



Determining Video Complexity to Optimize Video Quality

ACM Mile-High Video May 2023

Ivan Damnjanovic & Ian Trow

Women's Super League

sky sports football

Agenda

MHV May 2023

Introduction

ITU Rec P.910

Complexity

Encoding Mode

CRF Level

Input Format

User Case : UHD

User Case : HD

Conclusions

Complexity Measurement & Importance in maintaining Video Quality

Temporal Index (TI) & Spatial Index (SI)

Bit-Rate as a Measurement

Content Quality versus Constant Rate Factor (CRF)

Complexity Profile Variability

Impact an Encoded Complexity

Statistical Multiplex Planning

Video Quality Assessment in Statistical Multiplex Line-ups

Is Bit-Rate Profile in Constant Quality Mode a good estimate of Complexity?

Introduction

Understanding content complexity key to optimise encoded assets

Content Quality & Constant Rate Factor : candidates for complexity

Input Format : significant impact on complexity

Statistical Multiplex systems rely on complexity measure to scale

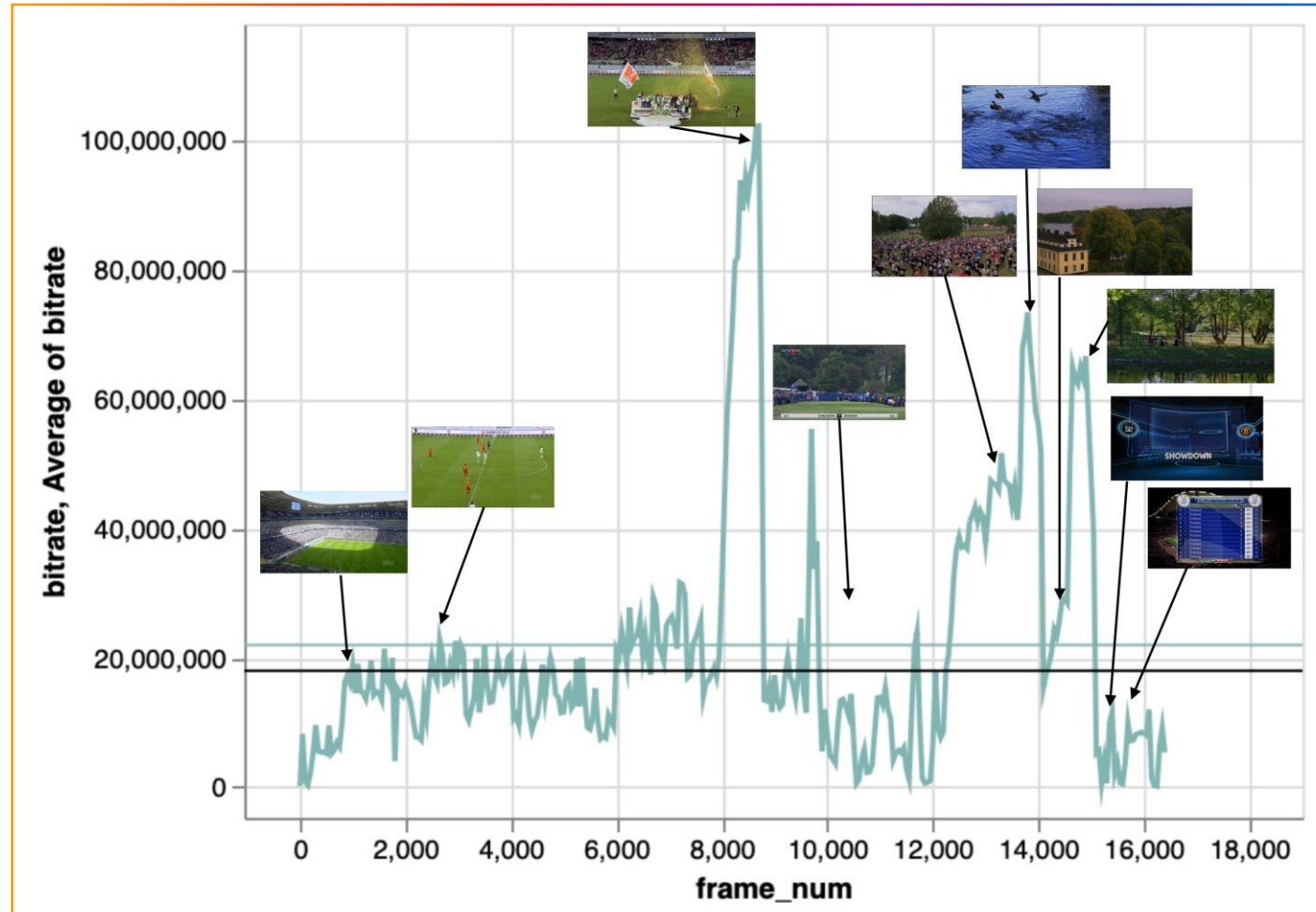
Temporal & Special Index inadequate for encoder complexity

TI good for determining temporal entropy, rather than complexity

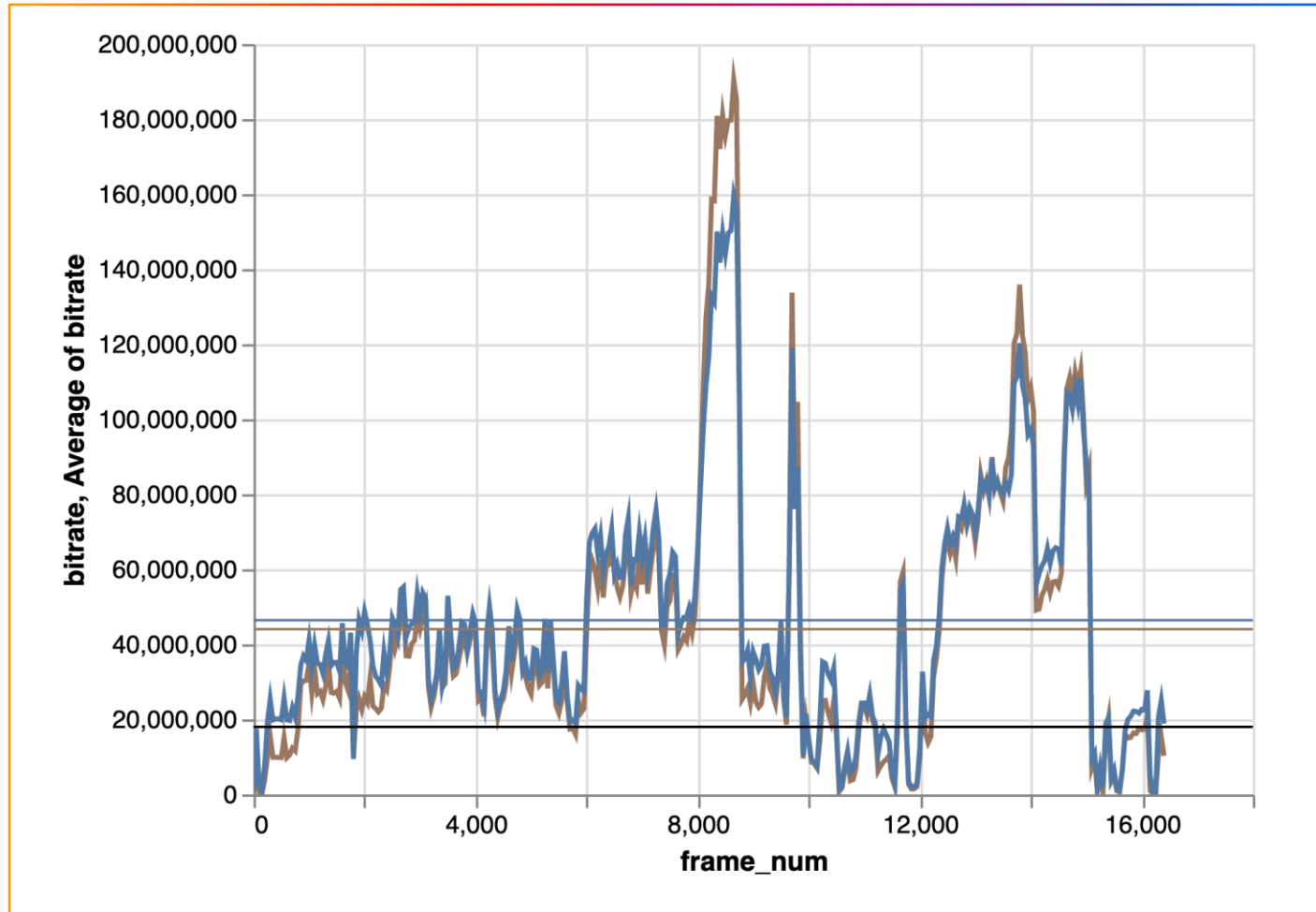
SI easily fooled, especially by high frequency / repetitive patterns

Majority of content low complexity : Representative Content key

Complexity



Complexity



Encoding Mode

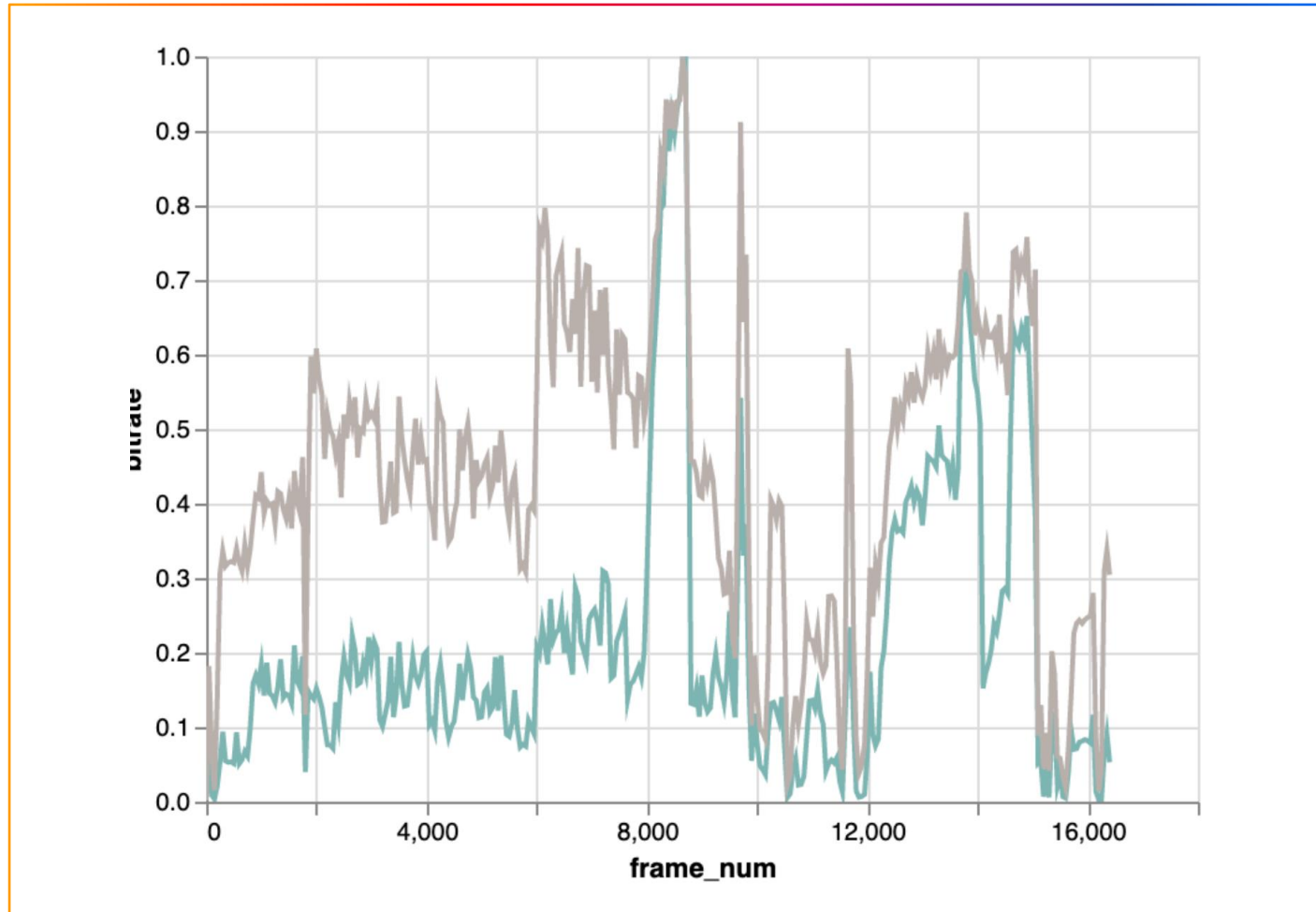
CQ or CRF for determining bit-rate profile?

Tests showed for every CQ there is a corresponding CRF, equating to similar bit-rate profile in either scenario

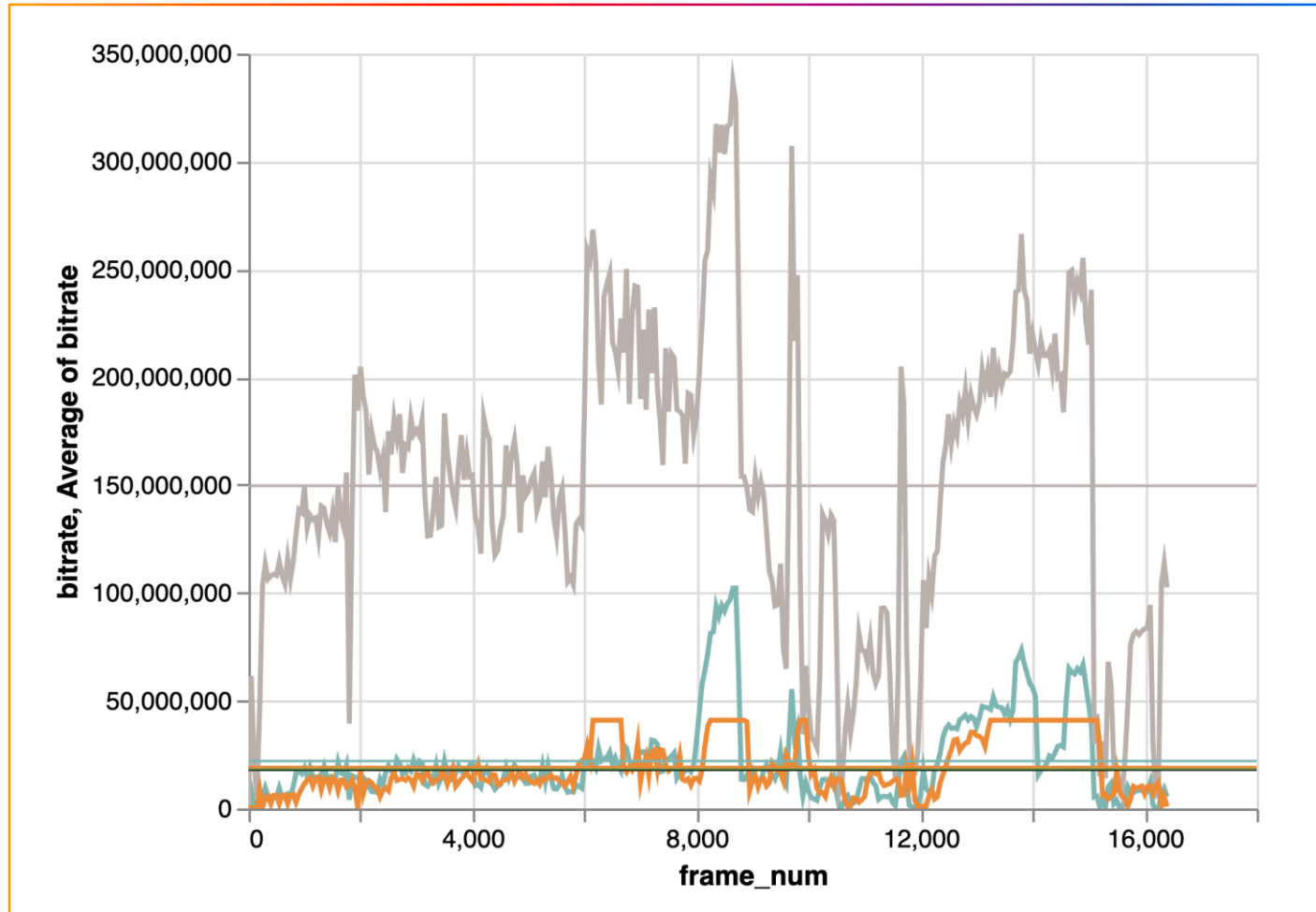
Conclusion :

CQ or CRF can be used to estimate content complexity, correctly tracking encoded bit-rate according to complexity

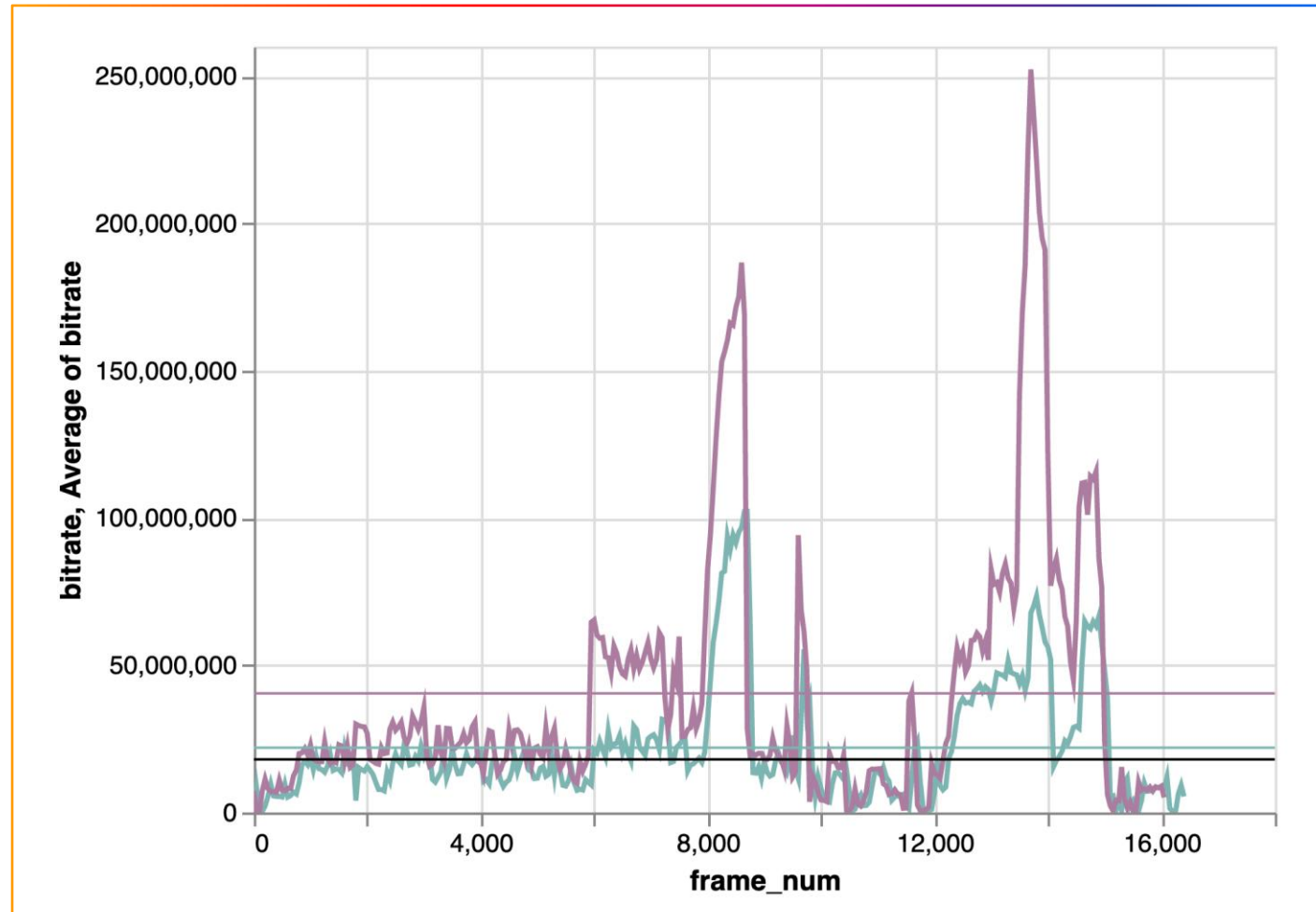
Constant Rate Factor Level



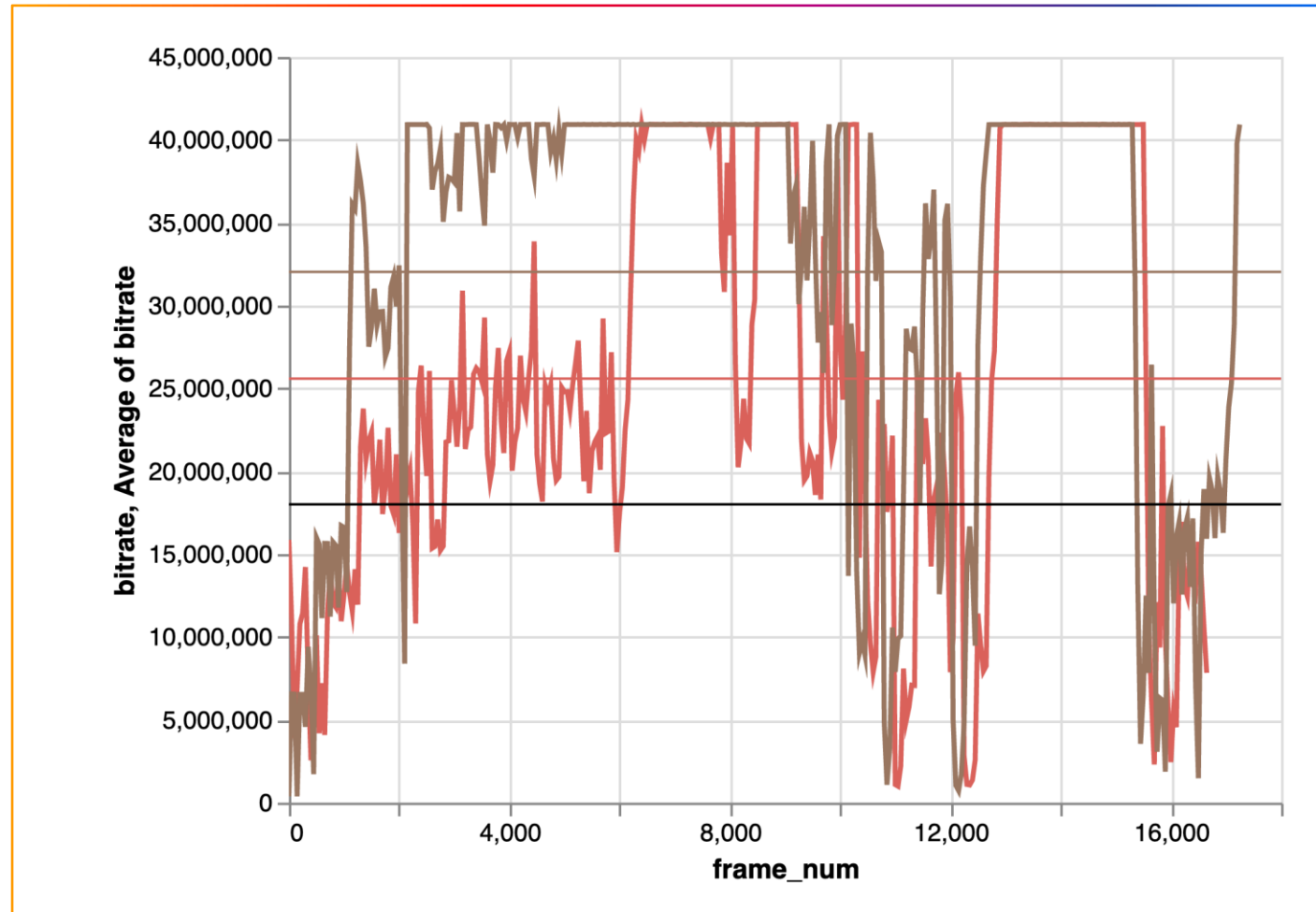
Constant Rate Factor Level



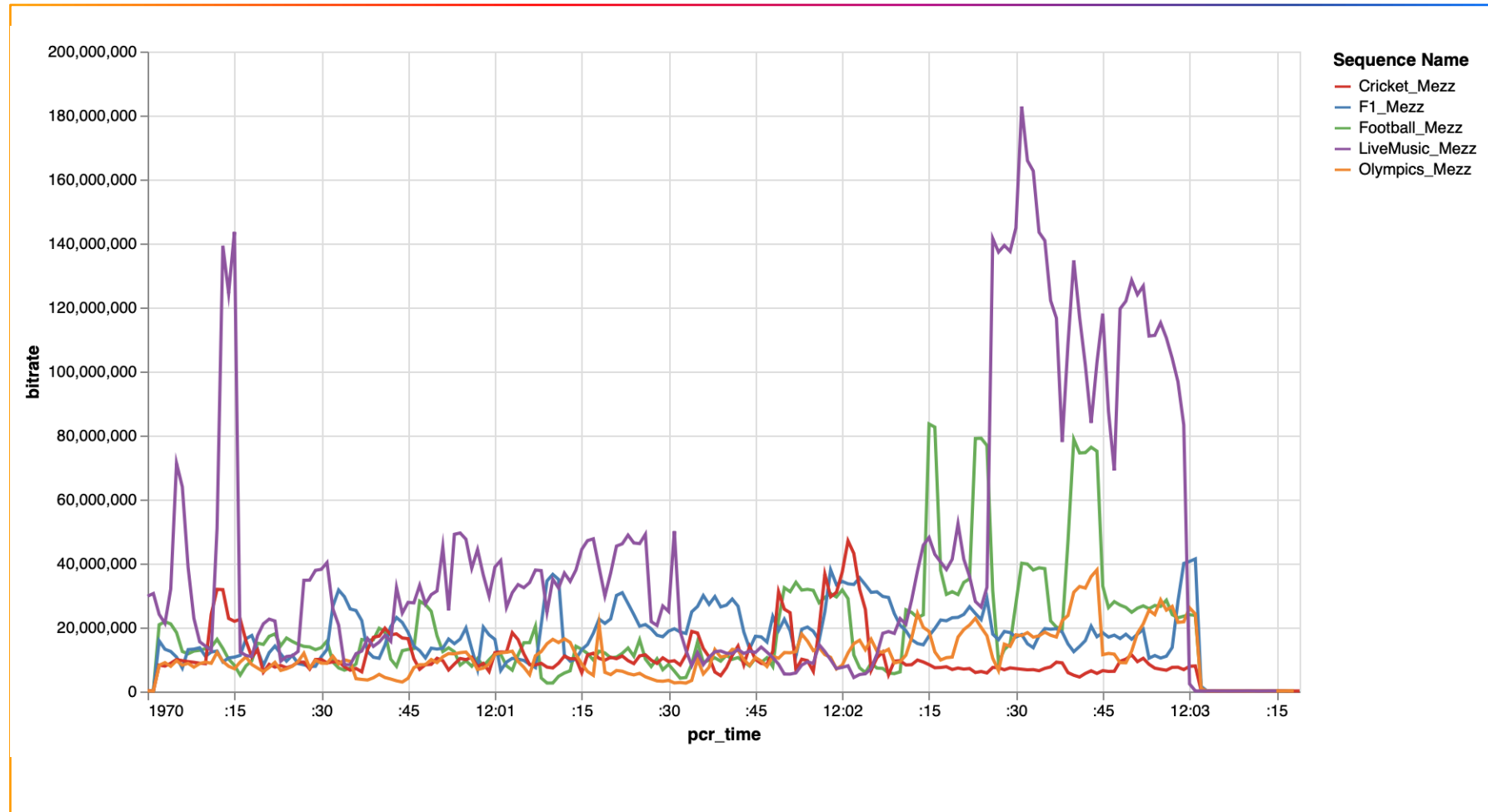
Input Format : Impact on Encoded Complexity



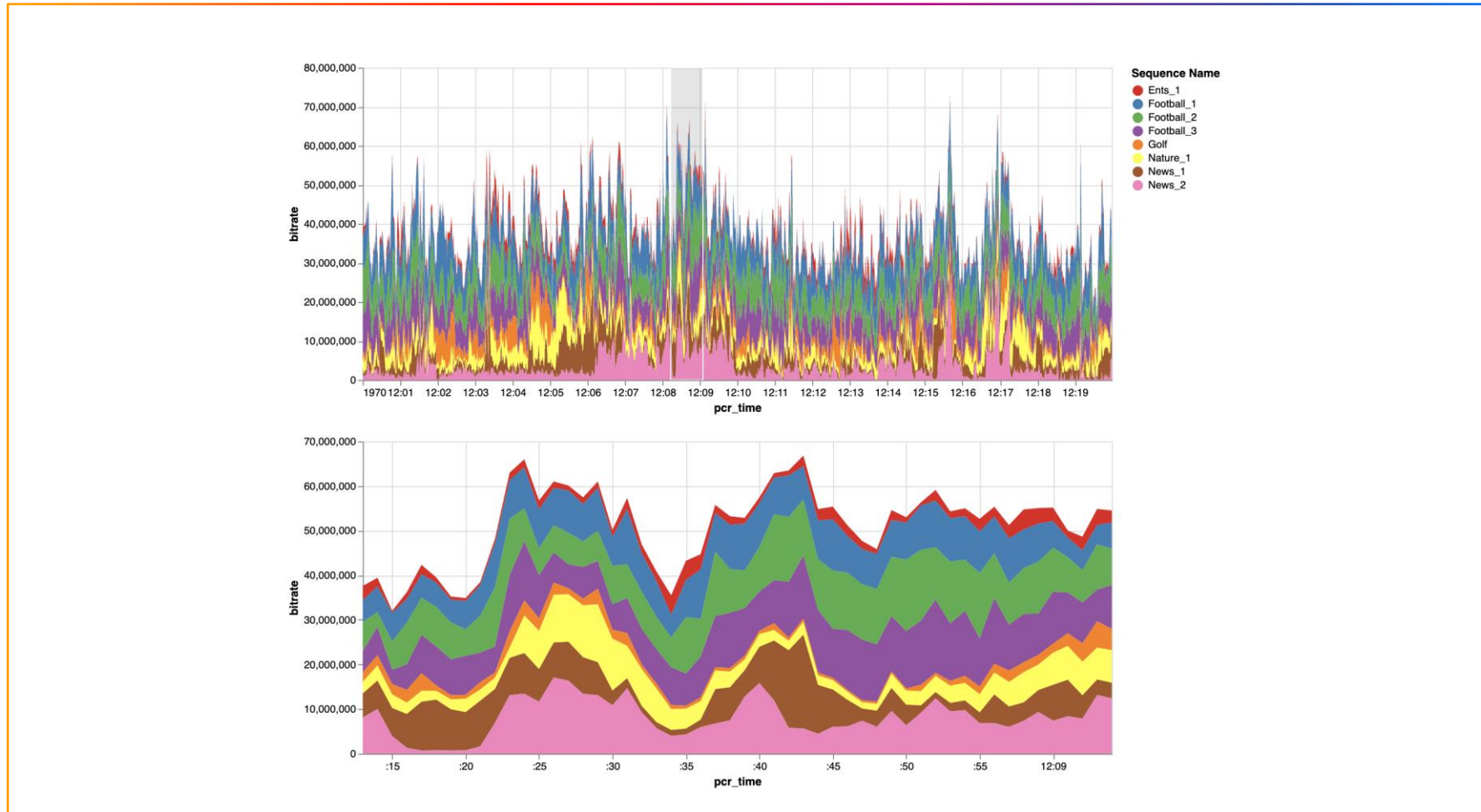
Input Format : Impact on Encoded Complexity



User Case : UHD Statistical Multiplex Planning



User Case : HD Statistical Video Assessment



Conclusions

Content Complexity can be accurately tracked using the Bite-Rate of Constant Quality Encoding

Important to use representative test sequences, and not just complex content

Input format has a significant impact on Encoder Quality

Approach outlined can be extended to Statistical Multiplex Systems

Questions?