

PARTIAL MEMBERSHIP LATENT DIRICHLET ALLOCATION

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ABSTRACT

For many years, topic models (e.g., pLSA, LDA, SLDA) have been widely used for segmenting and recognizing objects in imagery simultaneously. However, these models are confined to the analysis of categorical data, forcing a visual word to belong to one and only one topic. There are many images in which some regions cannot be assigned a crisp categorical label (e.g., transition regions between a foggy sky and the ground or between sand and water at a beach). In these cases, a visual word is best represented with partial memberships across multiple topics. To address this, we present a partial membership latent Dirichlet allocation (PM-LDA) model and associated parameter estimation algorithms. PM-LDA defines a novel partial membership model for word and document generation. We employ Gibbs sampling for parameter estimation. Experimental results on two natural image datasets and one SONAR image dataset show that PM-LDA can produce both crisp and soft semantic image segmentations; a capability existing methods do not have.