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October 13th 2023 - 2:30pm

University of Brescia, DII

Edificio ex Ca' Noa - Aula 1

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End-to-End Learned Image and Video Compression: Design, Implementation, and Computer Vision Applications

The DCT-based image and video coding technique was adopted by the international standards (ISO JPEG, ITU H.261/264/265/266, ISO MPEG-2/4/H, and many others) for nearly 30 years. Although researchers are still trying to improve its efficiency by fine-tuning its components and parameters, the basic structure has not changed in the past two decades. The arrival of deep learning recently spurred a new wave of developments in end-to-end learned image and video compression. This fast-growing research area has attracted more than 100+ publications in the literature, with the state-of-the-art end-to-end learned image compression showing comparable compression performance to H.266/VVC intra coding in terms of PSNR-RGB and much better MS-SSIM results. End-to-end learned video coding is also catching up quickly. Some preliminary studies report comparable PSNR-RGB results to H.265/HEVC or even H.266/VVC under the low-delay setting. These interesting results have led to intensive activities in international standards organizations (e.g. JPEG AI) and various Challenges (e.g. CLIC at CVPR and Grand Challenge on Neural Network-based Video Coding at ISCAS). In this talk, I shall overview (1) the progress of this area, with a particular focus on the recent standardization activities in JPEG AI, (2) review some notable end-to-end learned image/video compression systems, and (3) address recent efforts in creating hardware-friendly, low-complexity models. The talk will be concluded with potential research opportunities and an outlook for learned compression systems.

Distinguished Lecture Series 2023

Prof. Wen-Hsiao Peng

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Dr. Wen-Hsiao Peng (M'09-SM'13) received his Ph.D. degree from National Chiao Tung University (NCTU), Taiwan, in 2005. He was with the Intel Microprocessor Research Laboratory, USA, from 2000 to 2001, where he was involved in the development of ISO/IEC MPEG-4 fine granularity scalability. Since 2003, he has actively participated in the ISO/IEC and ITU-T video coding standardization process and contributed to the development of SVC, HEVC, and SCC standards. He was a Visiting Scholar with the IBM Thomas J. Watson Research Center, USA, from 2015 to 2016. He is currently a Professor with the Computer Science Department, National Yang Ming Chiao Tung University, Taiwan. He has authored over 100+ journal/conference papers and over 60 ISO/IEC and ITU-T standards contributions. His research interests include learning-based video/image compression, deep/machine learning, multimedia analytics, and computer vision. Dr. Peng was Chair of the IEEE Circuits and Systems Society (CASS) Visual Signal Processing (VSPC) Technical Committee from 2020-2022. He was Technical Program Co-chair for 2024 PCS, 2021 IEEE VCIP, 2011 IEEE VCIP, 2017 IEEE ISPACS, and 2018 APSIPA ASC; Publication Chair for 2019 IEEE ICIP; Area Chair/Session Chair/Tutorial Speaker/Special Session Organizer for IEEE ICME, IEEE VCIP, and APSIPA ASC; and Track/Session Chair and Review Committee Member for IEEE ISCAS. He served as AEiC for Digital Communications for IEEE JETCAS and Associate Editor for IEEE TCSVT. He was Lead Guest Editor, Guest Editor and SEB Member for IEEE JETCAS, and Guest Editor for IEEE TCAS-II. He was Distinguished Lecturer of APSIPA and the IEEE CASS. He is Editor-in-Chief for the IEEE JETCAS for the term 2024-2025.