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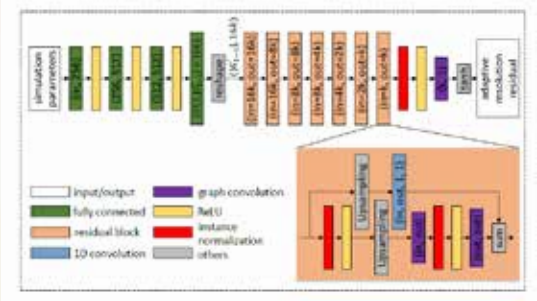
Machine Learning for Scientific Visualization

In this talk, I will discuss several of our recent development on using machine learning algorithms for scientific data analysis and visualization. I will first present a neural network designed for 3D point clouds by geometric convolution, which can be extracted by clustering in the latent space, and tracked by applying tracking algorithms such as mean-shift. Then, I will describe a load-balanced particle tracing algorithm based on an online reinforcement learning paradigm, where three core components are developed to dynamically optimize parallel particle tracking performance in distributed memory systems. Additionally, I will discuss STSRNet, leveraging a deep learning model to capture the non-linear complex changes of vector field data to reconstruct high temporal resolution (HTR) and high spatial resolution (HSR) vector fields sequence from the corresponding low-resolution key frames. Finally, as a preview of our upcoming pacific vis paper (selected to publish in TVCG), GNN-Surrogate is a graph neural network-based surrogate model, making the exploration of simulation outputs on irregular grids efficient.



Han-Wei Shen is a Full Professor at The Ohio State University, member of IEEE Visualization Academy, the Associate Editor in Chief for IEEE Transactions on Visualization and Computer Graphics,. Before, he served on the IEEE Visualization conference executive committee, and IEEE SciVis steering committee. His primary research interests are scientific visualization and computer graphics. Professor Shen is a winner of National Science Foundation's CAREER award and US Department of Energy's Early Career Principal Investigator Award. He has served as an Associate Editor for IEEE Transactions on Visualization and Computer Graphics and the paper chair of many top conferences. He has published more than 50 papers in IEEE Transactions on Visualization and Computer Graphics and IEEE Visualization conference, the very top journal and conference.

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