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Arindam Chaudhuri

Visual and Text Sentiment Analysis through Hierarchical Deep Learning Networks

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To my family and teachers

Preface

In everyday life, opinions form the central point of all human activities. They are our major behaviour influencers. The beliefs and reality perceptions and the choices we consider are dependent upon how people see and assess the world. As a result of this when we make any decision, we often seek out other's opinions of others. This is not only true for individuals but also true for organizations. The opinions and related concepts such as sentiments, evaluations, attitudes and emotions are the subjects of study of sentiment analysis and opinion mining. The inception and rapid growth of the field coincide with those of the social media on the Web, for example reviews, forum discussions, blogs, microblogs and social networks, as we have a large volume of opinion-based data placed in digital forums. Since the past decade, sentiment analysis has evolved as one of the most active research areas in natural language processing. It is also widely studied in data mining, Web mining and text mining. In fact, it has spread from computer science to management sciences and social sciences due to its importance to business and society as a whole. The industrial activities revolving sentiment analysis have also come up. Many established companies have built their own in-house capabilities. The sentiment analysis systems have found their applications in almost every business and social domain. The problem has been approached through various machine learning tools in the past including deep learning. Considering the current developments in deep learning framework, this monograph presents the research work done in visual and textual sentiment analysis through hierarchical deep learning networks. The unstructured text and image data are adopted from Twitter, Instagram, Viber and Snapchat blogs. This work facilitates qualitative and quantitative opinion analysis. This is crucial for practical applications. This work is suitable for students, researchers and professionals working in visual and textual social media analysis. This research supplements any natural language processing, social media analysis, text mining and data mining courses.

Noida, India — Arindam Chaudhuri

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About the Author

Arindam Chaudhuri is currently working as Principal Data Scientist at the Samsung R & D Institute in Delhi, India. He has worked in industry, research and academics in the domain of machine learning for the past 19 years. His current research interests include pattern recognition, machine learning, soft computing, optimization and big data. He received his M.Tech. and Ph.D. in Computer Science from Jadavpur University, Kolkata, India, and Netaji Subhas University, Kolkata, India, in 2005 and 2011, respectively. He has published three research monographs and over 45 articles in international journals and conference proceedings.

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Abstract

Social media sentiment analysis has gained considerable attention in the recent past. Here, sentiments in Twitter, Instagram, Viber and Snapchat blogs comprising of visual and textual contents are analysed using hierarchical gated feedback recurrent neural network (HGFRNN). HGFRNN is developed considering stacking of several recurrent layers by signal flow control from upper to lower layers through connecting units. HGFRNN is evaluated with different types of recurrent units. There is an adaptive assignment of HGFRNN layers in a temporal manner as well as layer-wise interactions by learning to gate corresponding interactions. Considering the requirements of a huge amount of social multimedia contents towards sentiment analysis, the visual and textual sentiment analysis techniques are joined together leading to the formation of multimodal sentiment analysis. The proposed method yields promising results from Twitter, Instagram, Viber and Snapchat datasets.

Keywords Sentiment analysis · Information retrieval · GFRNN · Text features · Visual features · Twitter · Instagram · Viber · Snapchat · Blogs

Synopsis of the Proposed Book

Sentiment analysis of social media is an interesting and challenging task. This has attracted significant research interest recently. Several studies have been performed, but most of the current methods focus on either only textual content or only visual content. This book presents current research on hierarchical deep learning for sentiment analysis. In this direction, this work aims at analysing sentiments in Twitter blogs from both textual and visual content using a hierarchical deep learning network, viz. hierarchical gated feedback recurrent neural network (HGFRNN). The mathematical abstraction of the sentiment analysis model is presented in a very lucid manner. The complete sentiment is analysed by combining text and visual prediction results. The textual results exceed visual results. The performance is further improved by introducing visual content which reaches good performance levels. The novelty of the work lies in developing novel hierarchical recurrent neural networks for analysing sentiments, stacking of multiple recurrent layers by controlling signal flow from upper recurrent layers to lower layers through global gating unit, evaluation of HGFRNN with different types of recurrent units and adaptive assignment of HGFRNN layers to different timescales and layer-to-layer interactions by learning to gate corresponding interactions. Considering the needs to leverage large-scale social multimedia contents for sentiment analysis, both state-of-the-art visual and textual sentiment analysis techniques are used for joint visual–textual sentiment analysis. The experiments are performed on Twitter datasets, and the results support the theoretical hypothesis. The proposed method yields promising results from Twitter datasets that include both texts and images. The proposed sentiment analysis model can be applied to any social blog dataset. The book is highly beneficial for postgraduate students and researchers in deep learning and sentiment analysis.