DCC 2021 is a Virtual Format

Due to continued widespread restrictions caused by the COVID19 pandemic, the DCC 2021 conference format is virtual.

The keynote presentation format is live with questions at the time listed.

Information for on-line access to all presentations, question and answer forums, posters, and the conference proceedings will be provided to registered participants.
WEDNESDAY, March 24
12:30pm - 1:30pm U.S. Mountain Daylight Time (Utah time)

Keynote Speaker
(live presentation)

User-Generated Video Quality Prediction:
From Local to Global

Alan C. Bovik, Director
Laboratory for Image and Video Engineering
The University of Texas at Austin

In this talk I will discuss recent experiments targeting a deeper understanding of the relationships between global and local space-time perception of video quality. Specifically, I will discuss the difficulty of assessing the quality of user-generated videos, which are often distorted, often by multiple commingled processes, and our latest approaches to attacking the problem using deep network architectures.

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 a 2020 Technology and Engineering Emmy Award, the 2019 Progress Medal of the Royal Photographic Society, the 2019 IEEE Fourier Award, the 2017 Edwin H. Land Medal from the Optical Society of America, a 2015 Primetime Emmy Award for Outstanding Achievement in Engineering Development from the Academy of Television Arts and Sciences, and the Norbert Wiener 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.
The year 2020 was unusual and difficult, and it moved compressed video applications to the forefront of everyday life. As the world was hit by a global pandemic on a scale not experienced for a full century, travel and physical interaction outside the home ground to a halt, and people were forced to move much of their life online. Video became central to learning, work, entertainment, health care and socializing, and the growth of video traffic further accelerated. Video usage had already been on an upward trajectory so steep that it had become 80% of internet traffic and was commanding strong attention from the industry, with especially strong growth in ultra high definition television (UHD), high dynamic range (HDR), security monitoring, and emerging immersive applications.

Meanwhile, the development of the next major generation of video coding standard proceeded to completion in the international community. The finalization of Versatile Video Coding (VVC) coincided with the historical year of 2020 as well, arriving to help meet these challenges. Undeterred by the inability to hold face-to-face meetings, the standards groups have adapted and managed to deliver the new standard without delaying its development schedule. Like MPEG-2, H.264 / MPEG-4 AVC and H.265 / HEVC before it, VVC’s main goal has been to address the longstanding problems of the massive bandwidth needed for video and the insatiable desire for improved quality and expanding usage. The fundamental requirement for VVC has been to achieve roughly a 2× improvement in coding efficiency – i.e., a bit rate reduction over its H.265 / HEVC predecessor on the order of 50% for the same visual quality. Considering that most applications are still using AVC, which HEVC had already greatly surpassed by a similar amount, the value proposition posed by VVC in today’s market is truly compelling.

Besides coding efficiency, and as its name emphasizes, versatility is also a central design goal of VVC. A broad diversity of the latest application needs was considered in the development of the VVC standard. Application requirements that were strongly emphasized during its design included UHD, HDR, computer-generated and screen-captured content (e.g., for screen sharing), 360-degree immersive video, and compressed-domain bitstream repurposing. These needs resulted in new coding tools and new high-level functionalities supported in the syntax. Further, VVC version 1 includes profiles that support still picture coding, multi-layer coding, e.g. for spatial, quality and multi-view scalabilities, and the coding of video in non-4:2:0 chroma formats.
Like its major predecessors, VVC has been developed jointly by the two largest international standardization organizations for video coding – the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG). The partnership is known as the Joint Video Experts Team (JVET), and the result is approval of the new design as both ITU-T H.266 and ISO/IEC 23090-3 (MPEG-I Part 3). The core normative VVC specification is also accompanied by a new Versatile Supplemental Enhancement Information (VSEI) standard, referenced as ITU-T H.274 and ISO/IEC 23002-7, which generalizes the approach to handling supplemental data for broad and versatile applicability as well.

Beyond the VVC version 1 specification document, early implementations of VVC have begun to emerge to confirm that the new standard is implementable and ready for real-world deployment. The JVET is also now hard at work developing a version 2 of VVC, which will enhance the design for higher bit-depth and higher bit-rate applications and add other supplemental data and possibly other coding improvement features as well. Beyond VVC, new work is also under way to explore the potential of deep-learning technology for interoperable standardization, with great promise shown in early studies.

Even as we strive to put the COVID-19 pandemic behind us sometime in 2021, the demand for more and better video technology will continue to grow. The new VVC standard will help to meet these needs, and will help illuminate the path forward for the next advances to come.

Gary J. Sullivan has been a chairman and co-chairman of various video and image coding standardization activities in ITU-T VCEG, ISO/IEC MPEG, ISO/IEC JPEG, and in their joint collaborative teams since 1996 and in 2021 became the chair of ISO/IEC JTC 1 Subcommittee 29, the organization that oversees JPEG and MPEG. He has led the development of the Advanced Video Coding (AVC) standard (ITU-T H.264 | ISO/IEC 14496-10), the High Efficiency Video Coding (HEVC) standard (ITU-T H.265 | ISO/IEC 23008-2), the Versatile Video Coding (VVC) standard (ITU-T H.266 | ISO/IEC 29090-3), the various extensions of those standards, and several other standardization projects. He is a Video and Image Technology Architect at Microsoft Research. At Microsoft, he has also been the originator and lead designer of the DirectX Video Acceleration (DXVA) video decoding feature of the Microsoft Windows operating system.

The team efforts that Sullivan has led have been recognized by three Emmy Awards. He has received the SMPTE Digital Processing Medal, the IEEE Masaru Ibuka Consumer Electronics Award, the IEEE Consumer Electronics Engineering Excellence Award, two IEEE Trans. CSVT Best Paper awards, the INCITS Technical Excellence Award, the IMTC Leadership Award, and the University of Louisville J. B. Speed Professional Award in Engineering. He is a Fellow of the IEEE and SPIE.
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Fast Partitioning for VVC Intra-Picture Encoding With a CNN Minimizing the Rate-Distortion-Time Cost

Gerhard Tech, Jonathan Pfaff, Heiko Schwarz, Philipp Helle, Adam Wieckowski, Detlev Marpe, and Thomas Wiegand
Fraunhofer Heinrich Hertz Institute, Germany

A Dual-Critic Reinforcement Learning Framework for Frame-Level Bit Allocation in HEVC/H.265

Yung-Han Ho¹, Guo-Lun Jin¹, Yun Liang¹, Wen-Hsiao Peng¹, and Xiao-bo Li²
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Multi-density Convolutional Neural Network for In-Loop Filter in Video Coding

Zhao Wang, Changyue Ma, Ru-Ling Liao, and Yan Ye
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An Efficient QP Variable Convolutional Neural Network Based In-Loop Filter for Intra Coding

Zhijie Huang, Xiaopeng Guo, Mingyu Shang, Jie Gao, and Jun Sun
Peking University, China

SESSION 2

SLFC: Scalable Light Field Coding

Hadi Amirpour¹, Christian Timmerer¹,², and Mohammad Ghanbari¹,³
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Lossy Compression for Integrating Event Cameras

Andrew C. Freeman and Ketan Mayer-Patel
University of North Carolina

Compression of Point Cloud Geometry Through a Single Projection

Dion E. O. Tzamarias, Kevin Chow, Ian Blanes, and Joan Serra-Sagristà
Universitat Autònoma de Barcelona, Spain

Multiscale Point Cloud Geometry Compression

Jianqiang Wang¹, Dandan Ding², Zhu Li³, and Zhan Ma¹
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A Grammar Compressor for Collections of Reads with Applications to the Construction of the BWT

Diego Díaz-Domínguez and Gonzalo Navarro
University of Chile

Backward Weighted Coding

Aharon Fruchtman¹, Yoav Gross¹, Shmuel T. Klein², and Dana Shapira¹
¹Ariel University, Israel, ²Bar Ilan University, Israel

ndzip: A High-Throughput Parallel Lossless Compressor for Scientific Data

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National University, South Korea, \textsuperscript{4}The University of Tokyo, Japan,
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Low Rank Based End-to-End Deep Neural Network Compression

Swayambhoo Jain, Shahab Hamidi-Rad, and Fabien Racapé

Interdigital AI Lab, USA

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University of California, Merced

Rate-Distortion Optimized Coding for Efficient CNN Compression

Zhe Wang¹, Jie Lin¹, Mohamed Sabry Aly², Sean Young³, Vijay Chandrasekhar¹,², and Bernd Girod³

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Jan Østergaard

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University Trier, Germany

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Roman Kazantsev, Vladimir Yanushkovsky, and Dmitriy Vatolin

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