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Human Stress Detection Based on Social Interaction

Kalaivani S [a], ***Jayasri K*** [b], ***Pooja K*** [c]

[a,b,c] *Sacred Heart Arts and Science College, Perani, Villupuram 605651, Tamil Nadu.*

ABSTRACT:

Psychological stress poses a significant threat to people's health, making timely detection for proactive care crucial. With the widespread use of social media, individuals regularly share daily activities and engage with friends, offering an opportunity to utilize online social network data for stress detection. In this study, we observe a close correlation between a user's stress state and that of their friends on social media platforms. Leveraging a large- scale dataset from real-world social platforms, we systematically investigate the relationship between users' stress states and social interactions. We define a set of stress related textual, visual, and social attributes and propose a novel hybrid model - a factor graph model combined with Convolutional Neural Network - to utilize tweet content and social interaction information for stress detection. Experimental results demonstrate that the proposed model can enhance detection performance by 6-9% in F1-score. Moreover, through further analysis of social interaction data, we uncover intriguing phenomena, such as stressed users having a higher proportion of sparse social structures (i.e., with no delta connections) compared to non-stressed users, suggesting that the social networks of stressed users' friends tend to be less connected and complex.

Keywords: Human Stress, Social Interactions

1. Introduction

About the project:

Traditionally, stress assessment has relied on self-reporting or clinical evaluation, which may be subjective, time-consuming, and prone to biases. However, the advent of social networking platforms and digital communication technologies has ushered in new possibilities for understanding and detecting stress in real-time based on social interactions. These platforms serve as virtual arenas where individuals express emotions, share experiences, and interact with others, leaving behind a rich digital footprint ripe for analysis..

OBJECTIVE:

II. SYSTEM ANALYSIS

Existing system:

- Behavioral Analysis: Many existing systems utilize behavioral analysis to detect stress in social interactions. This involves monitoring changes in speech patterns, body language, facial expressions, and other non-verbal cues during social interactions.
- Biometric Sensors: Some systems incorporate biometric sensors to measure physiological signals such as heart rate variability, skin conductance, and even cortisol levels, which can indicate stress levels.

Disadvantages:

- **Advanced Sensor Integration:** The proposed system may integrate more advanced sensors, such as wearables with multi-modal capabilities, to capture a broader range of physiological and behavioral signals during social interactions.
- **Data Fusion Techniques:** To enhance accuracy, the proposed system may employ advanced data fusion techniques to integrate data from multiple sources, including biometric sensors, smartphones, and social media activity.

Proposed system:

- Non-intrusive Monitoring: Existing systems often rely on non-intrusive methods such as analyzing speech patterns, body language, and facial expressions. This allows for stress detection without the need for invasive sensors or physical contact with the individual.

- Real-time Feedback: Many existing systems provide real-time feedback on stress levels during social interactions. This immediate feedback can help individuals become more aware of their stress triggers and manage them effectively.

Advantage:

- Early Detection: By analyzing social interactions, the system can detect signs of stress early on, potentially allowing for interventions before the stress escalates into more serious mental health issues.
- Non-intrusive Monitoring: Unlike traditional methods of stress detection that may require invasive procedures or sensors, social interaction- based detection is non-intrusive and can be seamlessly integrated into daily life without causing discomfort to the individuals being monitored

III. SYSTEM METHODOLOGY

Two-Level Attribute Analysis:

- **Purpose:** Analyzes attributes at both individual and aggregate levels to detect stress patterns.
- **Components:** Individual Level Analysis: Examines attributes specific to each user, considering their baseline behavior and personalized stress responses.
- **Aggregate Level Analysis:** Looks at patterns across a population to identify common stress triggers and societal trends in social interactions.

User-Level Attribute Integration:

- **Purpose:** Integrates user-specific attributes into the stress detection process.
- **User Profile Creation:** Establishes individual profiles based on historical social interaction data, physiological responses, and self-reported stress levels.

Personalized Attribute Weighting:

- Adjusts the significance of different attributes based on each user's unique stress response patterns and preferences.

Social Interaction:

- This analysis likely involves examining the topics, sentiments, or types of interactions (such as supportive versus negative) within users' posts or interactions on social media platforms.

IV. CONCLUSION:

This paper introduces a framework for identifying users' psychological stress states based on their weekly social media activity, utilizing both the content of tweets and users' social interactions. Using real-world social media data, we investigate the relationship between users' psychological stress states and their social interaction patterns. To effectively utilize both tweet content and social interaction data we propose a hybrid model that combines the factor graph model (FGM) with a convolutional neural network (CNN). Additionally, our research uncovers intriguing insights into stress phenomena. We observe that stressed users exhibit a higher prevalence of sparse social structures (i.e., lacking delta connections) compared to non-stressed users, suggesting that the social networks of stressed users' friends tend to be less interconnected and intricate. These findings may serve as valuable references for future studies in this field.

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