

Interpretable and Effective Learning for 3D Point Cloud Registration, Classification and Segmentation

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3D point cloud analysis and processing find numerous applications in computer-aided design, 3D printing, autonomous driving, etc. Most state-of-the-art point cloud processing methods are based on convolutional neural networks (CNNs). Although they outperform traditional methods in terms of accuracy, they demand heavy supervision and higher training complexity. Besides, they lack mathematical transparency. In this talk, I will present three interpretable and effective machine learning methods for 3D point cloud registration, classification, and segmentation, respectively. First, an unsupervised registration method that extracts salient points for matching is presented. Second, an unambiguous way to order points sequentially in a point cloud set is developed. Then, their spatial coordinates can be treated as geometric attributes of 1D data array. This idea facilitates the classification task. Third, for the segmentation task, we show how to leverage prior knowledge on point clouds to derive an intuitive and effective segmentation method. Extensive experiments are conducted to demonstrate the performance of the three new methods. I will also provide performance benchmarking between these interpretable methods and deep learning methods.

Speaker's Biography



Dr. C.-C. Jay Kuo received his Ph.D. degree from the Massachusetts Institute of Technology in 1987. He is now with the University of Southern California (USC) as William M. Hogue Professor, Distinguished Professor of Electrical and Computer Engineering and Computer Science, and Director of the Media Communications Laboratory. His research interests are in visual computing and communication. He is a Fellow of AAAS, NAI, IEEE and SPIE and an Academician of Academia Sinica.

Dr. Kuo has received a few awards for his research contributions, including the 2010 Electronic Imaging Scientist of the Year Award, the 2010-11 Fulbright-Nokia Distinguished Chair in Information and Communications Technologies, the 2019 IEEE Computer Society Edward J. McCluskey Technical Achievement Award, the 2019 IEEE Signal Processing Society Claude Shannon-Harry Nyquist Technical Achievement Award, the 72nd annual Technology and Engineering Emmy Award (2020), and the 2021 IEEE Circuits and Systems Society Charles A. Desoer Technical Achievement Award. Dr. Kuo was Editor-in-Chief for the IEEE Transactions on Information Forensics and Security (2012-2014) and the Journal of Visual Communication and Image Representation (1997-2011). He is currently the Editor-in-Chief for the APSIPA Trans. on Signal and Information Processing (2022-2023). He has guided 164 students to their PhD degrees and supervised 31 postdoctoral research fellows.