院士講座

Green Learning for Point Cloud Analysis

演講者

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Abstract

Low carbon footprints, small model sizes, low computational complexity, and mathematical transparency characterize the emerging green learning (GL) paradigm. GL offers energy-effective models in cloud centers and mobile/edge devices. GL has been successfully applied to a few applications. The design of a tiny machine learning model for point cloud object classification is presented as an example in this talk. To achieve GL's objective, we replace the multi-scale representation of a point cloud object with a single-scale representation for complexity reduction and exploit the rich 3D geometric information of a point cloud object for performance improvement. The proposed solution is named "Green-PointHop" due to its low computational complexity. We evaluate the performance of Green-PointHop on ModelNet40 and ScanObjectNN datasets. Green-PointHop has a model size of 64K parameters. It demands 2.3M floating-point operations (FLOPs) to classify a ModelNet40 object of 1024 down-sampled points. Its classification performance gaps against the state-of-the-art DGCNN method are 3% and 7% for ModelNet40 and ScanObjectNN, respectively. Conversely, the model size and inference complexity of DGCNN are 42X and 1203X of those of Green-PointHop, respectively. Other evidence of the power of GL, such as point cloud registration and 3D scene flow estimation, will also be given.

Biography

Dr. C.-C. Jay Kuo received his Ph.D. 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, ACM, IEEE, NAI, 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 168 students to their Ph.D. degrees and supervised 31 postdoctoral research fellows.

【主辦單位】 國立陽明交通大學電子研究所、電信工程研究所
【協辦單位】 IEEE Communications Society, Taipei Chapter
IEEE Vehicular Technology Society, Taipei Chapter