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A Supervised Neural Autoregressive Topic Model for Simultaneous Image Classification and Annotation

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(Submitted on 23 May 2013)

Topic modeling based on latent Dirichlet allocation (LDA) has been a framework of choice to perform scene recognition and annotation. Recently, a new type of topic model called the Document Neural Autoregressive Distribution Estimator (DocNADE) was proposed and demonstrated state-of-the-art performance for document modeling. In this work, we show how to successfully apply and extend this model to the context of visual scene modeling. Specifically, we propose SupDocNADE, a supervised extension of DocNADE, that increases the discriminative power of the hidden topic features by incorporating label information into the training objective of the model. We also describe how to leverage information about the spatial position of the visual words and how to embed additional image annotations, so as to simultaneously perform image classification and annotation. We test our model on the Scene15, LabelMe and UIUC-Sports datasets and show that it compares favorably to other topic models such as the supervised variant of LDA.

Comments:	13 pages, 5 figures
Subjects:	**Computer Vision and Pattern Recognition (cs.CV)**; Learning (cs.LG); Machine Learning (stat.ML)
Cite as:	**arXiv:1305.5306** [cs.CV]
	(or **arXiv:1305.5306v1** [cs.CV] for this version)

Submission history

From: Yin Zheng [view email]
[v1] Thu, 23 May 2013 03:35:31 GMT (2207kb,D)

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