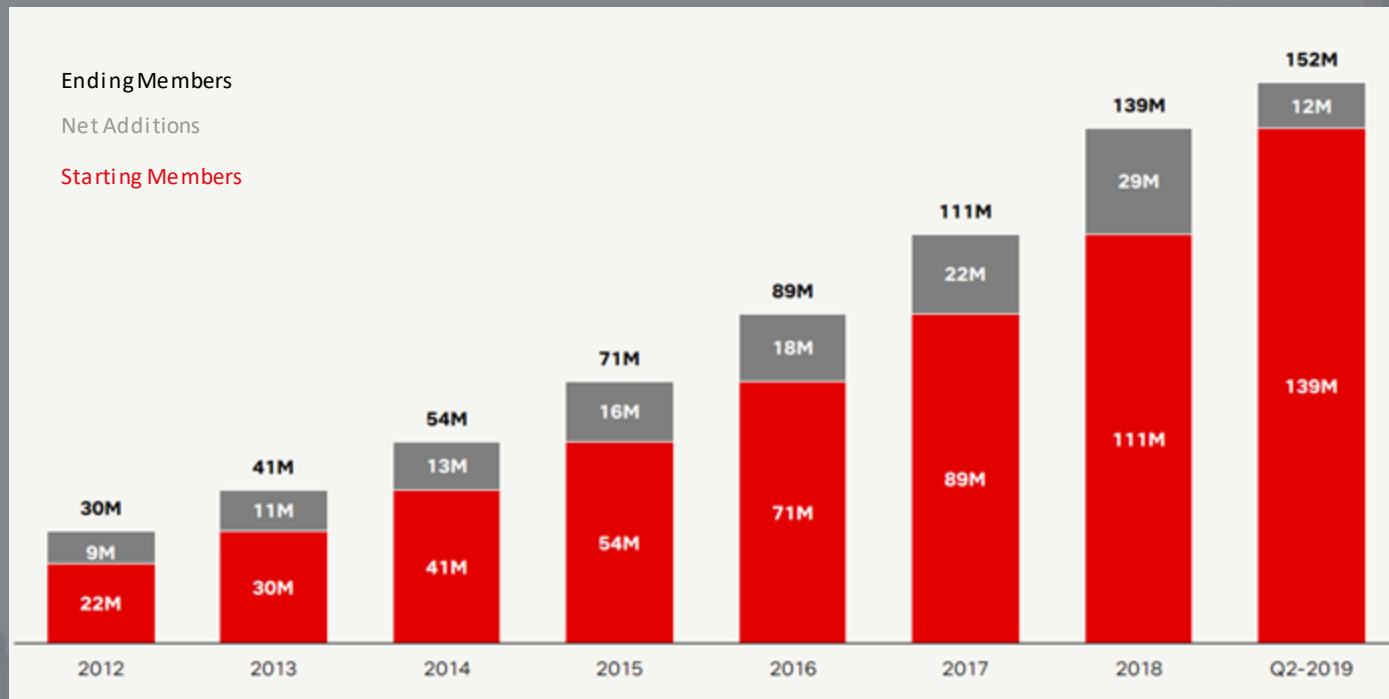


Netflix在全球范围内保持用户增长



北京
2019

遨游“视”界 做你所想
Explore World, Do What You Want





深圳
2019

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LiveVideoStackCon 2019 深圳

2019.12.13-14



出品: **LiveVideoStack**
—— 音视频技术社区 ——

成为讲师: speaker@livevideostack.com

成为志愿者: volunteer@livevideostack.com

赞助、商务合作: kathy@livevideostack.com

高质量的内容，用最优的编码和
流媒体技术带给用户最佳的体验



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Netflix用户会如何评价这一段视频的质量：极差，一般，或者非常好？

对于这样一段视频，是编码器A还是编码器B的质量表现更好？

当码率限制在1000 Kbps的条件下，这一个剧集是应该采用标清还是高清的分辨率来进行编码？

我们需要一个准确的视频质量评估工具



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- 能够预测人对视频质量的主观感知
- 保证跨内容的一致性
- 能够在云端大规模部署
- 能准确预测HTTP流媒体技术下的图像质量失真
 - 压缩失真 (Compression Artifacts)
 - 缩放失真 (Scaling Artifacts)



VMAF: Video Multimethod Assessment Fusion



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VMAF: 未毕之旅

李智, Netflix (视频算法组)

LiveVideoStackCon 2019, 8.23-24, 北京

NETFLIX

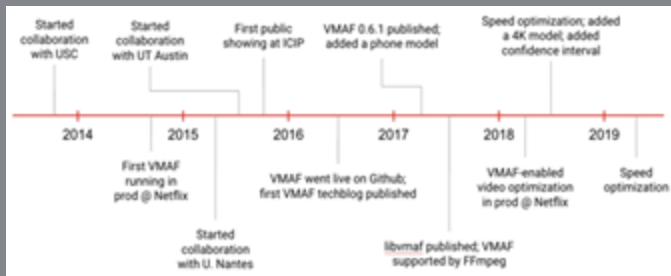
出品: LiveVideoStack
音视频技术社区 CSDN



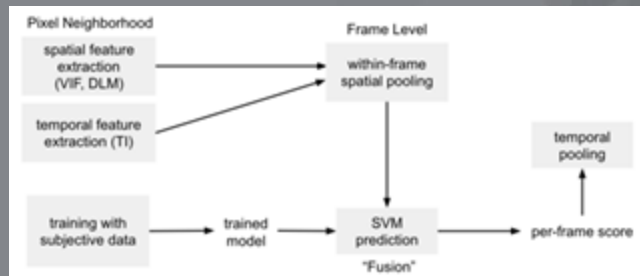
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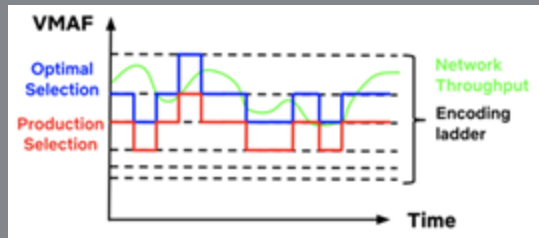
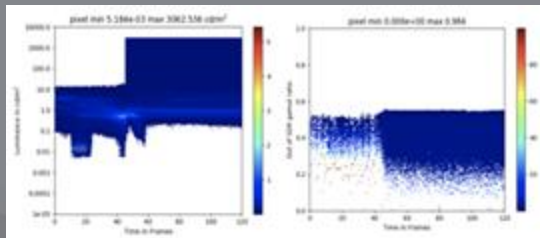
这次分享将涵盖VMAF的短暂历史，
基本原理，以及我们近期的一些工作



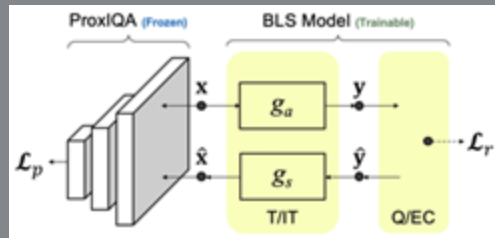
VMAF的短暂历史



VMAF的基本原理



近期工作

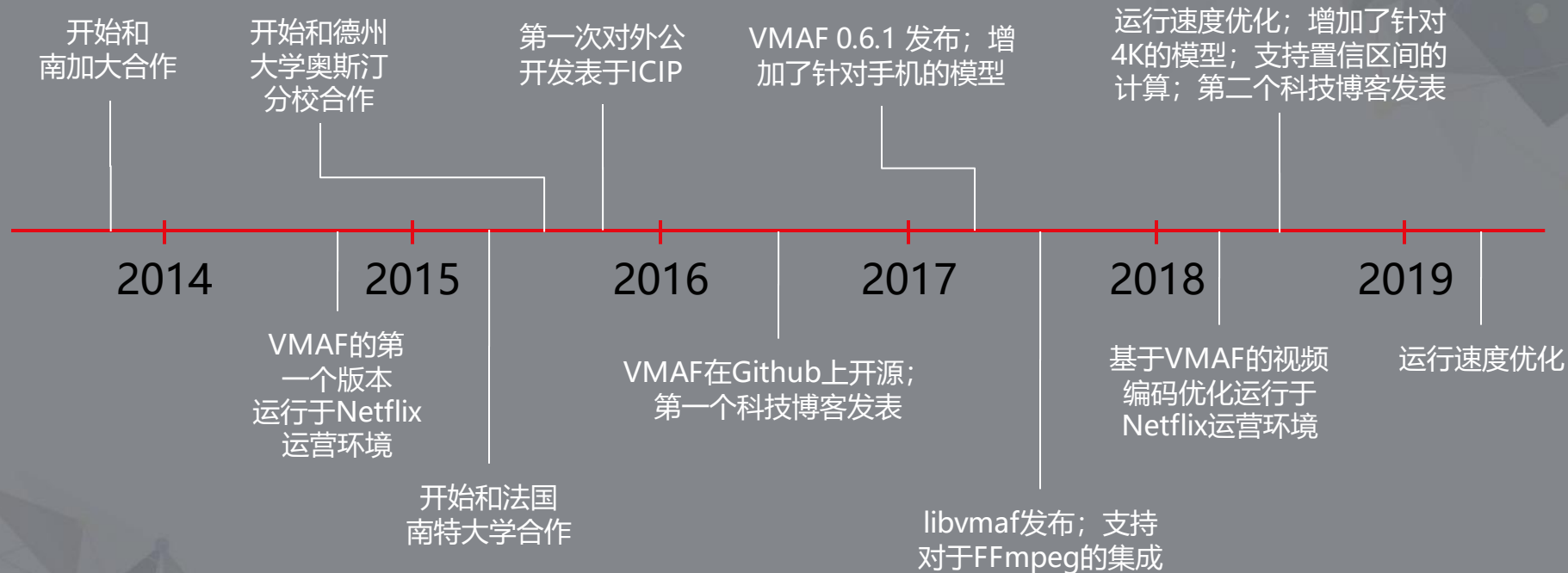


VMAF的编年史



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VMAF开源项目



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Netflix / vmaf

Unwatch ▾

389

★ Star

1,202

🍴 Fork

268

Code

Issues 44

Pull requests 3

Projects 0

Security

Insights

Settings

Perceptual video quality assessment based on multi-method fusion.

Edit

Manage topics

963 commits

17 branches

13 releases

35 contributors

Apache-2.0

Branch: master ▾

New pull request

Create new file

Upload files

Find File

Clone or download ▾



christosbampis Merge pull request #353 from Netflix/feature/WriteOutMoreFeaturesToLog

Latest commit 66200b1 4 days ago

feature

Merge pull request #326 from legrosbuffle/master

last month

libsvm

Feature/revamp2 (#23)

3 years ago

matlab

Add matlab imports in run_testing; run mex for ST-MAD.

8 months ago

model

Change default bootstrap model to plain bootstrapping; modify docs.

8 months ago

pthreads

Fix incorrect VMAF score on VS2015 and refactor MSVC project files

7 months ago

VMAF在第三方软件里的集成



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FFmpeg

About

News

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Documentation

Community

Mailing Lists

IRC

Forums

Bug Reports

Wiki

Developers

10.107 libvmaf

Obtain the VMAF (Video Multi-
videos.

The obtained VMAF score is pr

It requires Netflix's vmaf libr
library it can be enabled using
. If no model path is specified

The filter has following option

model_path
Set the model path w
"vmaf_v0.6.1.pkl"

log_path
Set the file path to be used

log_fmt

MSU Video Quality Measurement Tool

[MSU Graphics & Media Lab \(Video Group\)](#)

Projects, ideas: Dr. Dmitry
Implementation: Alexey Moskvina, Oleg Petrov, Sergey Putlin, Sergey Grishin, Arsae
Georgy

▼ Why VQMT?

- Basic Information
- Why update?
- PRO Version (with command-line interface) benefits [Full Doc]
- Key Contributors

▼ Support

- Setting & Screenshots (advanced files settings, visualization setting)
- Metrics Info (VMAF, NIQE, PSNR, MSE, MSAD, SSIM, VQM, MSU Blu)
- FAQ (Frequently Asked Questions)
- Plugins & Plugin SDK
- MSU VQMT program performance
- Subjective quality metrics comparison

ZOND 265 — your indispensable tool

- Visualized bits distribution statistics to facilitate encoding of CU, PU, and TU data
- Quality estimation by Netflix VMAF, PSNR and MSSIM metrics
- Fast translucent overlays of encoded file image (CU, PU, TU, GP, Bits, Refidx, PNSR) for Ultra HD files
- HEVC stream validation conformance according to the specification in GUI

Video Clarity

Tools for Video Analysis

HOME PRODUCTS SOLUTIONS INFORMATION SUPPORT OFFICES

CONTACT US

Automated Testing Solutions

ClearView – Video Quality Measurement and Analysis Systems

- Resolution and frame rate independent picture quality analyzers with multiple models
- Versatile input/output with 12G-SDI, 10G IP, HDMI, IP stream decode/capture
- Comprehensive media ingest with full featured file decoder application
- Quantitative picture quality metrics VMAF, NIQE, MS-SSIM/OMOS, PSNR, and Samoff JND (option)
- Test for HDR color just noticeable differences with ΔEITP
- Test for source sequence complexity using Temporal and Spatial metrics
- Performance testing for audio using aFreq metric for audio quality with AV offset (lip-sync) measurement and aPeak metric for standardized loudness testing
- Automatic temporal and spatial alignment, comparison playback of uncompressed video via HDSOI or HDMI outputs with interactive side-by-side views up to 8K and 4K @ 60 Hz
- Picture zoom up to 16X with pan and scroll provides unmatched inspection of compression artifacts during any play mode for a detailed view of one or a comparison of two videos
- Desktop window of comparison play modes provides for machine room or data center use without video output connectivity

elec card

VIDEO COMPRESSION GURU

What can we do for you?

Video Quality Estimator

Video Quality measurement tool designed to compare quality of encoded streams based on objective metrics, such as PSNR, APSNR, SSIM, DELTA, MSE, MSAD, VQM, NQI, VMAF and VMAF phone.

使用案例：编解码器的性能比较



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Joint Video Experts Team (JVET)
of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/W
16th Meeting: Gothenburg, SE, 3–12 July 2019

CrowdRun

HEVC VVC

100

Resolution	BD-rate (PSNR)	BD-rate (VMAF)	BD-rate (MOS)
HD	-31.24%	-35.18%	-36%
UHD	-34.42%	-40.44%	-40%

Source:

Orange, INSA Rennes and b-com

0

0

1000

2000

3000

4000

5000

6000

7000

8000

9000

10000

Bitrate (kbps)

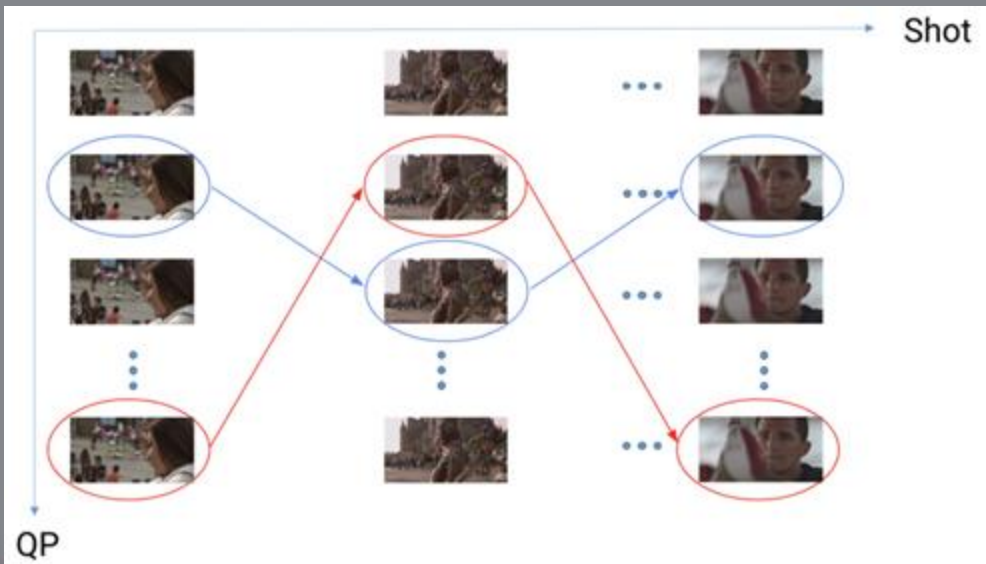
[Source: JVET-O0451 Subjective Comparison of VVC and HEVC,
JVET 15th meeting: Gothenburg, SE, 3–12 July 2019]

使用案例：编码优化

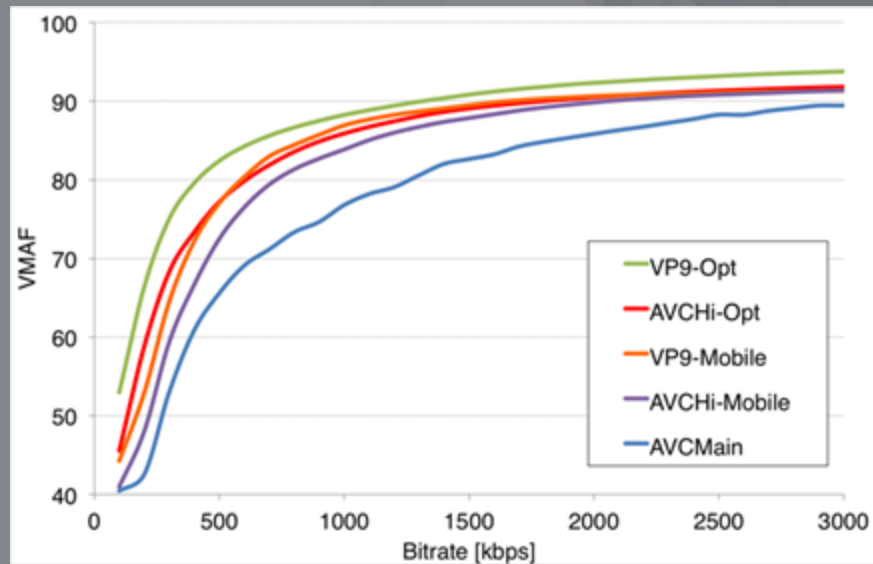


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对于指定平均码率，Dynamic Optimizer 可以找到能达到最优VMAF的编码路径

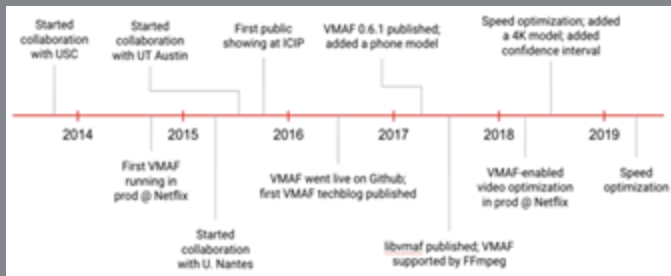


[Source: Dynamic optimizer—a perceptual video encoding optimization framework, Netflix Techblog, Mar 6, 2018; Optimized shot-based encodes: Now Streaming! Netflix Techblog, Mar 10, 2018]

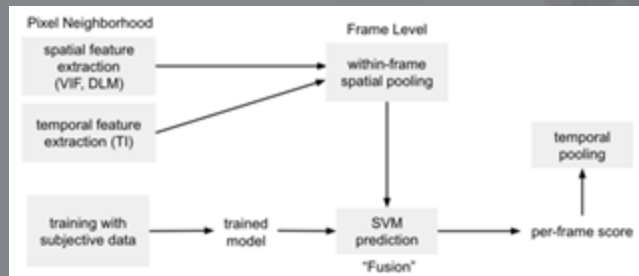


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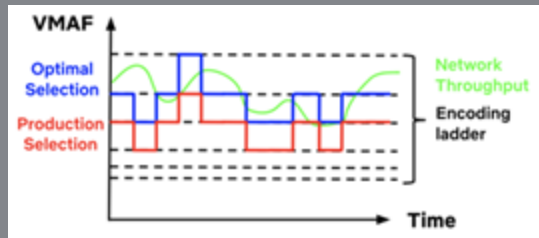
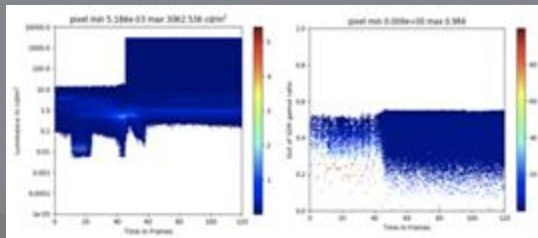
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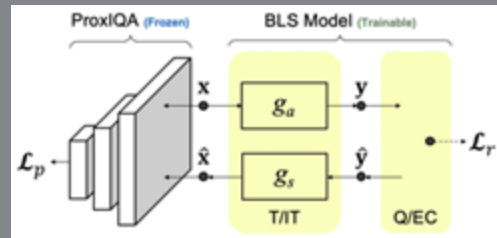
VMAF的短暂历史



VMAF的基本原理

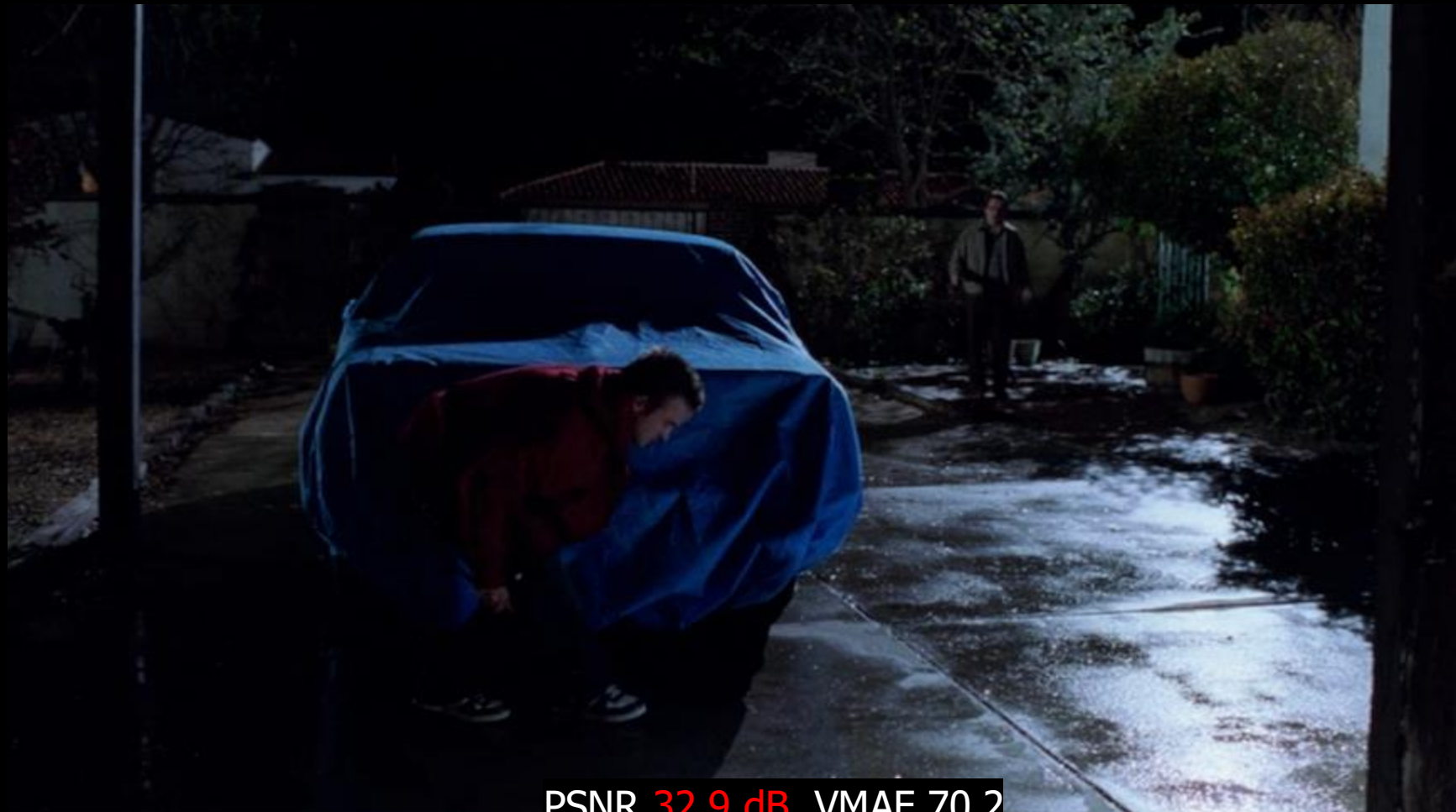


近期工作





PSNR 37.1 dB, VMAF 71.1



PSNR 32.9 dB, VMAF 70.2



PSNR 29.1 dB, VMAF 20.4



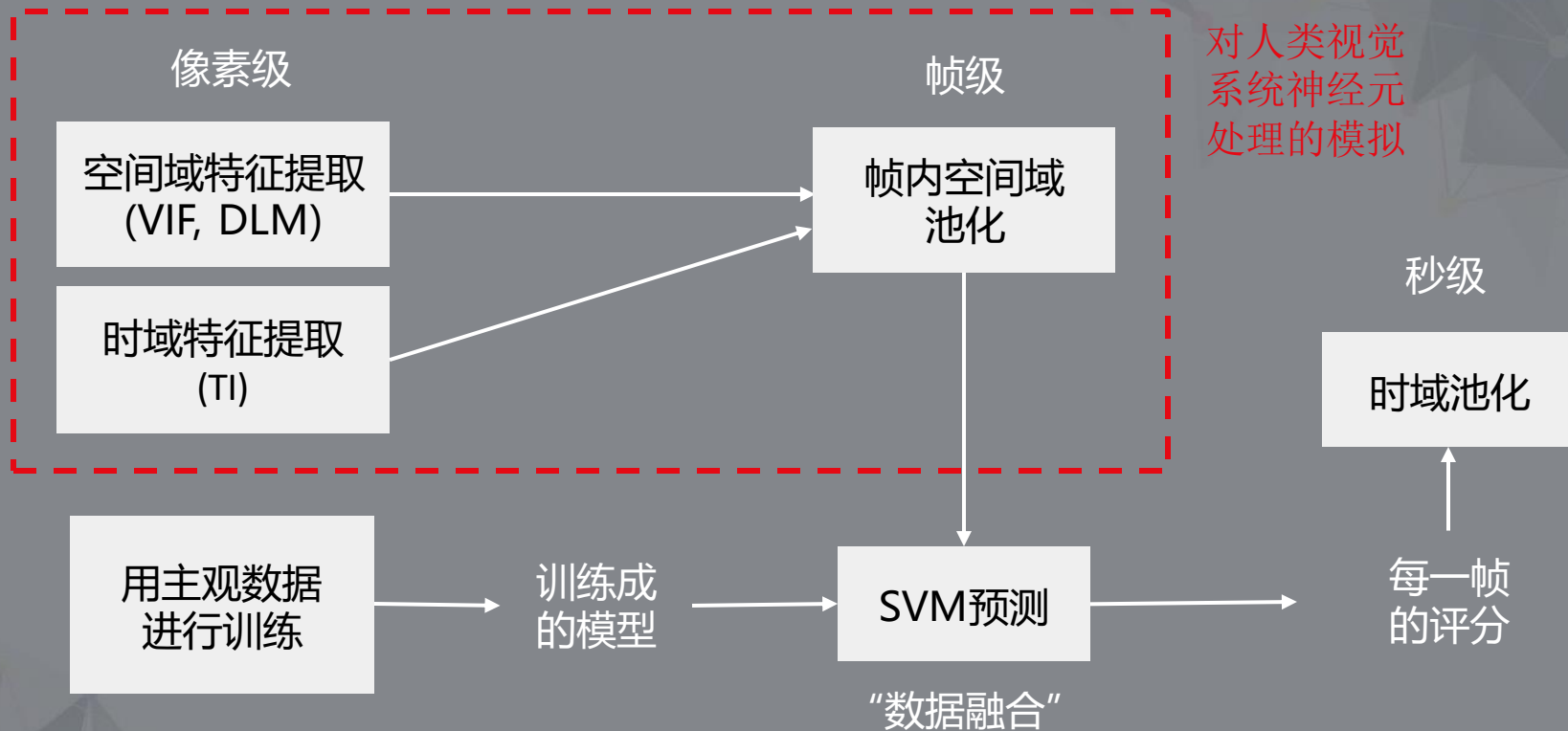
PSNR 29.3 dB, VMAF 69.8

VMAF基本构架



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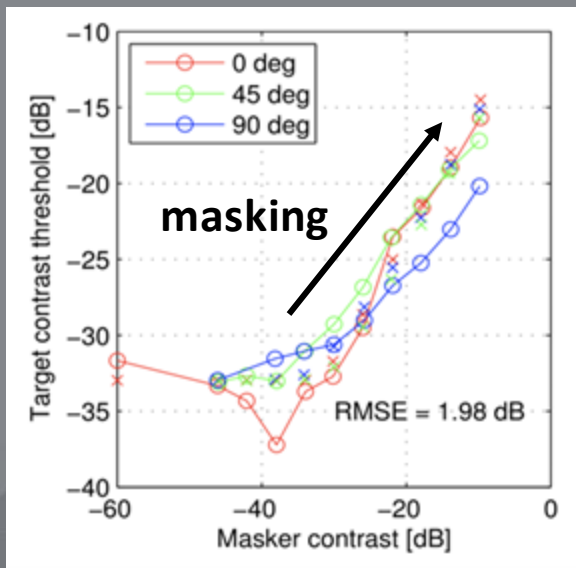
对人类视觉系统神经元处理的模拟： 基于对比度的掩蔽效应 (Contrast Masking)



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- 当图像损失（比如压缩失真）被叠加到视频源上，如果其频率和方向和源信号类似，则这些失真会变得更难被人眼察觉



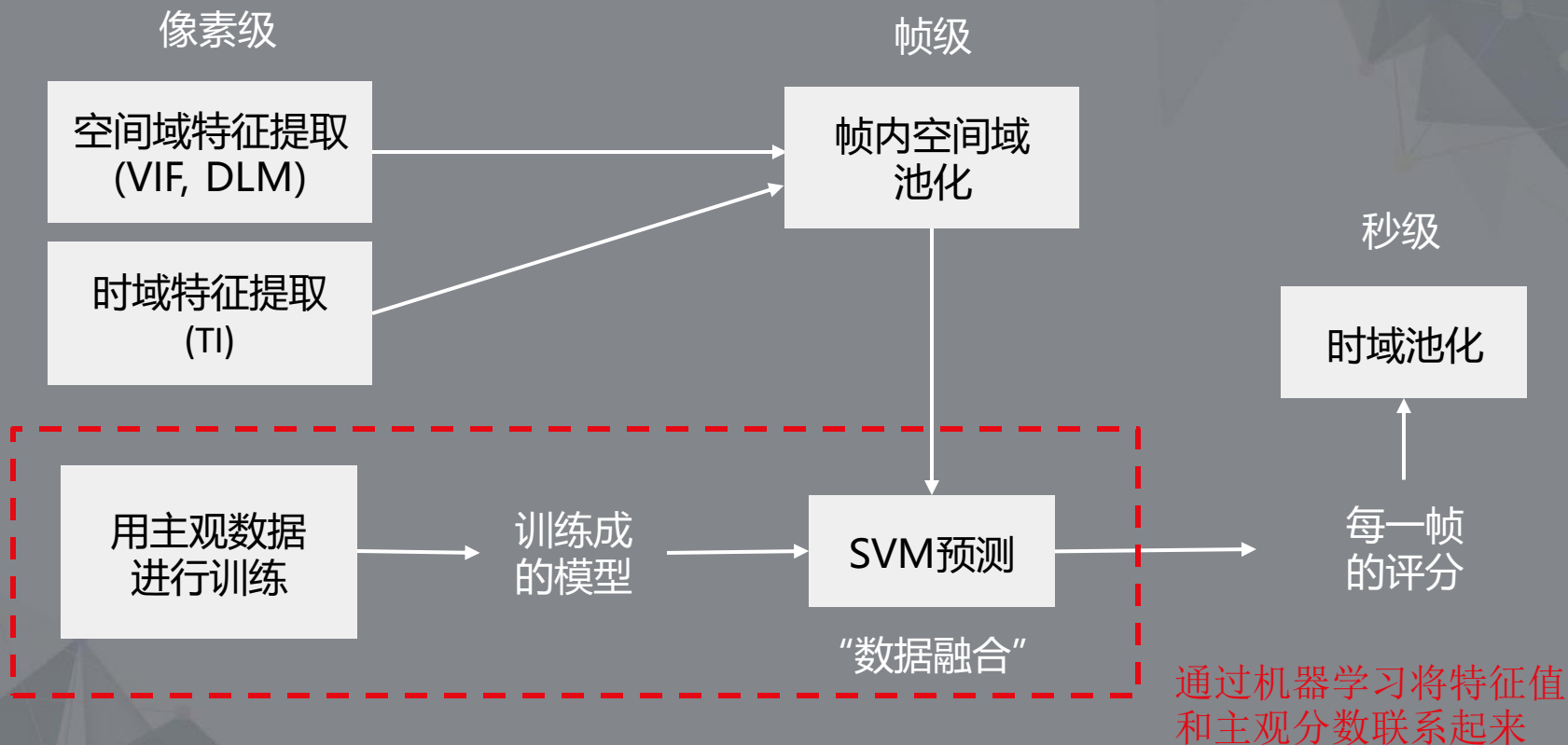
[Source: HDR-VDP2, Mantiuk et al. 2011]

VMAF基本构架



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主观实验：收集用户评分



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极差 差 一般 好 极好



Absolute Category Rating (ACR) 尺度

将ACR尺度映射到VMAF尺度



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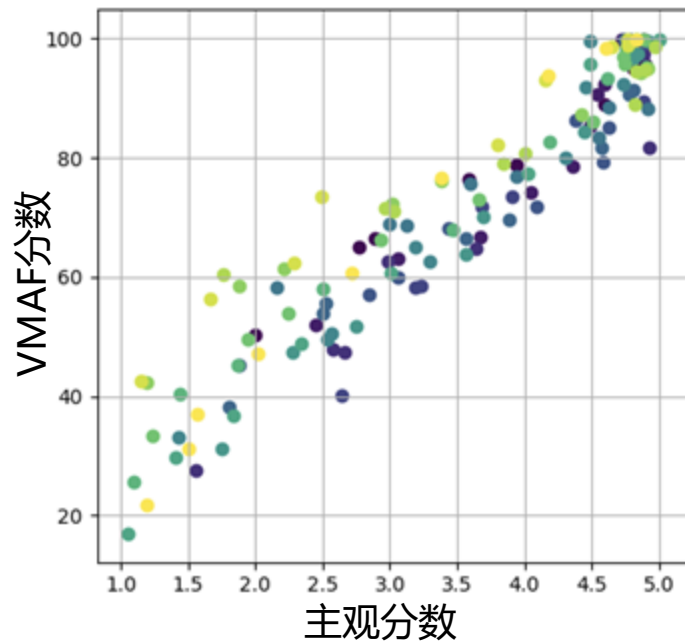
遨游“视”界 做你所想
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极差 差 一般 好 极好

Absolute Category Rating (ACR) 尺度

0 20 40 60 80 100

VMAF 尺度



观看距离/屏幕尺寸会影响主观图像质量



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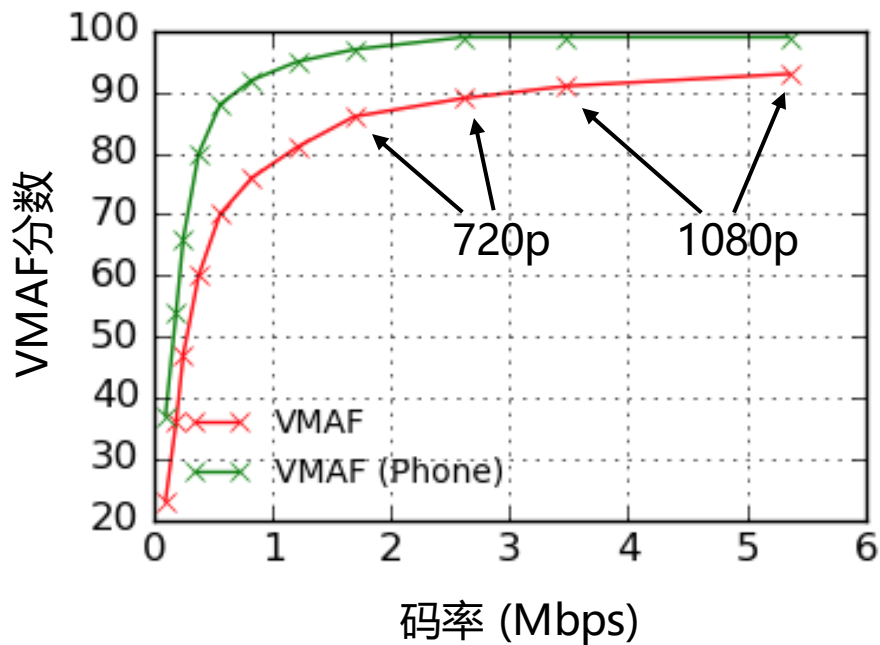


针对手机屏幕的VMAF模型



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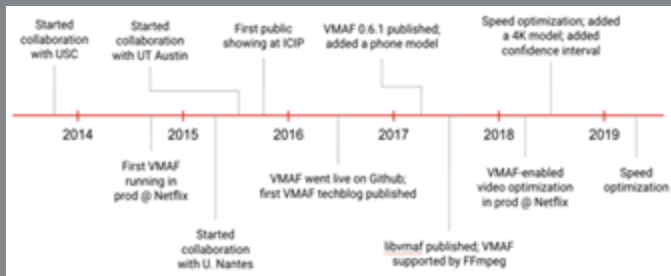
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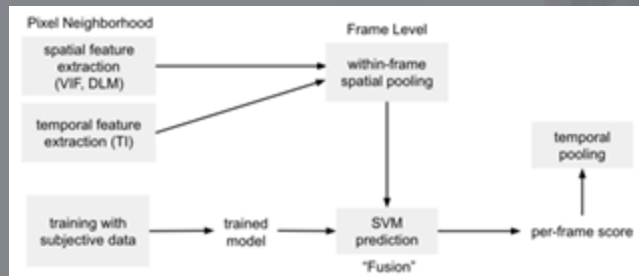


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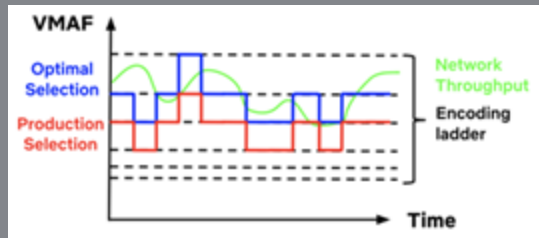
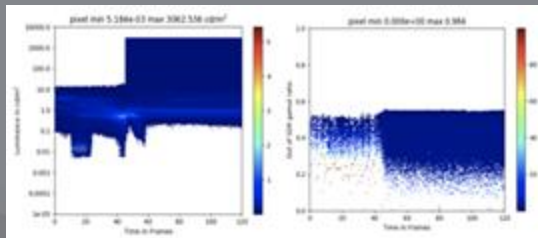
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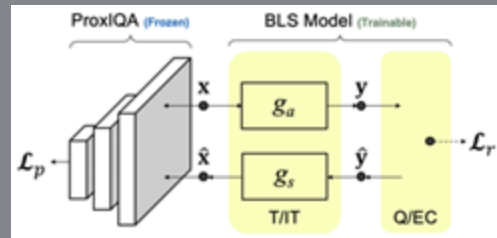
VMAF的短暂历史



VMAF的基本原理



近期工作

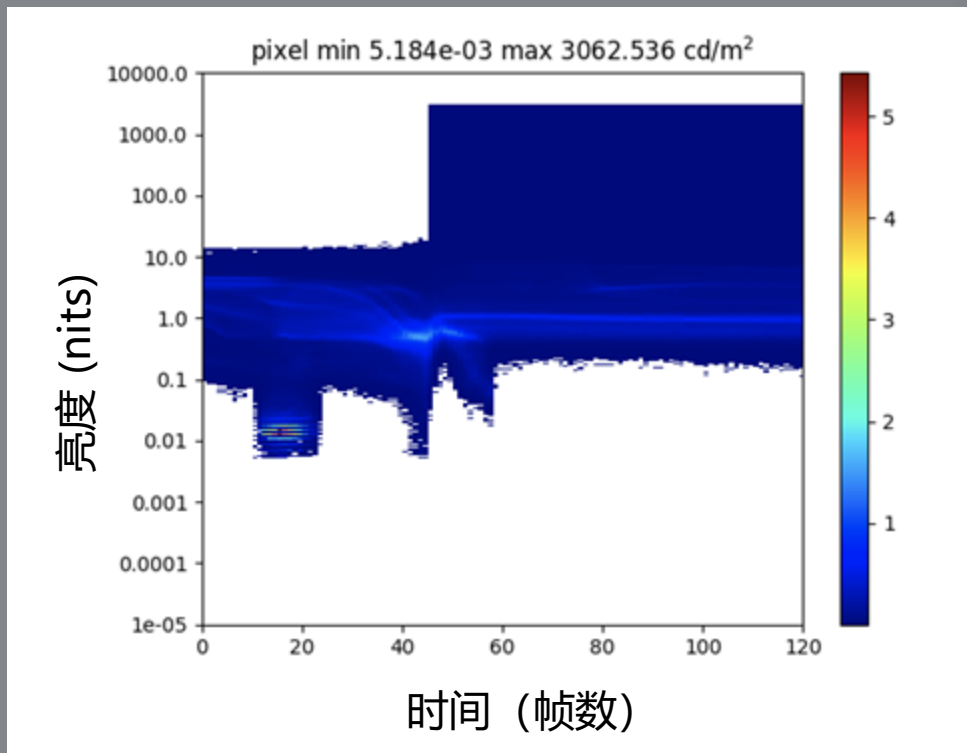


一段HDR视频源 (P3D65, 亮度最高 3000 nits)



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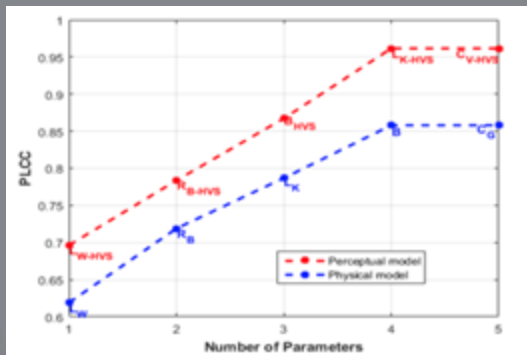
针对HDR的VMAF模型



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- 目标
 - 能够预测HDR视频相对于SDR在主观体验上的优势
 - 更广义上来讲，能够将VMAF的适用范围扩展到HDR
- 挑战
 - 需要能捕捉到和主观质量最相关的一些物理特征（比如：最大亮度）
 - 需要新的能扩展到HDR域的人类视觉模型
 - 需要能捕捉在亮度和压缩损失之间的复杂反应（亮度掩蔽效应）



与主观质量最相关的物理特性

- 最大亮度 (L_w)
- 背光的分辨率 (RB)
- 最小亮度 (L_k)
- 比特深度 (Bit Depth) (B)
- 色域 (Color Gamut) (C_g)

[Source: Dolby, Choudhury' 17]



Malena @anelam_ · Jan 5

为什么我的Netflix每次都卡顿??



Tad Legler @TadLegler · Aug 25

Come on @netflix, you can't rebuffer Big Trouble in Little China during the climactic battle sequence - I have to know what happens!



1



Lauren P. Koester @LPKess · Jan 18

为什么Netflix卡顿得这么厉害?



2



Baitless Bob @C_Errr · Oct 1

没有什么能让我比看到netflix无缘无故从HD降到低分辨率更厌烦了



Stuart McCullagh @DeatGaming · Jul 9

@NetflixUK 为什么Netflix windows app需要这么长时间才能开始播放?
我的居然需要2分钟以上。



Em. ✨ @emmaalysann72 · Jun 12

为什么Netflix需要花这么久才能跳到下一集? 我真的不需要等这十五秒。



11

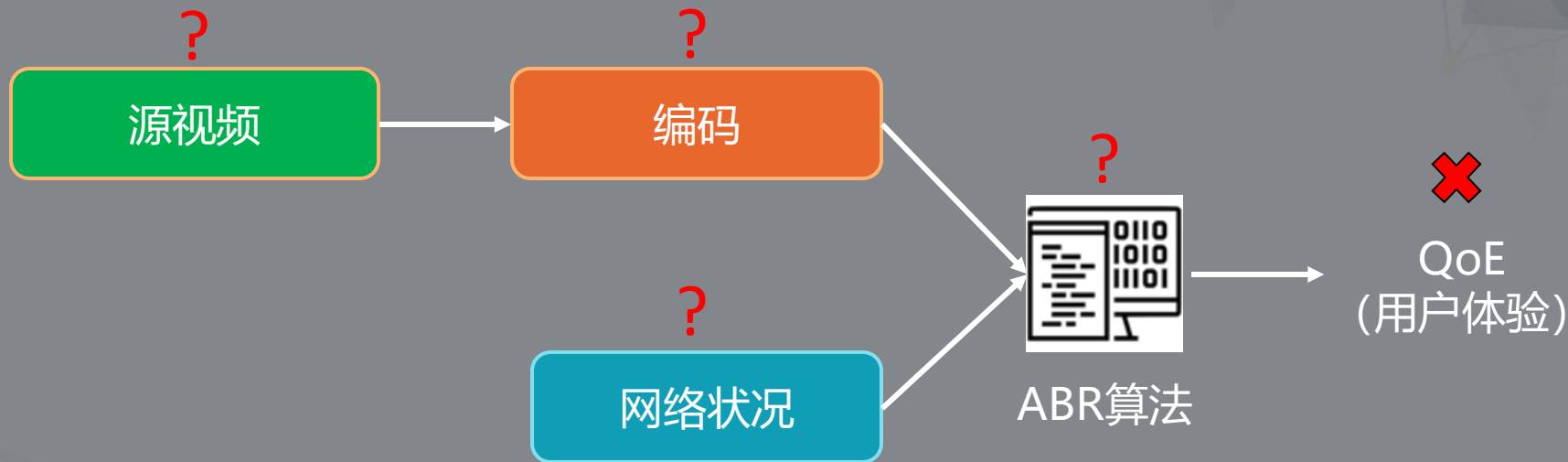


诊断一个用户体验的问题



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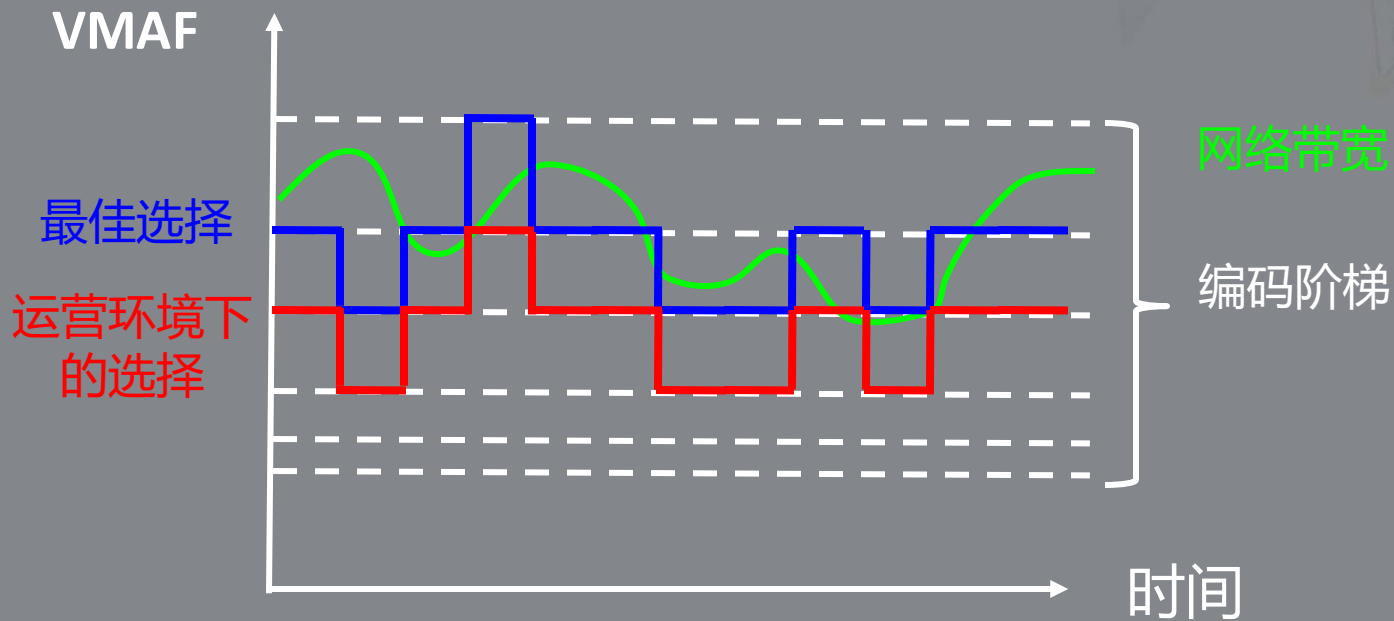


Hindsight: 一种事后评估ABR算法的方法



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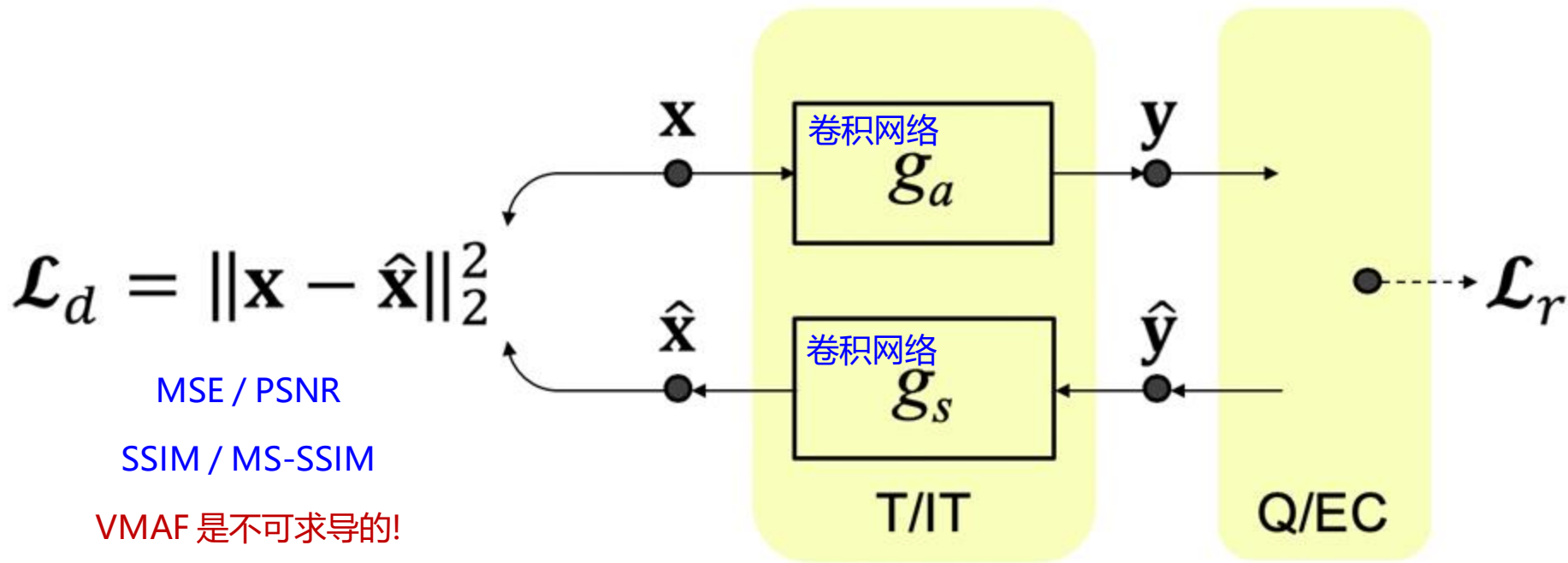


基于卷积网络的图像压缩 [Ballé 2017]



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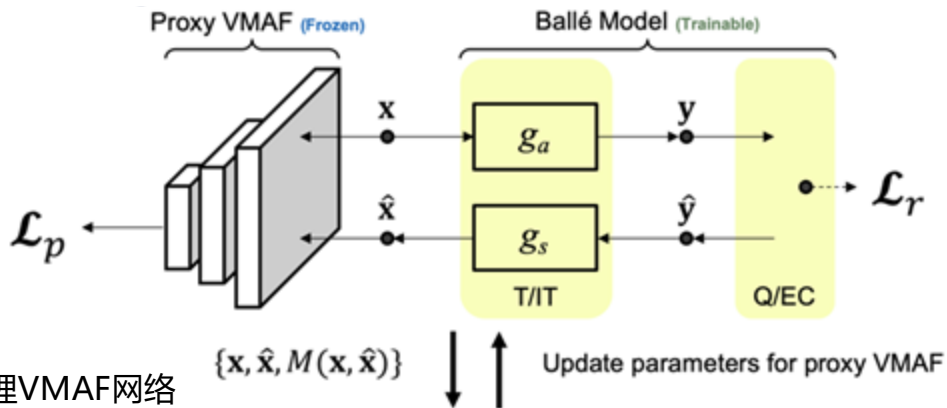
训练一个可导的“代理 (Proxy)” VMAF网络



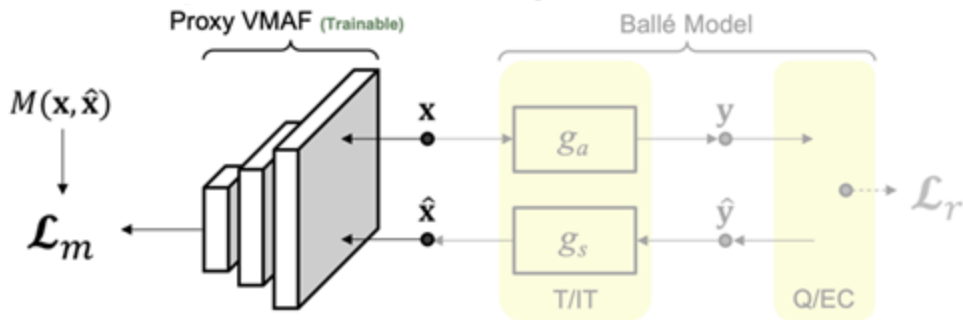
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训练Ballé压缩网络



训练代理VMAF网络



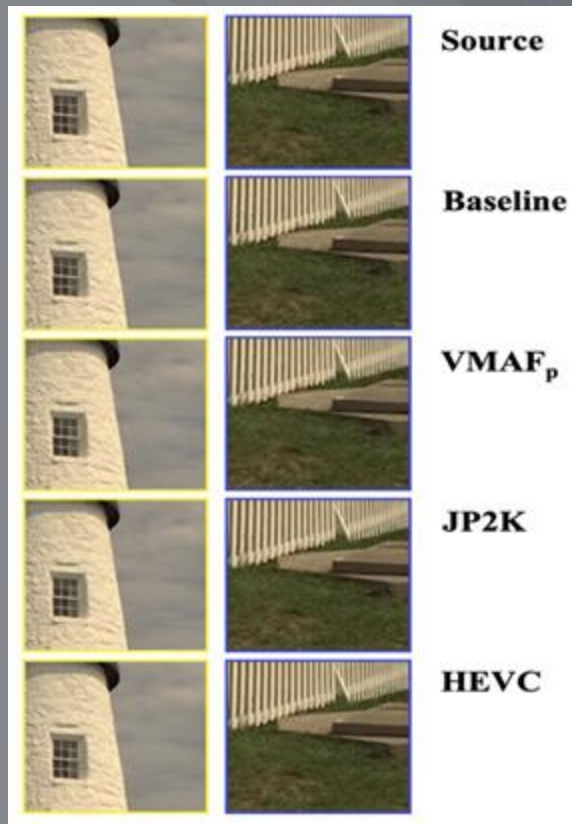
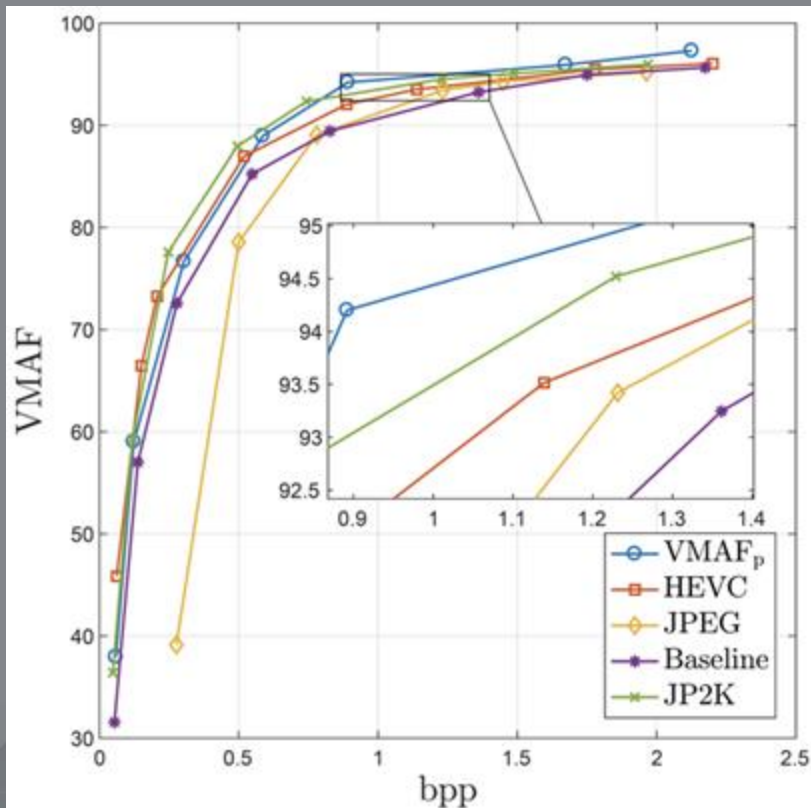
In each training step

实例：Kodim 19 (VMAFp: 代理VMAF)



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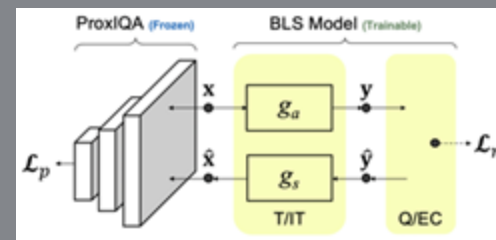
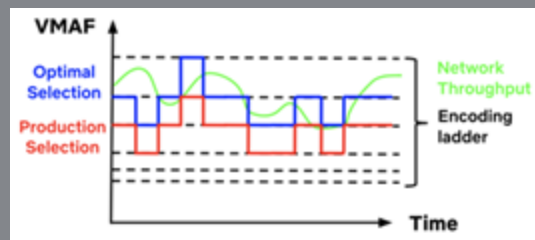
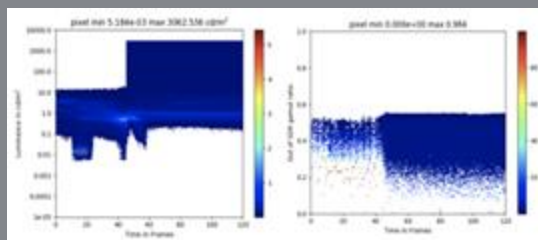
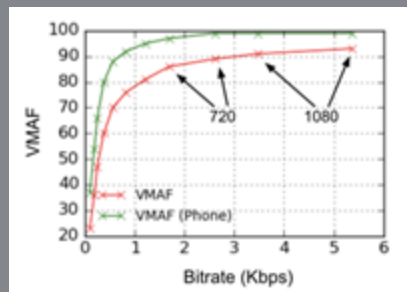
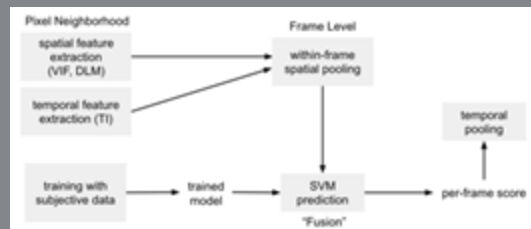


结束语：和开源社区一起，Netflix将致力于完善提高VMAF的性能及扩展其应用场景。The Journey Continues.



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We are hiring!

Senior Research Scientist – Video Encoding: <https://jobs.netflix.com/jobs/867864>

Senior Research Scientist – Video Quality Metrics: <https://jobs.netflix.com/jobs/870423>



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Thank you



出品:  **CSDN**
—— 音视频技术社区 ——