Diversity
  - Subjects: actors with different skin tones, genders, ages; landscapes, objects
  - Lighting: soft light, directional lighting, artificial and natural light
- Camera settings: aperture and focal length, ISO settings for noise and contrast
- Shooting methods: tripod, DJI Ronin M Gimbal, handheld with neck strap
- Apertures F2.8 to F8, shutter speed 1/125 s, ND filters
- DaVinci Resolve for post production, selective noise reduction

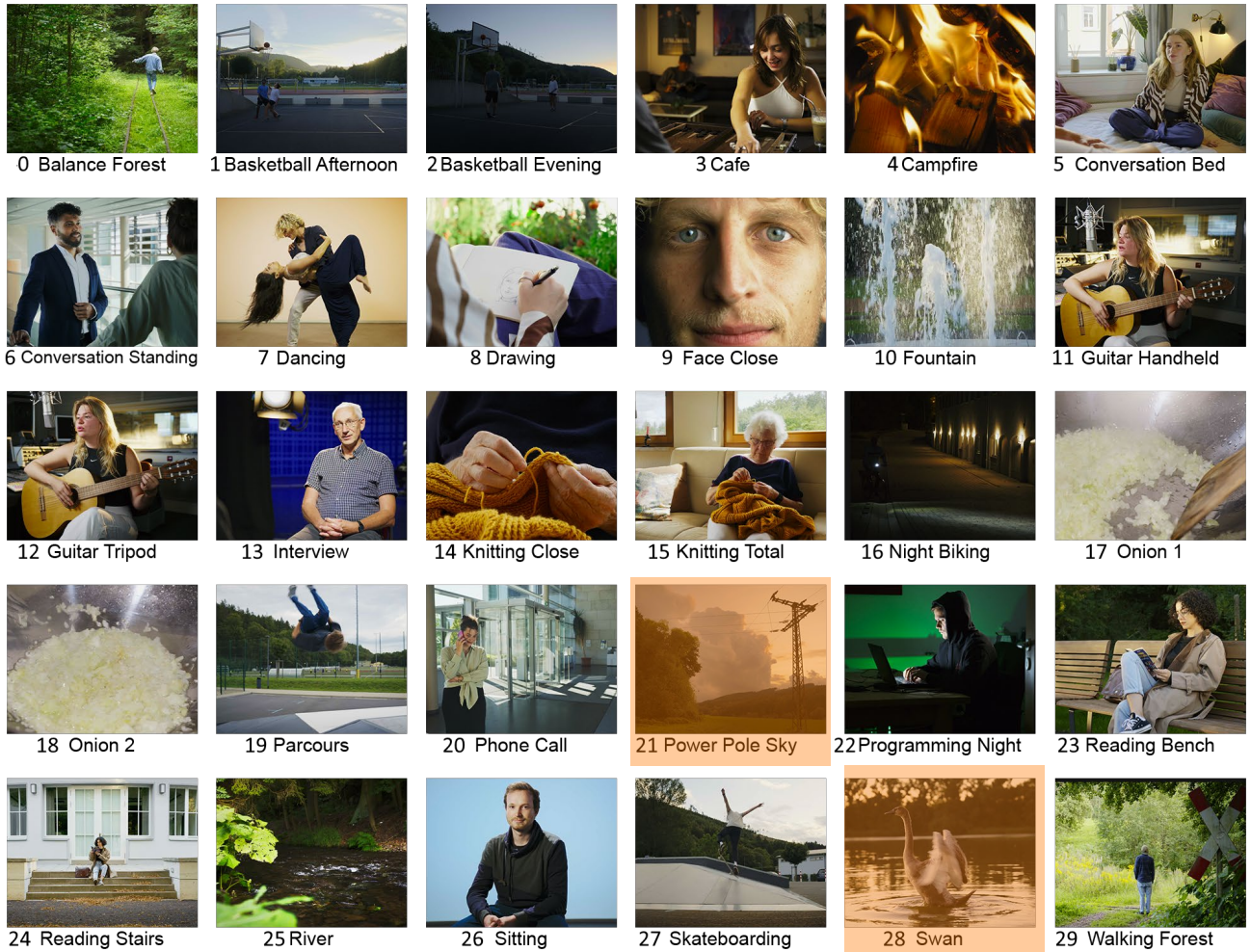
Dataset (1)

- Sources: Consists of 31 sources with unique IDs and names
- Indoor (16) and outdoor (15)
- Conversations, dancing, sports, portraits, cooking, nature shots, hobby activities, etc.
- Available at https://github.com/Telecommunication-Telemedia-Assessment/AVT-VQDB-UHD-2-HDR



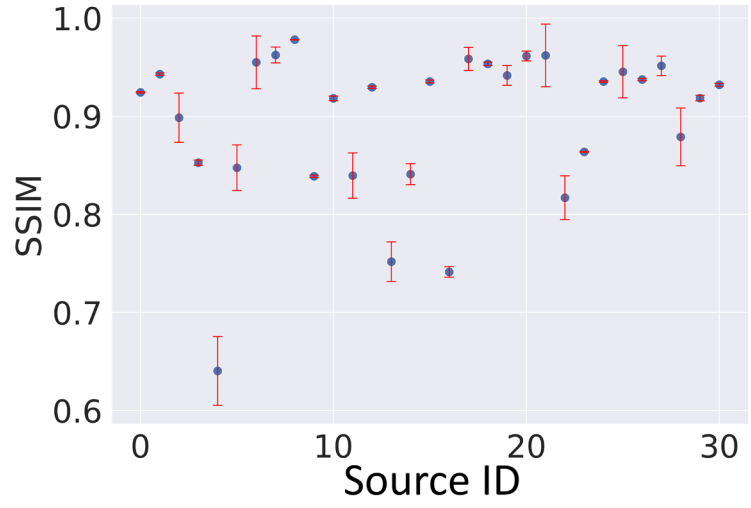
Dataset (2)

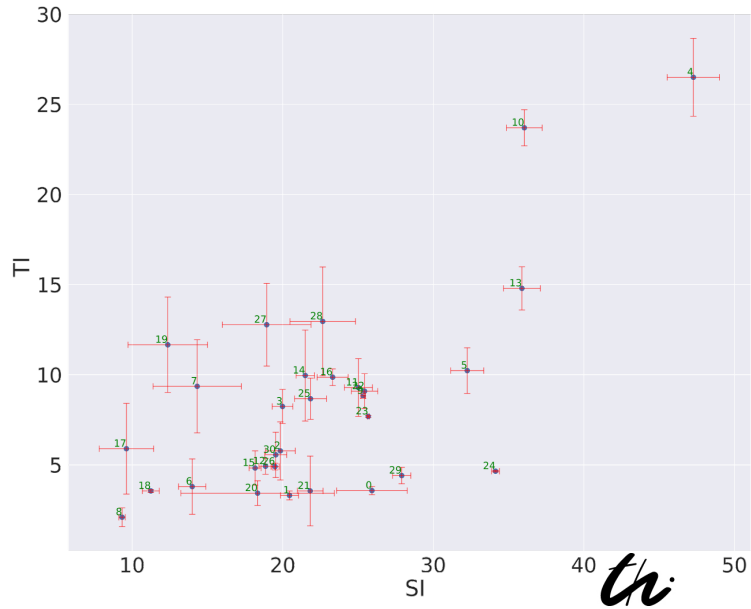
- Camera Nikon Z9, 35.9x23.9 CMOS
- Lens Nikkor Z 24-70mm f/2.8 S
- Rec. Res. 8256x5504 @ 59.94 fps
- Rec. Format NRAW with N-LOG
- Source Res. 7680x4320 @ 59.94 fps
- Codec FFV1
- Length 15 s (IDs 21/28 only 11 s)
- Bit Depth 16 bit, Full Range
- Color Format RGBA 4:4:4
- Color Gamut BT.2020
- Transfer Func BT.2100 PQ for HDR
- Matrix Coeff. BT.2020 non-constant



Analysis: Sharpness / Coding Complexity

- SI range 0 – 50, TI range 0 – 25
- TI influenced by noise, unbalanced distribution
- Scaling to 4K and upscaling to 8K for comparison
- PSNR and SSIM, high Pearson correlation of 0.93
- SSIM value range 0.8 to 0.9: 9 sequences,
  above 0.9: 19 sequences
- Criticality metric [18]: not all measures reached, hard to achieve high scores in UHD using natural content
- 8K resolution with added value, however, potential distortion through noise and scaling effects





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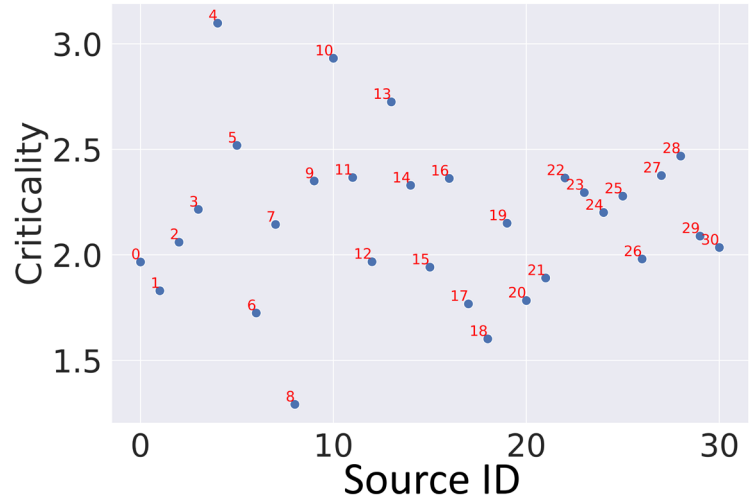
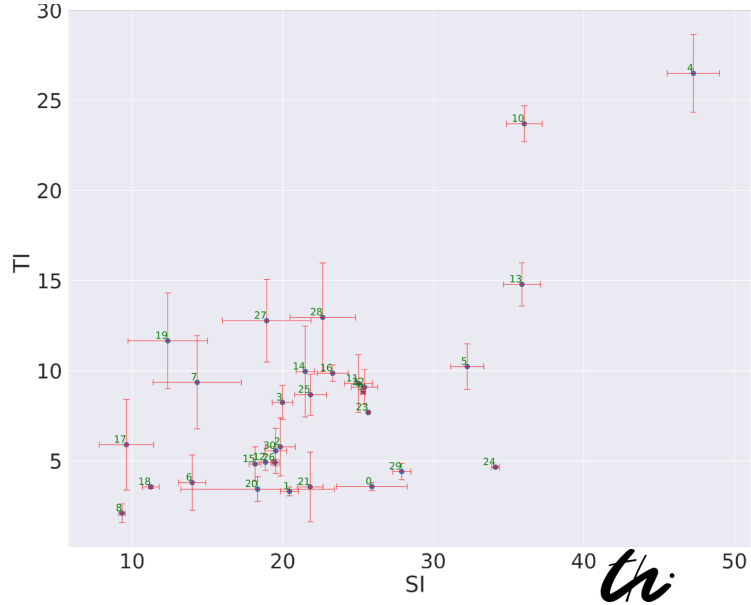
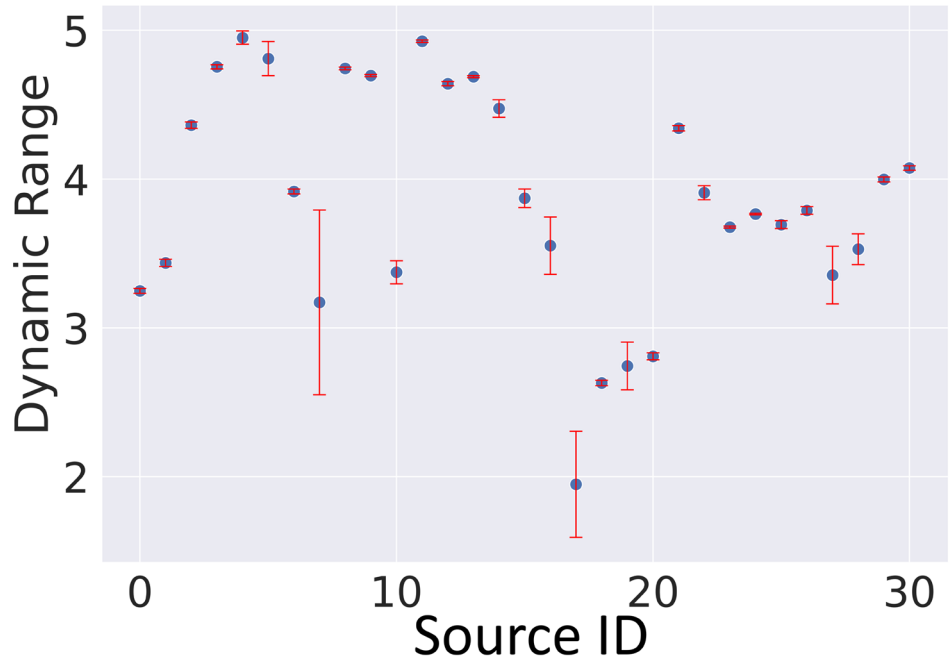




Analysis: HDR

- Dynamic range measured using metric DR [19]
- Conversion to Y and scaling to [0 – 1] range
- Signal mapped to 0.01 – 1000 cd/m²
- Exclusion of the 1% max and min values
- Max DR for range 0.01 – 1000 cd/m²: 5
- IDs 4, 11 use maximum DR
- IDs 17 and 18 with limited DR due to steam
- Dataset includes sources with varying DR, utilizing HDR standard efficiently



Conclusion and Outlook

- 8K HDR video dataset AVT-VQDB-UHD-2-HDR (3.3 TB)
- Dataset made publicly available for scientific usage: https://github.com/Telecommunication-Telemedia-Assessment/AVT-VQDB-UHD-2-HDR
- Base for subjective tests and subsequent training and evaluation of video coding algorithms, quality models, and metrics
- Preliminary objective analysis indicates benefits of the dataset
- Subjective tests needed
- Contribution to open research in 8K HDR video quality

Thanks for your interest in
AVT-VQDB-UHD-2-HDR.

For exchange or information
contact dominik.keller@tu-ilmenau.de

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