AI-Powered Comment Triage for Efficient Collaboration and Feedback Management

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Introduction

Collaborative platforms such as Google Docs and Confluence enable real-time feedback via comments. However, the volume and complexity of comments can overwhelm manual processing. This work addresses the need for an automated system that categorizes, prioritizes, and extracts key insights from comments using Natural Language Processing (NLP) and Machine Learning (ML).

Problem Definition

How can collaborative platforms effectively manage layered, high-volume comments by prioritizing them based on urgency, sentiment, actionability, and thematic relevance?

Work Summary

We developed a triage system combining rule-based logic with ML models to classify and prioritize comments across six dimensions:

Figure 1. Six Dimensions of the Comment Triage Framework

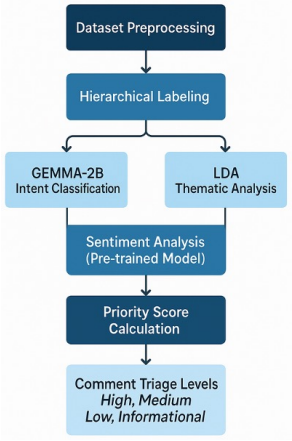

Figure 2. Triage Pipeline Diagram

Core Components:

- GEMMA-2B for zero-shot and N-shot intent classification
- BERT and RoBERTa for hierarchical multi-label classification
- LDA for topic modeling and thematic clustering
- HAN and H-CapsNet for capturing layered structures in comments

The system processes comments from publicly available collaborative documents, assigning priority scores based on defined logic and model outputs.

Results

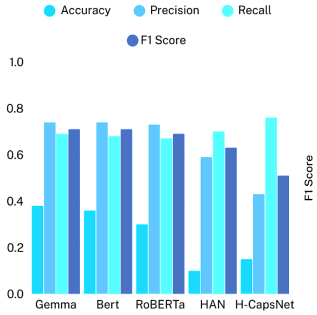

Figure 3. Model Comparison

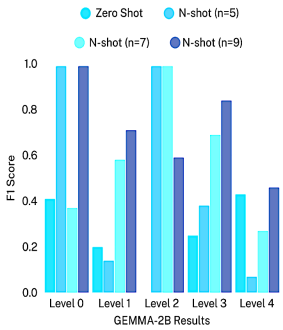

Figure 4. Zero-shot vs N-shot

Comments	Urgency	Importance	Sentiment	Actionability	Resolution	LDA Label	Priority Score	Triage Label
"The financial projections in section 3 are incorrect"	Immediate	Critical	Negative	Actionable	Pending	Project management & meetings	29	High
"Please consider updating the figures in the report soon. This change can improvethe clarity, but it's not mandatory"	Soon	Moderate	Neutral	Actionable	In progress	Data presentation and Health documentation	18	Medium
"Could we add a minor glossary at the end for technical terms whenever possible?"	Anytime	Low	Neutral	Actionable	Pending	Work progress & Task Completion	14	Low
"Nice work on introduction. It reads really well and sets the tone for the rest of the document"	Anytime	Low	Positive	Non - actionable	Resolved	Scientific studies & Environmental data	12	Low
" The data in table 5 is incorrect. This issue is critical and must be fixed immediately to avoid inaccurate conclusions."	Immediate	Critical	Negative	Actionable	Pending	Data presentation & Health documentation	24	High
"Great Job on figures! If possible we should also add a short explanation soon to clarify the data"	Soon	Moderate	Neutral	Actionable	Pending	Data presentation & Health documentation	20	High
"Consider adding more visuals in the final section, this is urgent."	Immediate	Critical	Negative	Non - actionable	Resolved	Work progress & Task completion	12	Medium
"I am not happy with the way section 2 is structured. It could me made clearer"	Immediate	Critical	Negative	Actionable	Pending	Project management & meetings	22	High
"The legal compliance section needs to be reviewed. This is a major issue that must be addressed immediately."	Immediate	Critical	Negative	Actionable	Pending	Scientific studies & Environmental data	25	High
" We should consider changing the layout of section 6, it's urgent."	Immediate	Critical	Negative	Actionable	In progress	Logistics, Bidding & Information updates	18	Medium
"This document looks great! No changes are required at this stage."	Anytime	Low	Positive	Non - actionable	Resolved	Scientific studies and Environmental data	10	Informational

Figure 5. Test Cases (Expected Outcomes)

Comments	Urgency	Importance	Sentiment	Actionability	Resolution	LDA Label	Priority Score	Triage Label
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Figure 6. Test Cases (Predicted Outcomes)

- GEMMA-2B achieved the highest F1-score (0.7133), especially effective in low-data (few-shot) settings.
- Transformer models (BERT, RoBERTa) showed general reliability across categories.
- H-CapsNet had highest recall but lower precision.
- LDA topic modeling revealed dominant themes such as Project Management, Scientific Updates, and Task Completion.

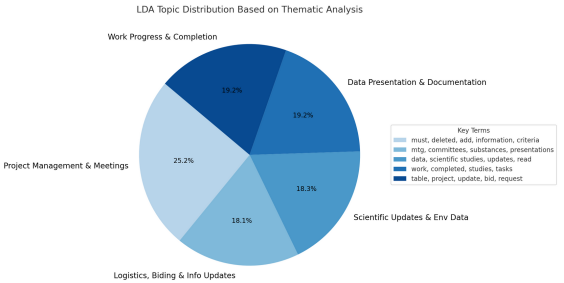

Figure 7. LDA-Based Thematic Analysis

Conclusion

The proposed system efficiently categorizes and prioritizes collaborative comments. GEMMA-2B demonstrated strong performance in dynamic and low-data conditions. Integrating LDA enhanced thematic relevance, enabling real-time, scalable comment management in team environments.

Limitations & Future Work

- Inconsistent sentiment predictions in some test cases
- Performance variation across deep hierarchy levels due to class imbalance

Future enhancements:

- Advanced models like Gemini Pro 1.5
- Real-time integration with collaborative platforms (e.g., Google Docs)
- UI development for practical deployment

Acknowledgements

Throughout the project, Dr. Hernandez offered invaluable insights, guidance, and feedback that greatly enhanced our work. His mentorship was instrumental in helping us navigate complex machine learning paradigms and apply them effectively within our research scope. We deeply appreciate his support and guidance.