High Efficient Video Coding (HEVC) is the latest video coding standard developed by the Joint Collaborative Team on Video Coding (JCT-VC). Compared with H.264, it improves the coding efficiency by 50% at the price of significant increase in encoding time. Due to Rate-Distortion Optimization (RDO) on large variations of block sizes and prediction modes. In this work, a novel intra coding algorithm is proposed to achieve the high computational complexity of HEVC intra-frame coding. The proposed algorithm is based on machine learning and Laplacian Transparent Composite Model (LPTCM). Features called binarization of Bi-Rated Order Coefficient (SBOC) vectors are firstly extracted from original frames by using LPTCM and then fed into online trained Support Vector Machine (SVM). Two SVMs are combined to predict Coding Unit (CU) decisions so that the encoding process can be significantly sped up. Additionally, a performance controller is introduced to ensure the robustness of machine learning models. It is shown by experiments that, combined with HM 16.3, the proposed algorithm reduces the encoding time, on average, by 40% with negligible increase in BD-rate.

Experiments & Results

The full test included 24 test sequences of 6 classes and all sequences were encoded under All-Intra-Main configuration. Benchmark methods assessed with real points are tested on the same machine. Blue points are data reported from the respective papers.

Performance Control & Dynamic Training Period

- Every P frames as one period, which can be set to different value for each depth. Models will be retrained periodically to ensure the effectiveness of prediction.
- T frames for training collect feature vectors and labels for all CU sizes, train SVM models at the end of the training stage.
- S frames for validation validate the performance of prediction models, switch off the decisions of some models to avoid significant loss on coding efficiency.
- \( T - P \) frames for testing apply prediction models to make decisions on CU partition and boost the encoding speed. Turn on/off according to their performances in validation stage.

References