Pseudo-supervised Approach for Text Clustering Based on Consensus Analysis

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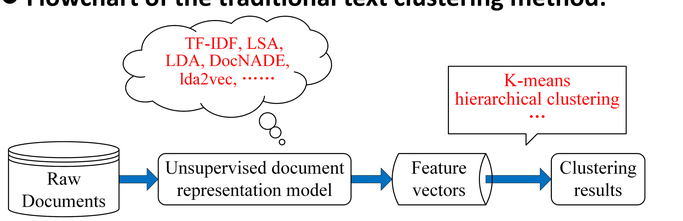
Abstract

- Compared with unsupervised models, the supervised neural networks usually generate more discriminative features.
- In text clustering, a typical unsupervised task, there are no predefined labels for modeling training.
- To benefit from the discriminative ability of the supervised neural networks, we propose a pseudo-supervised approach for text clustering.

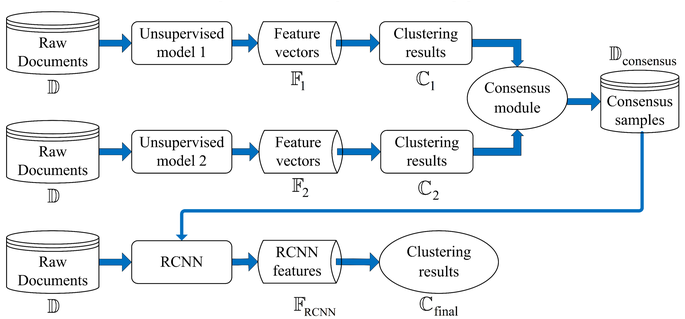
Background

- Flowchart of the traditional text clustering method:



Pseudo-supervised Approach

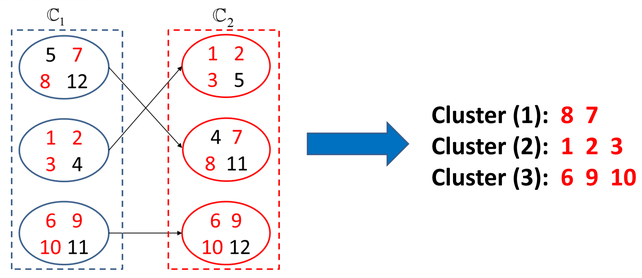
- Flowchart of the pseudo-supervised approach:



➢ **Step 1: Consensus Samples Generation:**

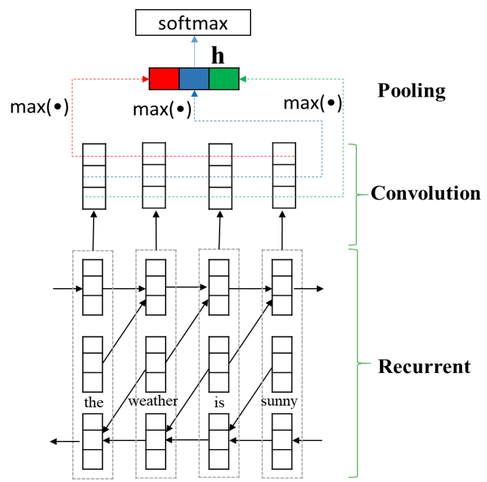
a) Align the cluster labels of two pre-clusterings $\mathbb{C}_1$ and $\mathbb{C}_2$ by Kuhn-Munkres algorithm. (Maximum Weighted Bipartite Matching)

b) The documents with consistent cluster labels in $\mathbb{C}_1$ and $\mathbb{C}_2$ are selected.



➢ **Step 2: RCNN training:**

The RCNN is trained on the consensus samples $\mathbb{D}_{consensus}$, using the cluster labels as pseudo-labels for training.



➢ **Step 3: Clustering:**

We utilize the trained RCNN to obtain the semantic features $\mathbf{h}$ for clustering.

Experiments

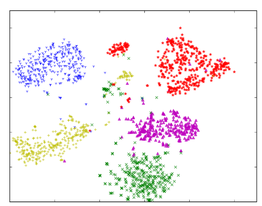
- Dataset: Fisher English corpus (released by LDC), which contains 11699 documents and involves 40 topics in total.
- Experimental results:

Table 1. ACC(%)/NMI(%) of baseline systems

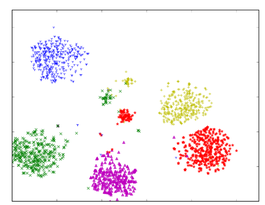
	30	40	50
LSA	69.08/78.29	80.43/81.29	76.39/80.14
LDA	72.34/78.95	**81.42**/81.97	74.85/80.13
DocNADE	**74.20/80.93**	80.70/**82.47**	**77.28/81.40**
lda2vec	72.74/79.77	80.37/80.91	74.95/79.73
TF-IDF	64.52/71.62	73.05/74.34	69.53/74.23

Table 2. ACC(%)/NMI(%) of pseudo-supervised frameworks

	30	40	50
LSA-LDA	76.39/84.14	89.19/89.65	84.80/**89.09**
LSA-lda2vec	76.61/85.12	**90.75/91.17**	83.20/88.81
LDA-DocNADE	76.66/84.37	89.64/90.09	**84.84**/88.18
DocNADE-lda2vec	**77.50/86.06**	87.43/89.36	84.24/88.39
LDA	72.33/78.96	81.76/82.38	75.18/80.48
DocNADE	74.28/81.07	80.81/82.65	77.41/81.73



(a) t-SNE of LDA features



(b) t-SNE of LSA-LDA pseudo-supervised features