



"Challenges and future in deep learning for sentiment analysis: a comprehensive review and a proposed novel hybrid approach"

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Abstract

Social media is used to categorise products or services, but analysing vast comments is time-consuming. Researchers use sentiment analysis via natural language processing, evaluating methods and results conventionally through literature reviews and assessments. However, our approach diverges by offering a thorough analytical perspective with critical analysis, research findings, identified gaps, limitations, challenges and future prospects specific to deep learning-based sentiment analysis in recent times. Furthermore, we provide in-depth investigation into sentiment analysis, categorizing prevalent data, pre-processing methods, text representations, learning models, and applications. We conduct a thorough evaluation of recent advances in deep learning architectures, assessing their pros and cons. Additionally, we offer a meticulous analysis of deep learning methodologies, integrating insights on applied tools, strengths, weaknesses, performance results, research gaps, and a detailed feature-based examination. Furthermore, we present in a thorough discussion of the challenges, drawbacks, and factors contributing to the successful enhancement of accuracy within the realm of sentiment analysis. A critical comparative analysis of our article clearly shows that capsule-based RNN approaches give the best results with an accuracy of 98.02% which is the CNN or RNN-based models. We implemented various advanced deep-learning models across four benchmarks to identify the top performers. Additionally, we introduced the innovative CRDC (Capsule with Deep CNN and Bi structured RNN) model, which demonstrated superior performance compared to other methods. Our proposed approach achieved remarkable accuracy across different databases: IMDB (88.15%), Toxic (98.28%), CrowdFlower (92.34%), and ER (95.48%). Hence, this method holds promise for automated sentiment analysis and potential deployment.

Keywords Sentiment analysis (SA) · Deep learning · Classifiers · Neural network (NN) · Attention · Capsule network