

## Detecting Developer Burnout Through Sentiment Trends in Software Repositories Using DistilBERT

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Recent studies have indicated that severe chronic stress relates to burnout, and Software Engineering (SE) is no exception, having greater than 57% chronic stress. Conventional methods of evaluation employ surveys and biometric measurements, which are extremely intrusive. In the domain of remote working teams, continual real-time measurement lacks feasibility. This study investigates the feasibility of reliably detecting early signs of developer burnout using a sentiment-focused framework, unobtrusively. Using the 20 Years of Issues and Commits of Mozilla and Apache Development (20-MAD), the dataset of 2,166,239 messages of communication (2,390 developers) is processed using a negation-aware preprocessing technique, DistilBERT sentiment-analysis framework, and Zscore temporal analysis to quantify and capture burnout. Findings highlight the detection of weekly and monthly burnout signals with a weighted classification of 84.09% precision, traditional models vs. DistilBERT. Statistically significant differences in sentiment, with a significant effect of true vs classification, were demonstrated. 462 developers demonstrated evidence of mild stress, 3 severe, and 24 moderate burnouts, during the week. The latter, independently, demonstrated evidence of sustained burnout across the period, which was confirmed by the monthly analysis of 13 severe moderate chronic stress cases and 24 sustained burnout cases. Integration based on GitHub has been made available for the real-time monitoring of burnout using advanced machine learning methods, which allow for high-speed inference within 100ms on a message to provide privacy to the user. The framework permits monitoring the well-being of developers, which consequently gives organizations the ability to run preventive programs.

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