**INTRODUCTION**

- HEVC bit rates are **40-50%** smaller than in H.264, but the encoding process is up to **500%** more complex [1]:
  - Larger number of partitions evaluated in quadtree structure through Rate-Distortion Optimization (RDO);
  - Frame is recursively partitioned in **Coding Units (CUs)**.
- Transrating for HEVC is even more complex, since it comprises decoding and encoding in cascade;

![HEVC Transrating Process](image)

This paper proposes an early termination that stops the recursive CU search earlier:

- Based on the correlation between CU depths in High Bitrate (HBR) to Low Bitrate (LBR) transrating;
- Based on **Random Forests** trained with HBR and LBR CU data.

**PARTITIONING IN HEVC TRANSRATING**

- HEVC partitioning is performed in a quadtree structure with square CUs from 64×64 to 8×8 pixels;

![CU Partitions](image)

- **HBR HEVC → LBR HEVC** transrating:
  - Same video sequence, information reuse.
- Partitioning correlation analysis provides the basis for the method proposed in this work (Table I);
- In most cases, the same CU size used in HBR (or a larger CU size) is employed during the LBR transrating;
  - However, partitioning also depends on other features.

**RANDOM FORESTS FOR CU SIZE DECISION**

- Data mining with 25 features collected from HBR decoding;
- Gini Importance (GI) calculated for each feature;
- Most important features used to train Random Forests.

![Gini Importance](image)

**PROPOSED SCHEME**

- Forests with up to 1000 trees were trained, but accuracy did not improve significantly with more than 20 trees;
- Based on features extracted from the HBR decoding, Random Forests decide whether the HBR CU map must be **updated or maintained** in the new LBR CU map;
- The LBR CU map is used to **constrain** the CU splitting process in the encoding process (Fig. 3).

**RESULTS AND CONCLUSIONS**

- Compression efficiency was measured in Bjøntegaard Delta-rate (BD-rate);
- **Time savings** (TS) were measured as \( TS = \frac{T_{\text{original}} - T_{\text{modified}}}{T_{\text{original}}} \times 100 \)

![Comparison with Related Works](image)

**REFERENCES**


