Sentiment Analysis via Deep Hybrid Textual-Crowd Learning Model

Motivations

- *Crowdsourcing* provides a useful platform to employ human skills in *sentiment analysis*.
- Crowdsourcing aggregation models are *incompetent* when the number of crowd labels per worker is *not sufficient* to train parameters, or when it is *not feasible* to collect labels for each sample in a large dataset.
- Crowdsourcing aggregation models do not utilize *text data*, and consider *crowd labels* as the only source of information.

Contributions

- Proposing a *hybrid crowd-text model* for sentiment analysis, consisting of a *generative crowd aggregation model* and a *deep sentimental autoencoder*.
- Defining a *unified objective function* for the hybrid model, and deriving an *efficient optimization algorithm* to solve the problem.
- Achieving *superior or competitive results* compared to alternative models, especially when the crowd labels are *scarce*.

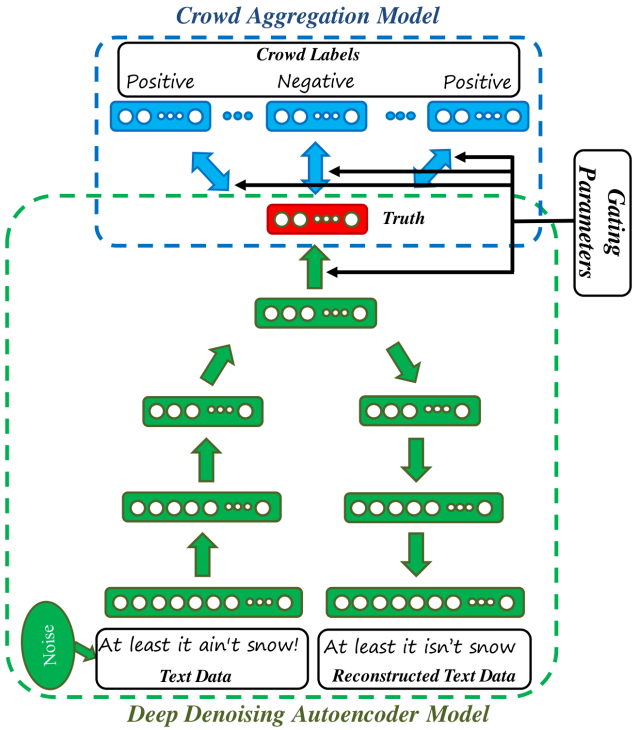

Figure : *CrowdDeepAE* architecture.

(a) *MV-DeepAE* (b) *CrowdDeepAE*

Figure : 2D visualization of *CrowdDeepAE* (ours) and *MV-DeepAE* features on *CrowdFlower* dataset using PCA, when only 20% of the crowd data is available.

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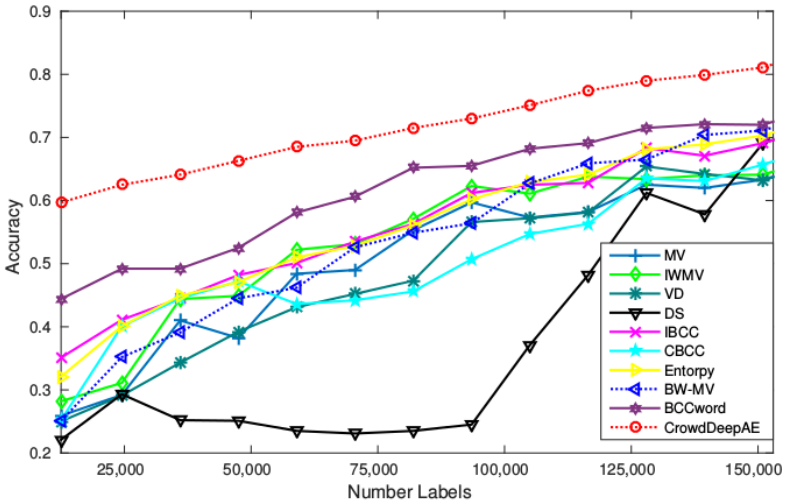
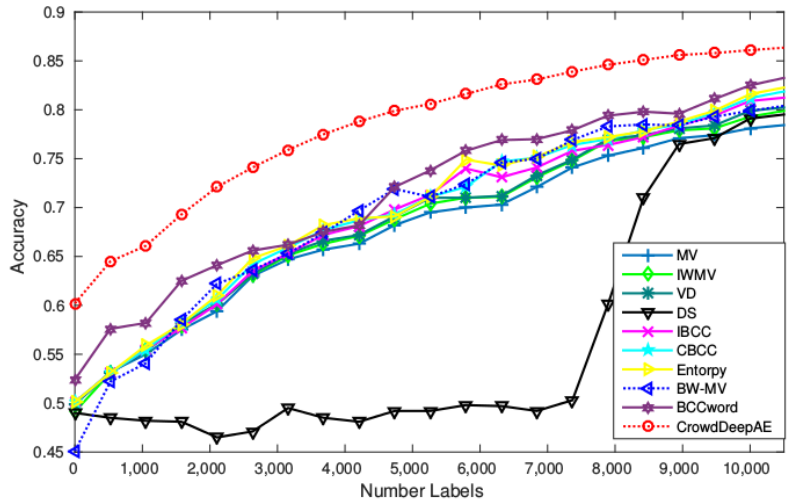


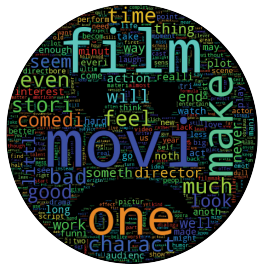
(a) *CrowdFlower* (*CF*)



(b) *SentimentPolarity* (*CF*)

Figure : Accuracy of crowdsourcing aggregation models on *CrowdFlower* (*CF*) and *SentimentPolarity* (SP) datasets, when increasing the number of crowd labels.

(a) Pos-docStatistic



(b) Neg-docStatistic

(c) Pos-CrowdDeepAE

(d) Neg-CrowdDeepAE

Figure : Word clouds of the positive (Pos) and negative (Neg) sentiments in SP dataset. The extracted word clouds using the statistics of documents (docStatistic) and our language model (*CrowdDeepAE*) are shown in the left and right, respectively. The colors are only for legibility.