AIDirections
Pain Detection Solution
White Paper

Supporting Pain Management Using Artificial Intelligence

Keeping Pace With Patient Experience

Artificial Intelligence can support doctors and care takers by identifying levels of pain, using algorithms analyzing facial expressions. This Whitepaper illustrates how Artificial Intelligence can work in pain detection, applying its capabilities to measure the intensity of pain and its levels.

In most hospitals and clinics, pain is currently assessed with the help of humans; this can either be through, admittedly subjective, self-reporting of patients, or by the medical staff using a set of questions. This is supported by the alternative practice to gauge pain by visually "reading" the facial expressions and estimating the pain levels.

Humans are capable of reading facial information as part of our natural facial expression processing system, and this includes identifications of levels of pain. Yet, this capacity is limited by a number of features, including tiredness, which has been proven to impact doctor's pain level assessment, different facial features, and individual behaviour.

In a world where Big Data and Artificial Intelligence are deployed across organizations, sectors, and industries to better capture reality and understand its complexities, it is time to support methods heavily reliant on subjective assessments by objective measurements provided by are Artificial Intelligence.

These technologies evidently rely on both the accuracy and the relevancy of the data captured. Luckily, recent research findings have shown that pain intensity can be detected from facial expressions, more precisely the move of well identified muscles. This study involving patients with prior injuries was conducted to identify their pain intensity. Patients were recorded while they completed a set of movements on the injured and non-injured body regions. (McMaster-UNBC Pain Archive).

More and more attention has been channeled in the last years around viable and effective ways to apply both these scientific insights and technologic breakthroughs, with an undeniable focus on Artificial Intelligence, in the realm of healthcare and particularly around optimizing the patient journey. This whitepaper offers practical ways to benefit from this research and is aimed at hospitals and clinics that are looking to improve patient journey and satisfaction.

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Digitalizing Pain Detection

AIDirections is very research-oriented and frequently takes scientific breakthroughs and transforms that into AI solutions. Our Pain Detection solution is no exception, and its foundations are built on the scientific progress mentioned above.

The primary function of this solution is to assess the intensity of pain based on facial muscular position and contractions. The solution relies on machine learning algorithms to decode the association between facial expressions and pain, analysing facial features such as landmarks, position, lighting, and movements to detect the level of pain a human is in.

The solution uses a number of Artificial Intelligence models to accurately serve this function: from identifying and normalizing the face, reading facial expressions, identifying the relevant muscles, measuring the level of muscular contraction, and finally translating these elements to the pain level in line with the scientific findings.

Our Pain Detection solution detects, monitors, and quantifies patients' level of pain, using a camera recording the facial expressions of the patients. The measurement and corresponding quantifying of the level of pain is based on the internationally accepted PSPI scale to measure pain.

Pain Detection Solution Accuracy

The accuracy of the Pain Detection solution is around 86%. This number stems from the data we used for model training; this training used data that had been annotated by well-experienced medical pain experts, making our solution as good as well-trained humans in assessing the pain.

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Pain Detection Solution – Use Case

Below are a few use cases for our pain detection solution:

Telemedicine

AIDirections Pain Detection solution can detect and measure pain through integration with a smart phone, e.g. a medical smart phone application.

- Pain level directly reaches doctor
- Enhancing patients' experience
- Managing patients remotely

Monitoring Patients

The Pain Detection Solution identifies and estimates pain objectively and consistently over time. This solution can detect pain using any camera.

- Doctors can compare patients' pain level over time
- Supporting doctors make right decision
- Enhance patients' experience

Communicating Pain

The Pain Detection Solution sends an alarm to nurses if pain levels continue to raise. With this solution the nurse can move to a patient needing help, instead of random checking.

- More quality time with patients
- Improve effectiveness and efficiency of medical staff (purposeful rounding)
- Enhance patients' experience

Digitalizing Pain Detection

AIDirections is constantly working on improving our Pain Detection Solution; during the initial development, our access to training data was limited due to the high confidentiality nature of patients' care, its records, and around medical data in general. However, our research and development team is always working around-the-clock to achieve higher accuracies and better results, and we would also like to partner with hospitals and clinics to do further research.

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References

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To learn more about AIDirections pain detection solution contact us on: 00971521502449

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