# Grand Challenge: Objective Quality Assessment Methods for Light field Coding Applications

**Organizers:** Saeed Mahmoudpour[1,2], Mylène C.Q. Farias[3], Shengyang Zhao[4], and Peter Schelkens[1,2]

[1]Vrije Universiteit Brussel (VUB), Pleinlaan 2, Brussels B-1050, Belgium

[2]IMEC, Kapeldreef 75, Leuven, B-3001, Belgium

[3]Department of Computer Science, Texas State University, TX, US

[4]Ningbo Institute of Digital Twin, Eastern Institute of Technology, Ningbo, China

## A. Introduction

Light field imaging has emerged as a transformative technology for capturing and visualizing three-dimensional scenes. By recording spatial and angular information, light fields enable advanced applications in immersive media, virtual reality, computational photography, and scientific imaging. However, due to the massive amount of data generated, efficient compression techniques are essential for enabling practical use and widespread adoption of light field technology.

Compression algorithms often introduce distortions, which can degrade visual quality and thus, assessing the visual impact of distortions is critical to ensuring that compressed light fields maintain their perceptual fidelity. The subjective quality assessment relies on human observers to assess perceptual quality. While these methods are highly reliable, they are time-consuming and impractical for large-scale or iterative testing scenarios. To overcome these limitations, objective quality assessment metrics have gained importance as they offer an automated, scalable, and repeatable approach to evaluating visual quality.

This Grand Challenge seeks proposals for **full-reference** and **no-reference** objective light field quality assessment methodologies to evaluate perceptual quality in **light field coding** applications. These methodologies will be tested on subjectively annotated light field datasets to ensure alignment with human opinions.

## B. Significance of the Grand Challenge

A reliable framework for objective quality assessment accelerates innovation by providing consistent benchmarks for evaluating new compression techniques. This facilitates the development of efficient and perceptually optimized codecs, enabling more practical use of light field technology in consumer and professional applications. Objective metrics reduce the dependency on extensive subjective testing, offering faster and more cost-effective evaluation methods while ensuring scalability.

The JPEG Pleno initiative supports these advancements by driving standardization efforts, including the integration of subjective and objective quality assessment methods for plenoptic modalities in the new Part 7 Quality Assessment of the JPEG Pleno

standard. Contributors to this Grand Challenge will have the opportunity to collaborate on the ongoing standardization activities, helping to ensure the practical application of their methodologies.

### C. Rules for Participation

Participants are invited to submit proposals for **full-reference** and/or **no-reference** objective light field quality assessment methods, following these rules:

- Each submission must include:
    - A summary of the proposed methodology.
    - A platform-independent executable of the algorithm must be provided, including command-line parameters for evaluation. The executable should support directories (containing light fields of n by m views) and be capable of reading .ppm and .png file formats. An example of such datasets will be shared before the deadline.

- *For full-reference submission track:* the command line must support at least two input directories: one for the reference light fields and one for the test light fields. An example of the command line:
  ./executable --reference_dir /*path_to_ref_lightfields* --test_dir /*path_to_test_lightfields*

- *For no-reference submission track*: the command line must support at least one input directory for the test light fields. For example:
  ./executable --test_dir /*path_to_test_lightfields*

A sample dataset will be provided to the participants, who must ensure that their code functions correctly with these sample datasets. Additionally, participants should be readily available to quickly address any issues that arise when running their executable.

The output of executing the command line should provide a quality score.

- Information about the training dataset and process used in the development of the objective method, when applicable.

- Paper submission on the proposed objective quality metric is not mandatory but encouraged. Proponents shall present their methods at the Special Session organized at ICIP 2025.

### D. Evaluation Process

Two competition tracks will be organized for full-reference and no-reference methods. The proposed methodologies will be evaluated for their alignment with subjective quality scores based on the following quantitative criteria:

- **Correlation Metrics:** Pearson Linear Correlation Coefficient (PLCC) and Spearman Rank Order Correlation Coefficient (SROCC) will measure the correlation between objective and subjective scores.
- **Root Mean Square Error (RMSE):** RMSE will be computed between objective and subjective scores after mapping the former to the latter.

The methodology achieving the best overall performance across these metrics will be declared the winner.

**E. Datasets**

The organizers have created a subjectively annotated dataset based on extensive subjective experiments with light fields of varying resolutions and baselines, including both dense and sparse representations. The dataset comprises natural and synthetic light fields compressed using state-of-the-art encoding techniques across multiple bitrates.

Proponents are required to submit the proposal requirements (summarized in section C) by the specified deadline. The organizing committee will compute the scores and evaluate their performance against the annotated dataset. After the deadline, the test dataset will be made publicly available for cross-validation.

**F. Timeline**

| **Date** | **Task** |
|---|---|
| July 18th, 2025 | Deadline for registration of proposals. |
| Aug 25th, 2025 | Deadline for submission of proposals. |
| Aug 26th, 2025 | Releasing test dataset for cross-validation of the produced objective scores. |
| Sep 2025 | Special session for presentation of the proposals and winner announcement. |