

Compact Gaussian Representations for Volumetric Video: From Static Scenes to Dynamic Avatars

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Speaker: Shiqi Wang, Professor, College of Computing, City University of Hong Kong, Hong Kong, China

Abstract: 3D Gaussian Splatting has emerged as an efficient and high-quality representation for volumetric visual content, with growing applications in immersive communication. However, despite its rendering efficiency, the representation typically relies on a large number of Gaussian primitives, leading to substantial storage and transmission overhead that hinders practical deployment. A key challenge is therefore to identify and exploit the redundancy inherent in Gaussian-based representations. In this talk, I will present our recent efforts on compact Gaussian representations for volumetric video. For static scenes, we exploit predictive relationships among Gaussian primitives and integrate rate constraints into representation optimization to reduce spatial redundancy while preserving rendering quality. For dynamic scenes, we further leverage temporal coherence by predicting scene evolution from previously reconstructed Gaussian representations, allowing only compact temporal updates to be transmitted. Moving toward structured human content, we investigate appearance-motion decomposition, where persistent appearance is represented by a shared canonical Gaussian model and temporal variations are described using compact human motion parameters. For head avatars, semantic information is additionally incorporated to guide representation capacity toward visually important regions. We also discuss compression of feed-forward Gaussian representations, where correlations in learned features are reorganized to enable efficient and generalizable coding without scene-specific optimization. These studies demonstrate that compact volumetric representation is closely tied to the underlying structure of the content being represented. By exploiting spatial, temporal, articulated, semantic, and feature-level correlations, Gaussian-based volumetric video can be represented with substantially reduced data rates while retaining high-quality rendering.

Speaker's Bio:



Shiqi Wang is a Professor of Computer Science, and serves as the Associate Dean for College of Computing at the City University of Hong Kong. His research interests include multimedia computing, artificial intelligence (AI), image/video analysis, and AI for science. He received the B.S. degree in computer science from Harbin Institute of Technology in 2008 and the Ph.D. degree in computer application technology from Peking University in 2014. He has proposed more than 80 technical proposals to ISO/MPEG, ITU-T, and AVS standards, and authored or co-authored more than 300 refereed journal articles/conference papers. His research interests include video compression, image/video quality assessment, and image/video search and analysis. He received the

Best Paper Award from IEEE VCIP 2019, ICME 2019, IEEE Multimedia 2018, and PCM 2017. His co-authored article received the Best Student Paper Award at the IEEE ICIP 2018. He was a recipient of the 2021 IEEE Multimedia Rising Star Award in ICME 2021. He served as an Associate Editor for APSIPA Transactions on Signal and Information Processing, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Image Processing, and IEEE Transactions on Multimedia.

Host: Assitant Prof. Xiangjie Sui, City University of Macau, Macau SAR, China

Location: Room T223, Tai Fung Building, City University of Macau, Macau SAR, China

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