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EDITORIAL VIEW PAIN MEDICINE

Integrating artificial intelligence (AI) in the identification of pain

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Pain is a crucial health concern that needs an accurate diagnosis, deeper understanding, treatment, and follow-up depending on the pain identification process.[1] Although determining the right therapy requires a thorough assessment of pain, the self-reported pain level assessment has several drawbacks.[2] As the pain is subjective and people's experiences of pain may vary, it can be difficult sometimes to determine the underlying biopsychosocial components. This can lead to a lack of diagnosis of the exact cause of pain and its etiological factors.[3] This editorial outlines the importance of integrating AI into pain identification to enhance the quality parameter of assessment in research and clinical practice.

The traditional approaches for measuring pain are frequently subjective and inconsistent. On the other hand, conventional subjective evaluations are frequently constrained by communication and interpretation of pain.[4] The need marks the current state of affairs for more impartial and trustworthy techniques to evaluate pain, particularly in patients such as young children or severely ill people who are unable to express their sensations related to pain adequately.[4]

Artificial intelligence (AI) can improve diagnostic precision, forecast therapy results, and customize pain management techniques in this intricate situation.[3] Artificial intelligence (AI) is revolutionizing several industries by creating algorithms that use large data to increase production, decrease costs, improve decision-making, and increase efficiency.[5] There are encouraging prospects to increase the precision and effectiveness of pain assessment using AI, that can improve pain assessment and its efficiency, accuracy, and precision.[1] Multimodal models, which integrate advanced AI approaches with various data sources, including physiological signals, neuroimaging, and facial expression analysis, can be incorporated using AI-driven diagnostic methodologies.[3] An artificial intelligence-based hybrid approach integrating facial gestures and paralanguage analysis contributes to the area by enabling more objective, precise, and sensitive pain detection for individual differences.[4]

In terms of methodology, early research was carried out using machine learning algorithms, including random forest classifiers, decision trees, and support vector machines. Artificial neural networks, including convolutional and recurrent neural network methods, have been used more lately, sometimes even in tandem.[2] Wahab Sit and Dutta, in their recent work, introduced a model for identifying pain based on facial expressions.[6] A liquid neural network was used to construct an image extraction technique to extract various images from the video data and developed a hybrid feature engineering method using the DenseNet 201 and MobileNet V3 models. They used quantization-aware training to increase the models' effectiveness. The image classification was done using the Prkachin and Solomon Pain Intensity score. Using the random search strategy, they improved the LightGBM model to detect pain in the facial photos. The authors generalized the suggested model using the Denver Intensity of Spontaneous Facial Action dataset.[6]

Other than face expression detection, literature has also suggested using audio recognition and analysis for pain identification single artificial intelligence (AI) techniques. Audio is often utilized to assess pain, sometimes in combination with other behaviors like facial expression. However, less evidence exists that pain and voice are related to facial expression usage for pain assessments.[7] Artificial intelligence (AI) also has the potential to revolutionize chronic pain; when applied to clinical datasets, it can be used to identify pain subtypes, predict treatment responses, and can guide the clinical decision-making process.[3]

However, issues including data quality, the intricacy of human pain physiology, and validation across various patient demographics must be resolved before incorporating AI into clinical practice.[9] Some ethical

issues and considerations are also linked to patient privacy, biases, and the lack of reliability and generalizability.[3] Despite these issues, there is growing interest in AI models to detect pain, as AI has the ability to completely transform the diagnosis, evaluation, and treatment of pain, just like it has in other medical fields.[5] It could have a wide range of clinical and research applications. The urgency and importance of further research to develop and assess precise algorithms that can recognize pain through different inputs, such as visual and audio, should be a driving force for the audience. Additionally, more investigation is necessary to understand the factors contributing to different AI models used to identify pain.

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REFERENCES

1. El-Tallawy SN, Pergolizzi JV, Albasher MJ, Alghamdi NS, Salem GI, Ahmed RS, et al. Non-adherence to Clinical Practice Guidelines in Regional Anesthesia and Pain Interventions: Insights From a Comprehensive Case Series Review. Cureus. 2024 Dec 17;16(12):e75847. PMCID: PMC11736337, DOI: 10.7759/cureus.75847
2. Cascella M, Schiavo D, Cuomo A, Ottaiano A, Perri F, Patrone R, Migliarelli S, Bignami EG, Vittori A, Cutugno F. Artificial Intelligence for Automatic Pain Assessment: Research Methods and Perspectives. Pain Res Manag. 2023 Jun 28;2023:6018736. PMCID: PMC10322534, DOI: 10.1155/2023/6018736
3. Di Napoli R, Esposito G, Cascella M. Intrathecal Catheter (Archived). 2024 Mar 17. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. PMID: 31747197. Bookshelf ID: NBK549790
4. Gutierrez R, Garcia-Ortiz J, Villegas-Ch WJFICS. Front. Comput. Sci., Volume 6 - 2024 DOI: https://doi.org/10.3389/fcomp.2024.1424935
5. Srinivasan B, Venkataraman A, Raja SN. Artificial intelligence and pain management: cautiously optimistic. Pain Manag. 2024;14(7):331-333. Epub 2024 Sep 11. PMCID: PMC11485867. DOI: 10.1080/17581869.2024.2392483
6. Wahab Sait AR, Dutta AK. Developing a Pain Identification Model Using a Deep Learning Technique. JDR. 2024. Vol. 3(3). DOI: 10.57197/JDR-2024-0028
7. Borna S, Haider CR, Maita KC, Torres RA, Avila FR, Garcia JP, et al. A Review of Voice-Based Pain Detection in Adults Using Artificial Intelligence. Bioengineering (Basel). 2023 Apr 21;10(4):500. PMCID: PMC10135816, DOI: 10.3390/bioengineering10040500
8. Casarin S, Haelterman NA, Machol K. Transforming personalized chronic pain management with artificial intelligence: A commentary on the current landscape and future directions. Exp Neurol. 2024 Dec;382:114980. DOI: 10.1016/j.expneurol.2024.114980

