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Teaching Performance Evaluation

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Abstract: *Student's feedback is crucial for academic institutions in order to evaluate faculty performance. Handling the qualitative opinions of students efficiently while automatic report generation is a challenging task. Indeed, most of the organizations deal with quantitative feedback effectively, whereas qualitative feedback is either processed manually or ignored altogether. This research proposes a supervised aspect based opinion mining system based on two layered LSTM model. The first layer predicts the aspects described within the feedback and later specifies the orientation (positive, negative, neutral) of those predicted aspects. The model was tested on a manually tagged data set constructed from the last five years students' comments from Sukkur IBA University as well as on a standard SemEval-2014 data set. Unlike many other LSTM models proposed for other domains, the proposed model is quite simple in terms of architecture which results in less complexity. The system attains good accuracy using the domain embedding layer in both tasks: aspect extraction (91%) and sentiment polarity detection (93%). To the best of our knowledge, this study is a first attempt that uses deep learning approach for performing aspect based sentiment analysis on students' feedback for evaluating faculty teaching performance.*

Keywords: Aspect Extraction, Deep Learning, Long Short Term Memory Network ,Opinion Mining, Polarity Detection, Student Feedback

I. INTRODUCTION

In this era of digital world,mining people's opinion is very crucial in order to dig out the useful insights and their sentiments regarding any specific entry. It is a common practice that when it comes to decision making ,individuals or organizations prefer to seek out other's opinions. Similarly in academi ,faculty teaching performance is evaluated through student's feedback provided at the end of each course. The quantitative responses are then aggregated and used as a measure to gauge the teaching quality of concerned faculty members. Though student feedback form is not only comprised of closed ended questions,it also provides students with a space for textual comments,an open ended feedback to express their thoughts and experiences. It provides students with an opportunity to give suggestions and opinions about various teaching aspects not covered by quantitative metric.However , manual handling of qualitative opinions is a very tedious task, as a result it is either being ignored altogether or full of biases. So there is a need to automate this process to analyze student's feedback and this task comes under the emergent area of opinion mining.On the contrast, students describe various aspects of a teacher like teaching pedology,communication skills,technical knowledge etc. in their feedback

II. PROPOSED SYSTEM

Our proposed framework is comprised of two layered LSTM model for aspect extraction and sentiment classification. The first layer classifies a review sentence in one of the six aspects including- Teaching Pedagogy, Behavior, Knowledge, Assessment, Experience, and General. Next, the second LSTM layer predicts the sentiment orientation (+ve, −ve or Neutral) expressed towards that particular aspect. The advantage of using this two layered model is that if decoupled these two layers can still be used to perform the individual job of aspect extraction or sentiment polarity detection. We have also built and incorporated domain word embedding into these models. Both layers using domain embedding demonstrate reasonable performance at their respective tasks. It provides students with an opportunity to give suggestions and opinions about various teaching aspects not covered by quantitative metric. However, manual handling of qualitative opinions is a very tedious task, as a result, it is either being ignored altogether or full of biases.

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III. METHODOLOGY

- **DOMAIN UNDERSTANDING**: In order to identify the labeling categories of our academic domain data set, It was required to know the core aspects or parameters of a teacher, considered by management while evaluating faculty teaching performance. For this purpose, we needed the output of domain experts especially people designated at different managerial positions in academics. As these are the people who have a great deal of experience to share about different parameters on which the teaching performance is assessed. To collect their responses, we designed a structured interview based on 10 questions verified by the Quality Enhancement Cell(QEC) of Sukkur IBA University. Interview questions are mentioned in Appendix .The interview duration was set to 15 minutes. We chose a structured interview for data collection as these are easy to replicate and fairly quick to conduct that ultimately save the time of interviewer and Interviewer.
- **DATA ACQUISITION** : After identifying aspect categories, the next step was to acquire data of student's feedback. To the best of our knowledge, there is no any publically available data set of students' feedback for performing ABSA. For this study, we used last the dataset as feedbacks .Usually, the university is processing feedback manually by tagging each students comments in positive or negative category. The presence of negative comments within feedback is indicated through manual highlighting process done by domain experts. Despite doing this hectic work, this still does not specify the teacher's aspect discussed within that comment. As the feedback's were already tagged with orientation, our next task was to assign a proper aspect label to each feedback.
- **PREPROCESSING & DATA CLEANING:** At first, when we reviewed our data set it was having comments about both teacher and course. So, we kept only those comments that were given for the teachers and discarded others. The filtered data set had near about 2000 comments given specifically for the teacher. Secondly, it consisted of paragraphs where students evaluated their teachers in various aspects. So in our first step, we used OpenNLP to break the paragraphs into multiple sentences. By default, it used period sign (.) for splitting a sentence but then again considering the data set we found sentences where connectives like "AND" & "BUT" were used. Their usage causes the inclusion of multiple aspects within a single sentence. For example, consider a sentence: Sir was fair during the assessment and taught the concepts well. Here, the student appreciated two aspects of a teacher that is Assessment and Teaching Skills by using connective "And". Similarly in another sentence "But" is used as a connective between behavior and teaching skill. Good behavior but should be slow in pace while teaching. So in order to capture a single aspect from a sentence, we further break a sentence on these connectives. In addition to this, data had a lot of irrelevant symbols like tags, colon, semicolon, and emoticons. So we performed the data cleaning to remove noise from the data. In this step, stop words like is, am, are, an etc. were further removed by using a list of stop words from Natural Language Toolkit(NLTK) corpus.
- **DOMAIN WORD EMBEDDINGS**: One of the main features that we used in our methodology is academic domain word embeddings to represent words semantically .. By doing so, we expect that these trained domain embeddings capture semantic similarities between words in a better way. To generate these domain word embedding, we have used a skip gram model.
- **LSTM Model for Layer1 and Layer2** : The working mechanism of our proposed LSTM model that we have used in both steps of Aspect extraction and opinion orientation . Unlike other studies, we have not modeled this problem as a sequence labeling task where the data is initially labeled through various tagging schemes like IOB2, rather we have simply used a tagged data set where we have manually tagged reviews as per their respective labels categories. So our proposed model classifies a review in the specified categories by using LSTM neural network. LSTM is one of the special variants of RNN that overcomes the problem of vanishing gradient problem . It has the ability to store longer memory and better control on what to store and discard. Moreover, it has a gating mechanism to control information flow inside the LSTM cell.

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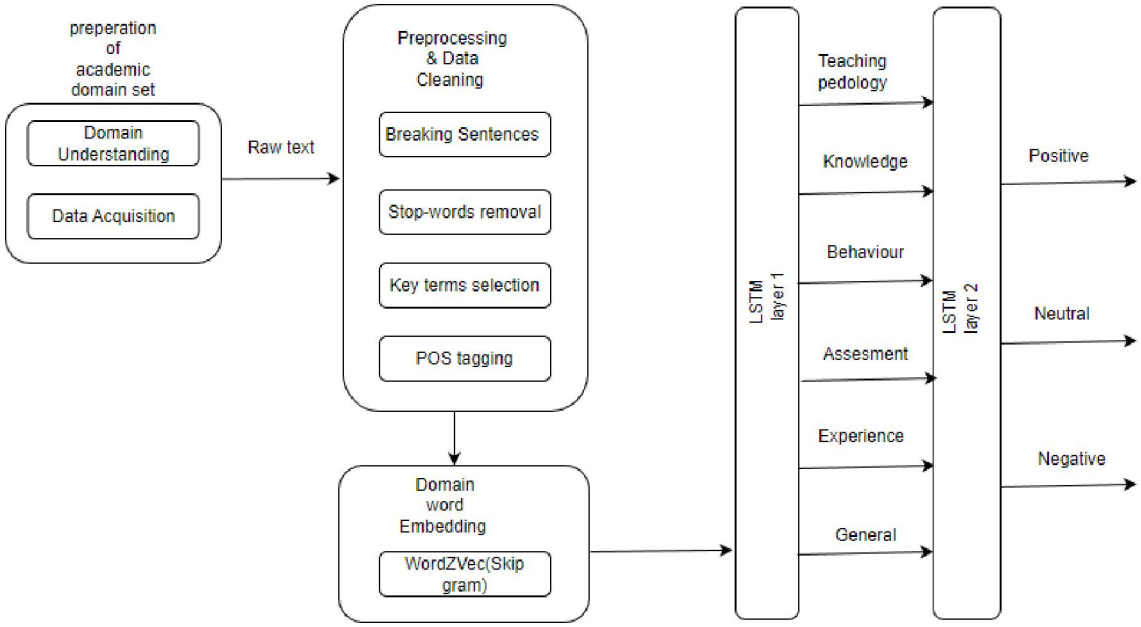

Figure1 : Flow diagram of Methodology

IV. SYSTEM ARCHITECTURE

The model was tested on a manually tagged data set constructed data set. Unlike many other LSTM models proposed for other domains,the proposed model is quite simple in terms of architecture which results in less complexity. The system attains good accuracy using the domain embedding layer in both tasks aspect extraction(91%) system performs ABSA on student's textual feedback to evaluate the teaching quality of concerned faculty member.

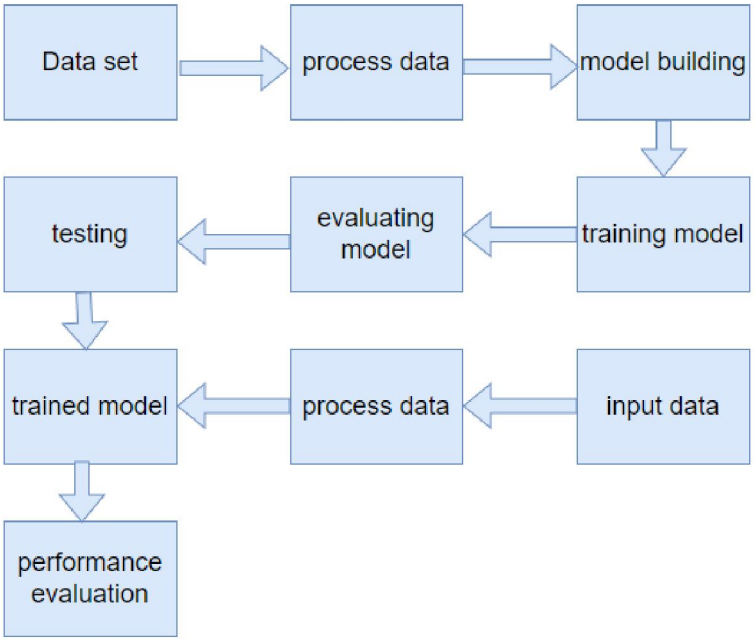

Figure 2 : System architecture

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V. CONCLUSION

Students while performing teacher's evaluation discuss several aspects of a teacher in their comments. Manual processing of these comments and reviewing every mentioned aspect polarity is a laborious job. Though their thorough understanding acts as a metric for evaluating faculty teaching performance . In this research, proposed a system for automatically extracting aspects from the available text and their corresponding orientation. As no predefined aspects categories were available for teacher evaluation, therefore with domain expert's guidance we finalized six aspect categories including Teaching pedology, Knowledge, assessment, experience, behavior and general. The model used two layered LSTMs models for the task of aspect extraction and polarity detection respectively. Also evaluated the model performance by using different word embedding and got promising results when we used domain embedding as an embedding layer. These domain embeddings were created through the skip gram model. And get satisfactory results by achieving 9% accuracy in aspect extraction and 93% accuracy in sentiment detection.

VI. FUTURE SCOPE

Our system demonstrated a reasonable performance in both tasks of aspect extraction and sentiment orientation detection.Consider these reviews from our academic domain data set "Outstanding in teaching as well as behavior towards the students" "Sir was fair during the sessions he taught well the concepts" More than one aspect could be addressed without using any connector, As per the demand of any supervised classification model, each sentence should be labeled with only one aspect. Therefore, such types of statements were misclassified and have been a major setback while calculating the accuracy of the system. So this is one of the limitation of our work that could be handled in future work. Moreover, this work of ABSA could be further extended by incorporating word dependencies, sentiment lexicon, and various NLP tools as an additional feature for creating domain embedding. Moreover, various neural network mechanisms like Gated RNN or CNN can also be used instead of LSTM to check system performance. As most of the domains now work on separately classifying the implicit and explicit aspects mentioned within the aspects. The task of aspect extraction could be further divided into these two subtasks. As this work relies on a supervised approach for ABSA, several unsupervised techniques like LDA can also be explored by specifying the number of clusters. Furthermore, the current system only handles comments given in the English language. As most of the students write comments in Roman Urdu so in future this system is further expanded by processing Roman Urdu and other natural language comments. . Another aspect is to check the association of emoticons like a happy face, sad face, etc. with sentiment orientation. Usually, when students are writing feedback about a teacher, they take help from many symbols, apparently, the usage of different symbols and emoticons is orientations specific so its exploitation might increase orientation accuracy.

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