



# Scene Classification Using Multi-Resolution WAHOLB Features and Neural Network Classifier

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## Scene Classification Using Multi-Resolution WAHOLB Features and Neural Network Classifier

Gholam Ali Montazer<sup>1,2</sup> · Davar Giveki<sup>2</sup>

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**Abstract** This article approaches scene classification problem by proposing an enhanced bag of features (BoF) model and a modified radial basis function neural network (RBFNN) classifier. The proposed BoF model integrates the image features extracted by histogram of oriented gradients, local binary pattern and wavelet coefficients. The extracted features are obtained in a hierarchical multi-resolution manner. The proposed approach is able to capture multi-level (the pixel-, patch-, and image-level) features. The histograms of features constructed by BoF model are then used for training a modified RBFNN classifier. As a modification, we propose using a new variant of particle swarm optimization, in which the parameters are updated adaptively, for determining the center of Gaussian functions in RBFNN. Experimental results demonstrate that our proposed approach significantly outperforms the state-of-the-art methods on scene classification of OT, FP, and LSP benchmark datasets.

**Keywords** Scene classification · Radial basis function neural network (RBFNN) classifier · Modified PSO–OSD (mPSO–OSD) · Bag of features (BoF) · Wavelet transform · HOG · LBP

### 1 Introduction

Computer vision has become ubiquitous in our society, with applications in search, image understanding, apps, mapping, medicine, drones, and self-driving cars. Core to many of

✉ Gholam Ali Montazer  
montazer@modares.ac.ir

Davar Giveki  
Giveki@students.irandoc.ac.ir

<sup>1</sup> Information Technology Engineering Department, School of Engineering, Tarbiat Modares University, P.O. Box 14115-179, Tehran, Iran

<sup>2</sup> Iranian Research Institute for Information Science and Technology (IranDoc), Tehran, Iran

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**چکیده:**

This article approaches scene classification problem by proposing an enhanced bag of features (BoF) model and a modified radial basis function neural network (RBFNN) classifier. The proposed BoF model integrates the image features extracted by histogram of oriented gradients, local binary pattern and wavelet coefficients. The extracted features are obtained in a hierarchical multi-resolution manner. The proposed approach is able to capture multi-level (the pixel-, patch-, and image-level) features. The histograms of features constructed by BoF model are then used for training a modified RBFNN classifier. As a modification, we propose using a new variant of particle swarm optimization, in which the parameters are updated adaptively, for determining the center of Gaussian functions in RBFNN. Experimental results demonstrate that our proposed approach significantly outperforms the state-of-the-art methods on scene classification of OT, FP, and LSP benchmark datasets.

کلیدواژه‌ها:

[Scene classification](#) - [Radial basis function neural network \(RBFNN\) classifier](#) - [Modified PSO-OSD](#)  
([mPSO-OSD](#)) - [Bag of features \(BoF\)](#) - [Wavelet Transform](#) - [HOG](#) - [LBP](#)

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