

# Simultaneous Image Classification and Annotation Using Probabilistic Topic Models and LLC Encoding of Visual Words

Seyed Navid Mohammadi Foumani

Ahmad Nickabadi

Department of Computer Engineering and Information Technology, Amirkabir University of Technology, Tehran, Iran

## ABSTRACT

There have been several attempts so far to use topic models like LDA for simultaneous image classification and annotation. Recently, other models based on probabilistic neural networks, e.g. SupDocNADE, have been introduced with promising results in modeling multinomial data. In these models, annotation words along with visual words are embedded in the same framework and are considered as the feature vector. The imbalance between the number of visual words and annotation words may cause some problems. For instance, the contribution of the annotation words to the hidden representation is so smaller than the contribution of the visual words that the network might easily ignore it. To address this issue, we propose a weighting scheme for the annotation words. We also use LLC to generate the visual words in our proposed model. Experimental results show a 5% increase in the F-measure in the proposed annotation words and a 1% improvement in classification accuracy compared to existing models on UIUC\_Sports and LabelMe datasets.

**Keywords:** Image Classification and Annotation, Topic Models, Probabilistic Model, Neural Network, LLC Coding.