



Motivation

- Increase in participation of readers by expressing their opinions and reviews in the form of comments on blogs with the rapid proliferation of online blogging websites.
- Comments are valuable source for the authors to understand how their audience are perceiving their blogs and for readers to consume the blog in a better way.
- Associating comments to the specific part of the blog will help author in getting insights about highly discussed parts of the blog and the questions or concerns that readers have about those parts.
- Categorizing these comments will further aid the author in imbibing the comments.

Problem Statement

Help authors and readers to extract useful insights from the comments on a blog. Sub-problems defining the useful insights are as follows.

- **Association of Comments:** Understanding the scope of the comment with respect to the blog.
- **Classification of Comments:** Understanding the nature (Suggestion, Agreement, Disagreement or Question) of the comments.
- **Visualization:** Visual representation of the comments related information for better insights .

Association of Comments

- Modeled the association task as a 'question-answering' problem where comment is the query and the segments of the blog are the answers.
- Used Learning to Rank models to rank different segments.
- Several lexical features like Segment Length (SegLen), Segment Position (SegPos), Exact Match (EMatch), Term Match (TMatch), Synonym Match (SMatch), Language Model (LM) and semantic features like Universal sentence embeddings (USE) and word2vec (W2V) were used for this purpose.

Classification of Comments

Separate classifiers are built for Suggestion, Question and Agreement/Disagreement for the training purpose and a hierarchical approach is proposed to classify the given test comment into one of the possible categories.

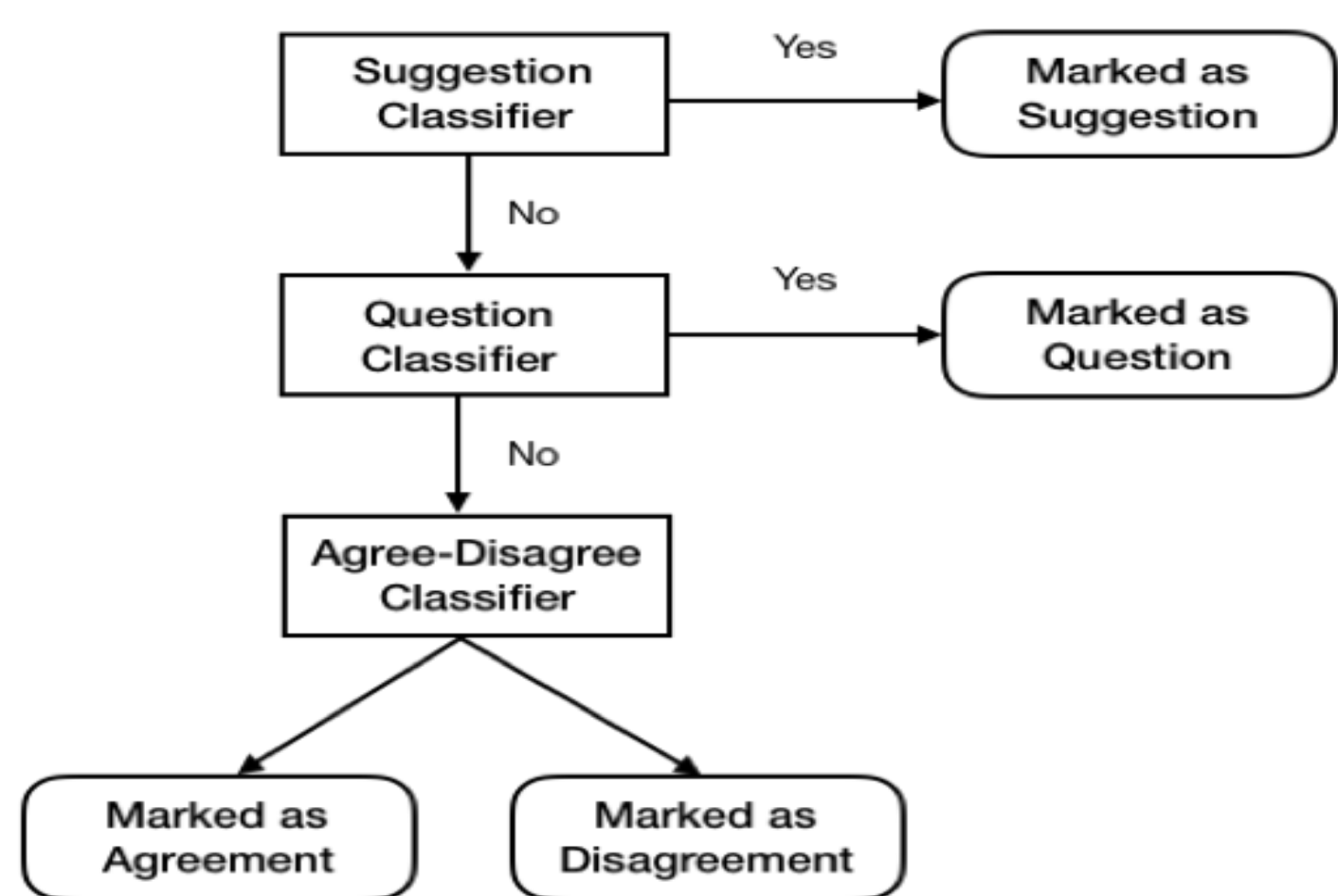


Figure: Hierarchical Classification Workflow

- **Suggestion Classifier:** Built a binary SVM classifier with features as self-curated clue words (Clue), modal verbs (MV), imperative mood expressions (IME) [2], typed dependencies (TypDep) [3] and informativeness score (InfScore).
- **Question Classifier:** Used Stanford parser for obtaining the parse tree of the given sentence and checked for the presence of either SBARQ or SQ tag in the tree. A precision of 0.86 and recall of 0.73 with F1-score of 0.79 were obtained.
- **Agree-Disagree Classifier:** Presence of agreement or disagreement depends upon the context and thus for this classification task the segment of the blog that the comment is associated with is considered along with the comment. A binary SVM classifier with LIWC, Glove embeddings (Glove), self-curated n-grams, positive and negative sentiment words (PosNeg, Pos, Neg) and affinn score (Affin) [1] as the features was built.

Results

Comment association task was evaluated on the following metrics.

- **Mean Reciprocal Rank (MRR):** It is given by $\frac{1}{|C|} \sum_{i=1}^{|C|} \frac{1}{rank_i}$, where C is the set of the comments that are queried for association and $rank_i$ refers to the rank position of the correctly associated segment.
- **Percentage accuracy:** It is the ratio of comments correctly associated to the total number of comments queried for the association.

For classification task, models were evaluated on **precision**, **recall** and **f-score metrics**.

Features	MRR	Accuracy
SegLen+SegPos+EMatch+TMatch+SMatch+LM+W2V	0.745	0.631
SegLen+SegPos+EMatch+TMatch+SMatch+LM	0.763	0.675
SegLen+SegPos+EMatch+TMatch+SMatch+LM+USE	0.769	0.692
TMatch	0.849	0.798

Table: Results of the Comment Association Model

Features	Precision	Recall	F1 score
Clue	0.44	0.18	0.25
Clue+MV+IME	0.46	0.64	0.54
Clue+MV+TypDep+InfScore	0.48	0.59	0.53
Clue+MV+IME+TypDep+InfScore	0.47	0.62	0.53

Table: Results from Suggestion Classifier

Features	Precision		Recall		F1 score	
	Agree	Disagree	Agree	Disagree	Agree	Disagree
LIWC	0.54	0.55	0.43	0.65	0.48	0.60
Glove+N-grams+PosNeg	0.63	0.65	0.63	0.65	0.63	0.65
Glove+N-grams+Pos+Neg	0.63	0.66	0.64	0.65	0.64	0.66
Glove+N-grams+Affin	0.67	0.66	0.60	0.72	0.63	0.69
N-grams	0.65	0.79	0.84	0.58	0.73	0.67

Table: Results from Agree-Disagree Classifier

Class	Precision	Recall	F1 score
Suggestion	0.47	0.62	0.53
Question	0.95	0.75	0.84
Agreement	0.63	0.85	0.72
Disagreement	0.76	0.50	0.60

Table: Results from Hierarchical Classifier

Visualizations

We built a mobile app to present these insights about the comments and the blog to the author and the readers.

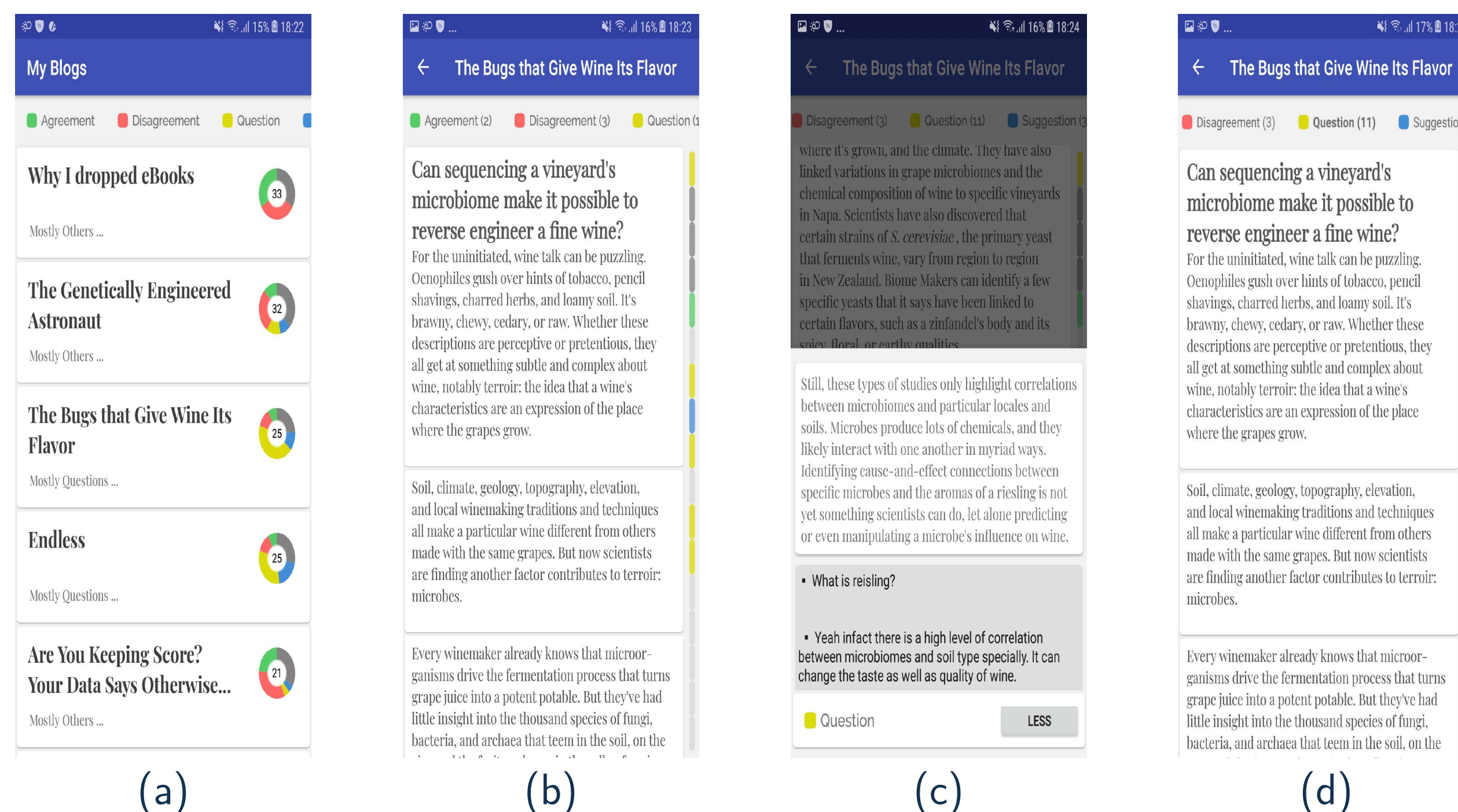


Figure: Different Visualization of the Mobile App

References