

2022 CSIG-VIS International Lecture Series 16

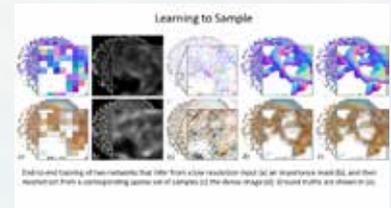
May 5, 2022 19:00-20:30
Beijing time (UTC/GMT+08:00)
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Prof. Rüdiger Westermann Technical University Munich

Neural Network-based Upscaling and Sampling for In-Situ Visualization

Complementary to the use of classical data compression and spatial as well as temporal subsampling schemes for in situ volume visualization, learning-based approaches have recently emerged as an interesting supplement. Here, upscaling refers to the spatial or temporal reconstruction of a signal from a reduced representation that requires less memory to store and sometimes even less time to generate. The concrete tasks where network-based data condensation and upscaling have been shown to work effectively in visualization are variable-to-variable (V2V) transfer, to predict certain parameter fields from others; upscaling in the data domain, to infer the original spatial resolution of a 3D dataset from a downsampled version; and upscaling of temporally sparse volume sequences, to generate refined temporal features. In this talk, I aim at providing a summary of the basic concepts underlying existing learning-based V2V and upscaling approaches, and a discussion of possible use cases for in situ volume visualization. Firstly, I will discuss the basic foundation of learning-based V2V and upscaling, and then shed light on the specific adaptations and extensions that have been proposed in visualization to realize such tasks. Next, I will discuss how these approaches can be employed for in situ visualization, and provide an outlook on future developments in the field.



Rüdiger Westermann, born in Mai 1966, is a Professor for Computer Science at the Technical University Munich. He is head of the Chair for Computer Graphics and Visualization. He received his Diploma in Computer Science from the Technical University Darmstadt in 1991 and his Doctoral degree "with highest honours" from the University of Dortmund in 1996. From 1992 to 1997 he was a member of the research staff at the German National Institute for Mathematics and Computer Science in St. Augustin, Bonn, where he worked together with Wolfgang Krüger on parallel graphics algorithms. In 1998, he joined the Computer Graphics Group at the University of Erlangen-Nuremberg as a research scientist. Before he became an Assistant Professor in the Visualization Group at the University of Stuttgart in 1999 he was a Research Assistant in the Multires Group at Caltech and a Visiting Professor with the Scientific Computing Laboratory at the University of Utah. In 2001 he was appointed by the RWTH-Aachen as an Associate Professor for Scientific Visualization in the Department of Computer Science. Since 2003, Rüdiger Westermann is Chair of the Computer Graphics and Visualization group. In 2012, he was honored an ERC Advanced Grant worth 2.3 million Euros for research in the area of uncertainty visualization. Since 2015, he is part of the Transregional Collaborative Research Center "Waves to Weather", where he supports meteorologists with visual analytics and deep learning approaches for identifying the limits of weather predictability. His recent research activities include stress-guided topology optimization with Prof. Jun Wu from TU Delft, as well as learning-based methods for data visualization and reconstruction, compression and feature analysis.