The 'Ins' and 'Outs' of Perceptual Streaming Video
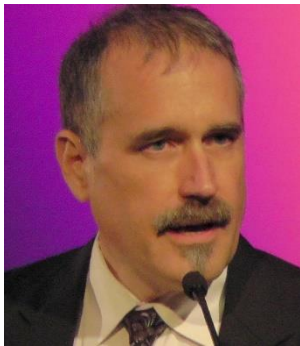
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The large-scale streaming of videos on demand, as exemplified by Netflix, Amazon, and Hulu, is a remarkable engineering achievement embodying major advances in video compression and communications, digital networks, high-speed computation, and displays. Yet significant challenges remain in providing high quality streaming content to consumers. Much focus in the past has been on popular perceptual models like MS-SSIM, VIF, MOVIE, and VMAF, which predict and control the video quality of streaming encodes delivered globally to consumers from the Cloud. However, two other important points along the streaming video workflow are of critical interest: at the In-put and the Out-put.

The In-put is source inspection, where the intrinsic quality and artifacts of source videos are assessed. Content providers ingest massive volumes of legacy contents (e.g., older TV programs and motion pictures) suffering from artifacts such as upscaling, combing and aspect ratio conversion. I will explain new ways to automatically detect and assess visual defects in sourced content, using both neurostatistical video models, as well as contemporary learning methods.

The Out-put occurs at the client-side set-top box / display, where balance tradeoffs between compression and rebuffering is critical. Excessive compression is undesirable, but can be accurately predicted. However, the perceptual effects of video stalls/rebuffering are less well studied. I will describe models that learn to map both stall events and measured video quality to subjective Quality of Experience (QoE) in combined compression-rebuffering scenarios. The ultimate aim are automatic rate control protocols that minimize rebuffering events while maintaining acceptable compressed perceptual picture quality.

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Al Bovik is the Cockrell Family Regents Endowed Chair Professor at The University of Texas at Austin. He has received many major international awards, including the 2017 Edwin H. Land Medal from the Optical Society of America, the 2015 Primetime Emmy Award for Outstanding Achievement in Engineering Development from the Academy of Television Arts and Sciences, and the 'Society and 'Sustained Impact" Awards of the IEEE Signal Processing Society. His is a Fellow of the IEEE, the Optical Society of America, and SPIE. His books include *The Handbook of Image and Video Processing, Modern Image Quality Assessment,* and *The Essential Guides to Image and Video Processing.* Al co-founded and was the longest-serving Editor-in-Chief of the *IEEE Transactions on Image Processing* and created the *IEEE International Conference on Image Processing* in Austin, Texas, in November, 1994.