Real-Time NLP-Based Stress Detection in Social Media for Digital Mental Health Intervention

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Abstract

This study presents an NLP-based machine learning system for detecting stress in social media posts, enabling timely digital mental health intervention. A dataset of 45,792 posts from Reddit and Twitter was compiled, cleaned, tokenised, lemmatised, and balanced using Random Oversampling, with sentiment features extracted via VADER. TF-IDF and sentiment scores were used to train four classifiers - Logistic Regression, LinearSVC, Random Forest, and XGBoost - evaluated on accuracy, precision, recall, F1-score, and inference time. LinearSVC achieved the highest F1-score (0.898) and fastest GUI inference (2.44 s), demonstrating strong performance and sensitivity to subtle stress cues. A Gradio-based GUI enables instant, accessible predictions, validating the system's practicality. The results confirm the feasibility of combining linguistic and sentiment analysis for scalable, real-time stress detection, laying a foundation for future integration with cyberincivility monitoring in digital health tools. © 2025 IEEE.

Author keywords

LinearSVC; mental health monitoring; natural language processing; social media analysis; stress detection

Indexed keywords

Engineering controlled terms

Learning systems; Logistic regression; Machine learning; Random forests; Sentiment analysis; Stresses

Engineering uncontrolled terms

Health monitoring; Language processing; Linearsvc; Mental health; Mental health monitoring; Natural language processing; Natural languages; Real- time; Social media analysis; Stress detection

Engineering main heading

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