Multi-scale Shuffling Convolutional Neural Networks for Deep Semantic Image Segmentation Using Multi-Modal Data

Corresponding authors:

   Kaiqiang Chen[1,2]:   chenkaiqiang14@mails.ucas.ac.cn

   Martin Weinmann[3]:   martin.weinmann@kit.edu

[1]Key Laboratory of Spatial Information Processing and Application System Technology, Institute of Electronics, Chinese Academy of Sciences, Beijing, P.R. China

[2]University of Chinese Academy of Sciences, Beijing, P.R. China

[3]Institute of Photogrammetry and Remote Sensing, Karlsruhe Institute of Technology, Karlsruhe, Germany

Brief summary of the applied methodology:

1) Feature extraction:

   - Radiometric features
     (IR, R, G, NDVI, and 4 modified variants of these)

   - Geometric features
     (8 local 3D shape features derived from the 3D structure tensor)

2) Supervised classification:

   - Based on the use of a Residual Shuffling Convolutional Neural Network (RSCNN) [1]
     (which combines the characteristics of a Residual Network with the advantages of atrous convolution and a shuffling operator)

   - Multi-scale Shuffling Convolutional Neural Network based on the RSCNN-101 architecture, where features from different layers with different scales are fused
     (for better training, deep supervision is introduced)

[1] K. Chen, M. Weinmann, X. Gao, M. Yan, S. Hinz, B. Jutzi, M. Weinmann, 2018. Residual Shuffling Convolutional Neural Networks for Deep Semantic Image Segmentation Using Multi-Modal Data. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*