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論　文　内　容　要　旨

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学位論文題目	Research on Early Detection of Depression Based on Neuro-Symbolic AI Approach via Social Media Analysis （ソーシャルメディア分析による神経記号AIアプローチに基づくうつ病の早期発見に関する研究）		

内容要旨

Depression is a pervasive mental health disorder that is widespread across the globe and has a significant impact on individuals and society as a whole. Key features of depression include persistent feelings of sadness, loss of interest in activities, decreased energy, increased self-evaluation, and increased feelings of guilt. People with depression may exhibit symptoms such as a lack of enthusiasm for daily activities, disrupted sleep patterns, altered appetite, difficulty concentrating and, in severe cases, a tendency to self-harm or commit suicide.

Accurately diagnosing and detecting depression in its early stages is a daunting clinical challenge. Symptoms and experiences associated with depression often manifest differently in different people and different cultures, complicating the diagnostic process. Current diagnostic methods rely heavily on clinician expertise and patient self-reporting, which can lead to subjective biases and inconsistencies. In addition, patients may consciously mask symptoms or unknowingly ignore signs of depression, further hindering an accurate diagnosis. Therefore, it has become imperative to integrate advanced technologies, especially artificial intelligence, to help detect depression early.

However, in addition to common challenges related to data acquisition, labeling, and model generalization performance, a significant limitation of current AI in early depression detection is the interpretability of models. Many deep learning models, especially deep neural networks, are often considered "black box" models due to their complex internal decision-making processes and logic that are difficult to understand. The lack of transparency makes it challenging to elucidate how the model determines whether an individual is in the early stages of depression. In clinical practice, clear interpretation and understandability are essential for doctors and patients to make informed and reliable decisions. Lack of interpretability can hinder the clinical application of the model and hinder patient acceptance.

This article introduces TAM-SenticNet, a neuromyotonic AI framework specifically designed for the early detection of depression by analyzing social media content. To address the limitations of traditional diagnostic tools, TAM-SenticNet combines neural networks for feature extraction and sentiment analysis with symbolic reasoning to enhance the explanatory power of the model.

Advances in technology and the integration of artificial intelligence (AI) have shown promise for revolutionizing early depression detection. Machine learning algorithms, particularly deep learning models, have demonstrated the potential to analyze large amounts of data and identify early patterns of depression. These AI-driven systems can process information from a variety of sources, such as text data from social media, audio recordings and video content, to extract relevant features and detect signs of depression. In addition, natural language processing (NLP) technology enables analysis of text data to capture emotional, emotional, and verbal cues, which may provide valuable insights into an individual's mental health.

The use of multi-modal data fusion to combine and jointly analyze information from different modes has great prospects in improving the accuracy and robustness of early depression detection models. Combining data from sources such as wearables (such as heart rate monitors, sleep trackers) and smartphone sensors (such as GPS, screen time) with traditional data sources allows for a more complete understanding of an individual's behavior and physiological patterns. This comprehensive approach allows for a more accurate and nuanced assessment of a person's mental state.

Moreover, it is critical to address interpretability challenges in AI models. Interpretable artificial intelligence (XAI) technology is gaining popularity in the field of depression detection, aiming to provide insights into the decision-making process of complex AI models. XAI methods, such as attention mechanisms and significance graphs, highlight the most influential features and components in the input data that contribute to the model's predictions. This transparency not only enhances clinicians' trust and acceptance of AI-powered diagnostic tools, but also enables individuals to better understand and trust the results these systems provide.

In conclusion, the use of advanced AI technology for early detection of depression is a promising way to improve diagnostic accuracy and thus improve mental health outcomes. Overcoming challenges related to data interpretation and model transparency is critical to successfully integrating AI tools in clinical practice. The potential for ongoing research and development in this area to have a positive impact on psychology is huge