

# Audio Video Quality @ YouTube

anilkokaram@ chaochen@

VIDEO INFRASTRUCTURE

2K 4K 8K

2010 2015

High Frame Rate

2014

VR 360 Stereo-3D

2015

# What do we care about?

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## Media

VR  
8K  
HDR  
HVC

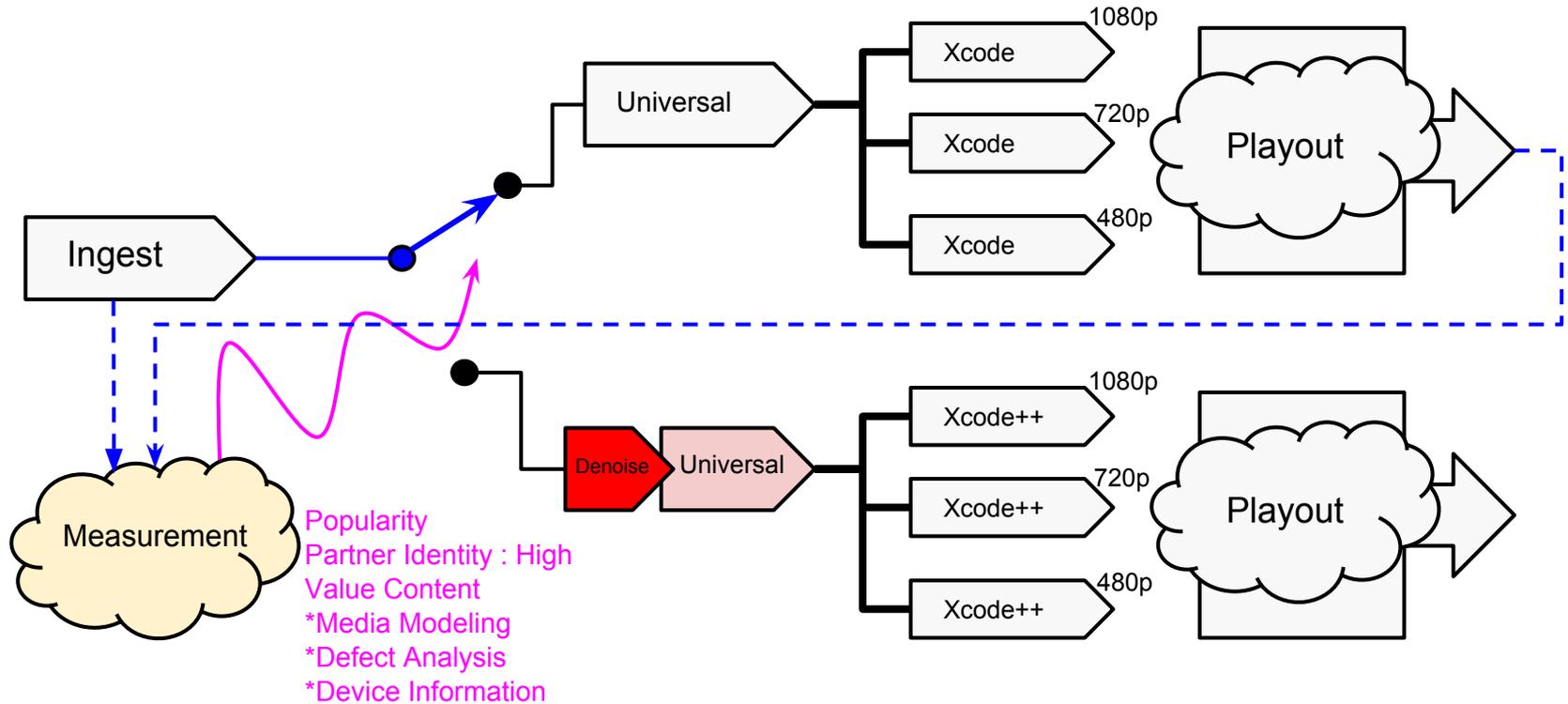
## Scale

Latency  
Reliability  
Bandwidth  
Adaptivity

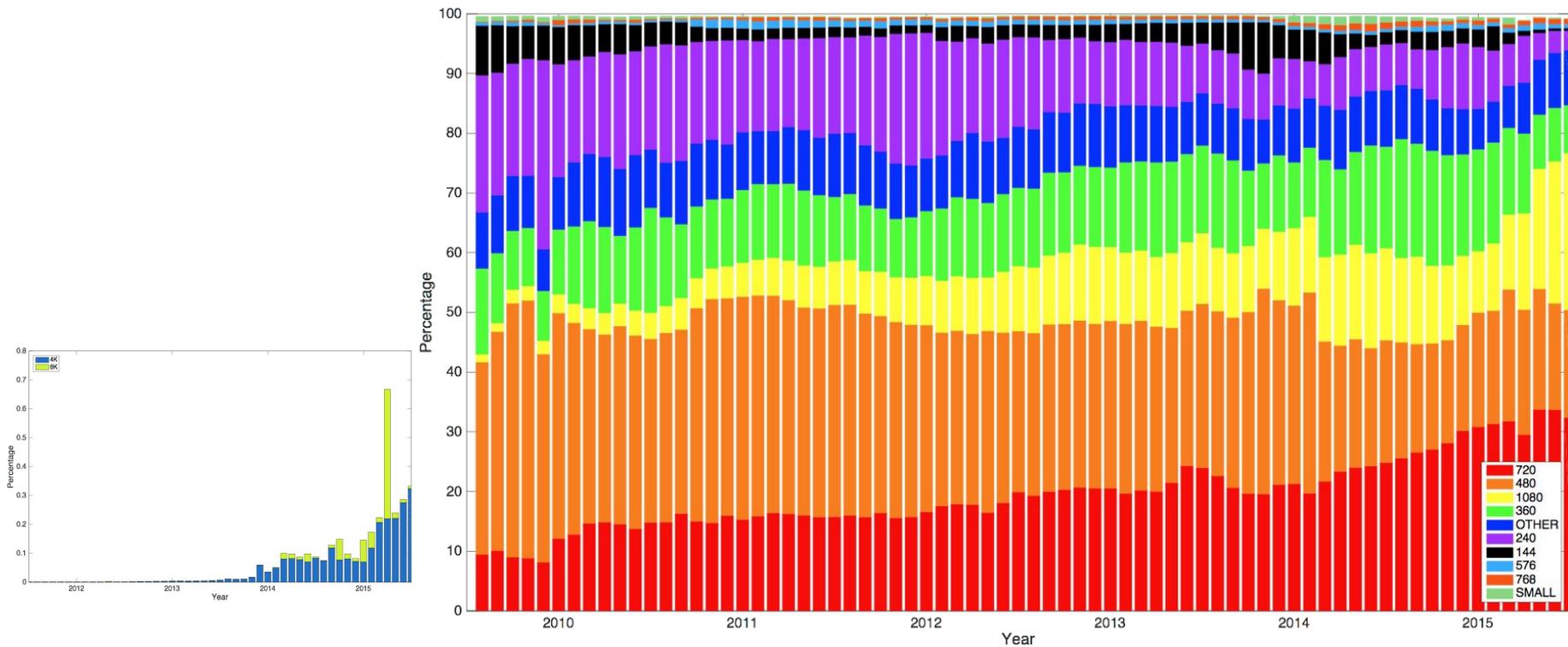
## Measurement

QoE  
AVQ

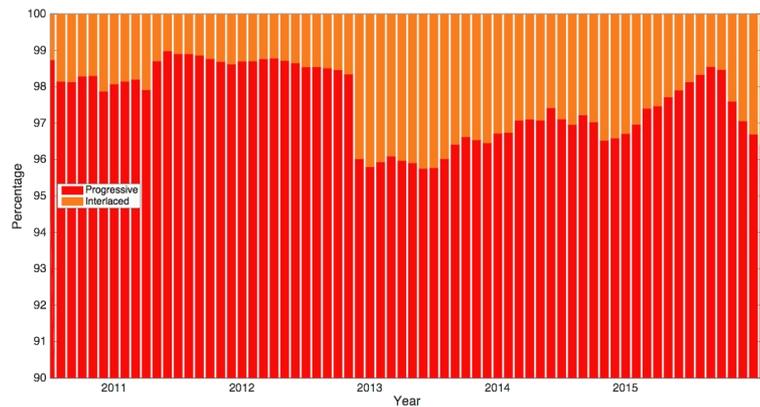
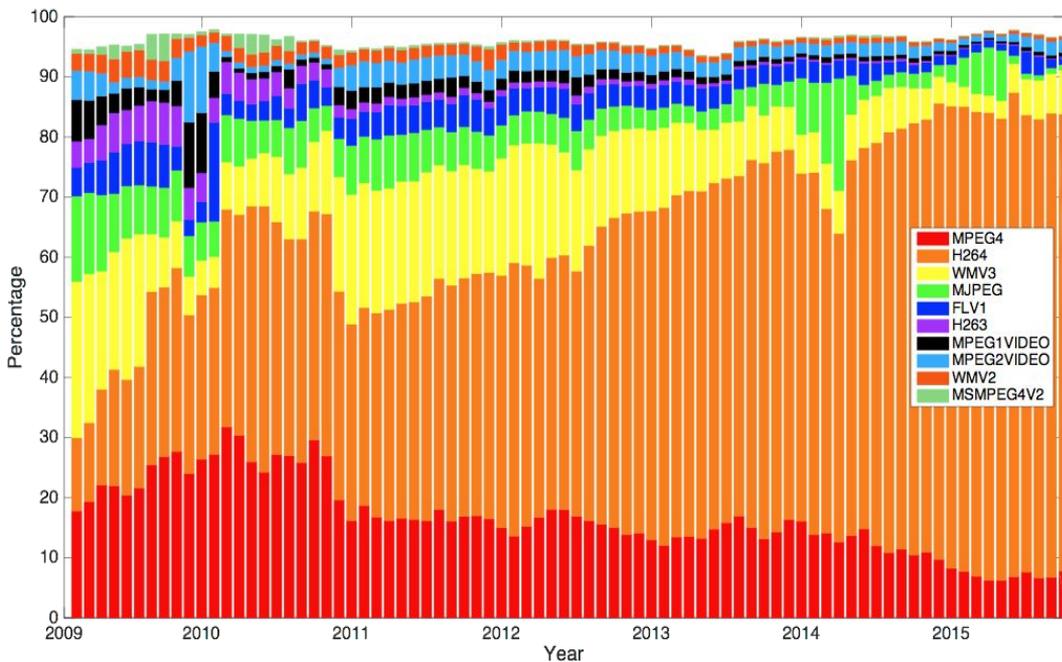
# Pipeline and using AVQ Measurements



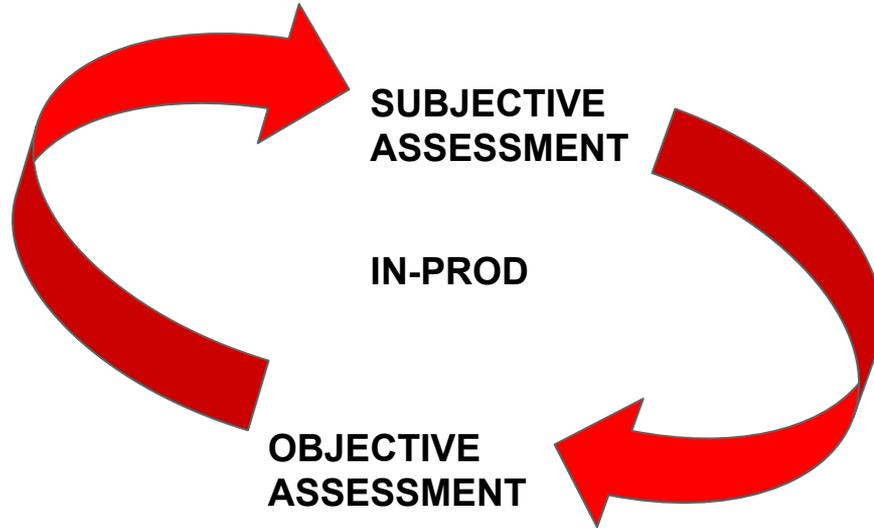
# Some Ingest Trends



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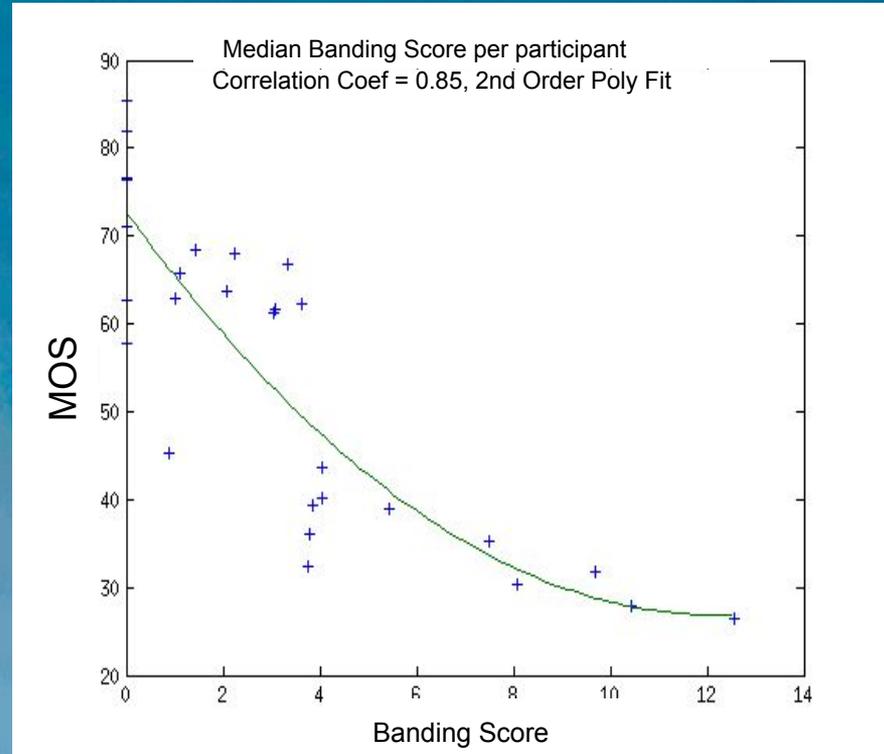


# AVQ Measurement



# Measurement: Subjective Evaluation

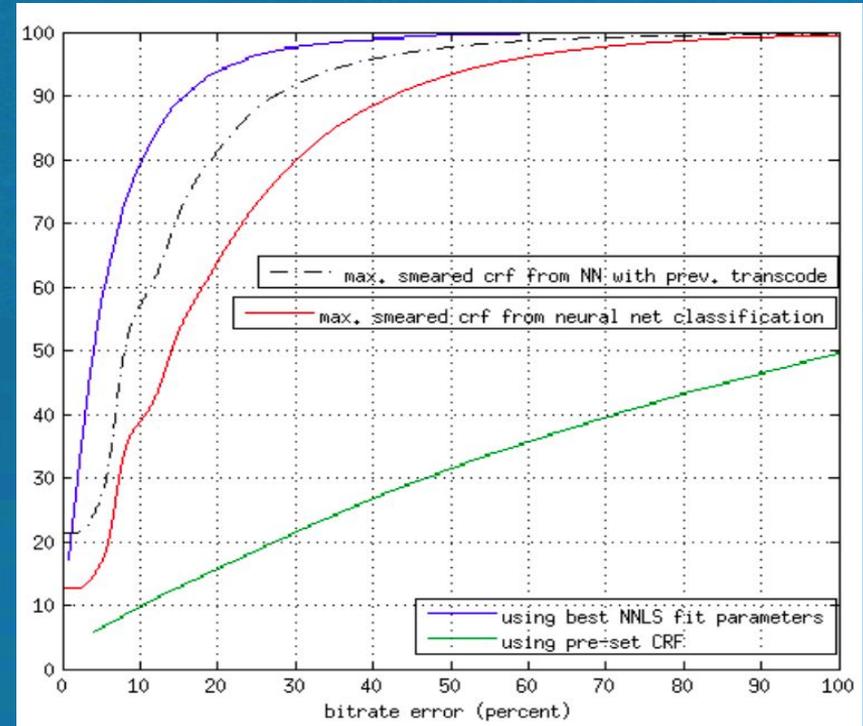
- Choosing bitrates for H.264, VP9 @ 4K
- Choosing DASH bands
- Calibrating new perceptual metrics



# Machine Learning for Clip Optimised Encoding

**Optimizing transcoder quality targets using a neural network with an embedded bitrate model**, Michele Covell<sup>1</sup>, Martin Arjovsky<sup>2</sup>, Yao-Chung Lin<sup>1</sup>, and Anil Kokaram<sup>1</sup>; <sup>1</sup>Google, Inc (United States) and <sup>2</sup>University of Buenos Aires (Argentina); SPIE Conference on Visual Information Processing and Communication, Electronic Imaging Symposium 2016, San Francisco, USA, Feb 2016

**Multipass encoding for reducing pulsing artefacts in cloud based video transcoding**, Yao Chung Lin, Hugh Denman and Anil Kokaram; Google, Inc (United States); IEEE International Conference on Image Processing, Quebec, Canada, Oct 2015



# HDR Video

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- VP9 Profile 2 [10 bits] in Matroska container (WebM and Frank Galligan)
- Advocating HLG and PQ for all compliant TVs
- Metadata signalling is still in flux
  - Device capability signalling
  - Standards for consumer devices
- Reliability of TV displays to be tested
- Bitrates: 25% rule of thumb; optimisation for HDR; banding has not gone away
- Broadcast Content mezz: what's up with ProRes? What's the chance that studios supply two colour grades?
- How pervasive will 10bit HDR TV be in 2017?

# Overall

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## Media

Compression  
Enhancement  
Device Capabilities

## Scale

Compression  
Enhancement  
Parallel  
Processing  
Efficiency

## Measurement

Perceptually  
relevant QoE

Standardised  
AVQ?

Contributing to  
standard  
datasets

**FIN**