

## Enhancing software quality and team productivity in agile development environments through machine learning-based sentiment analysis

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Communication in Agile software development plays an important place for task coordination, clarifying requirements and sprint activities supervision. The sentiment shown in these communication messages can provide useful information about the progress of sprint, and how well the team is working together. This study presents a machine learning based sentiment analysis approach to classify the sentiment expressed in sprint communication and to define a numeric value ranging from 0 to 1, where value closer to 1 indicate more positive communication patterns, while values approaching 0 indicate increasingly negative compositions within each sprint. These sentimental outputs can be generated at the end of the sprint or at any point during the sprint. This enables real-time tracking of the sentiment during a sprint and identifying communication problems that could inhibit the productivity of teams or impact the quality of software. Various machine learning models were trained. Logistic Regression provided the best compromise between generalization, interpretability, and stability and was therefore selected as the final model for this study. A prediction pipeline was developed to evaluate the sentiment on a sprint basis. This utilizes a trained Logistic Regression model and an integrated weighted probability method. The pipeline produces predictions of sentiment category distributions and forecasts of the score of the sentiments of a sprint. The patterns of communication that appeared to suggest that there were coordination issues or disruptions of the work process were often linked to low sentiment scores whereas the ones that appeared less problematic allowed the process to proceed smoothly. These findings show that sentiment scoring is a feasible and actionable metric for Project Managers and Scrum Masters to use in lightweight but effective sprint health monitoring to support proactive sprint management, strengthens task coordination and helps identify coordination issues that may influence team productivity and software quality in Agile development.

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