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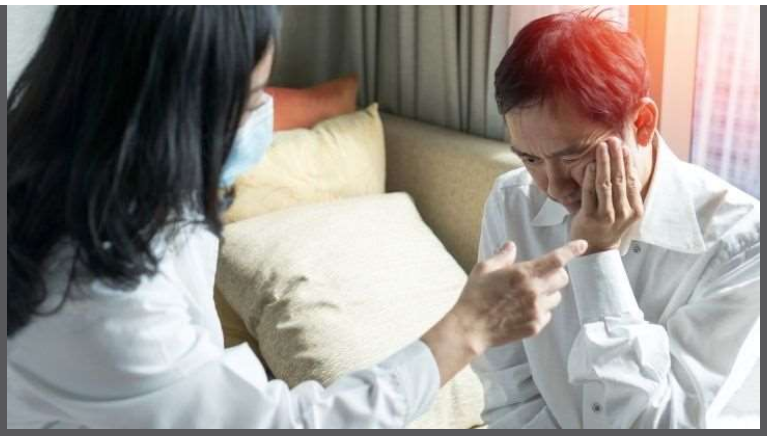
Computational neural networks parameterizing pain



The parameterization of pain varies according to the culture or the disease of the patient. Health personnel are in charge of evaluating the pain faces of hospitalized patients to make decisions about medication. The following study by the UAB proposes the use of trained computational neural networks to replace this task, and even neural networks that do not require humans for their training.

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Computational Neural Networks, roughly speaking, mimic the way neurons in the brain form connections to solve a given task. In the same way, we have used computational neural networks to identify the level of pain in patients' faces during their rehabilitation exercises. To train these networks, video images of the patients were used, and the network had to predict what level of pain they were suffering.

Using real pain values annotated by experts, the neural network learnt to associate a facial image with the patient's pain. The contribution of our work consisted in considering not only still images but video images, and thus identifying the movement of micromovements in the muscles of the face to estimate the level of pain. In this way the network learnt to ignore all those facial gestures that were superfluous in predicting the pain level and was focused on those movements that appear involuntary when pain is present.

The usefulness of the approach is due to those patients in intensive care units where health professionals have to visit them from time to time to check if they are suffering any pain, in order to decide whether or not to increase their medication. In addition to this, pain is also

perceived differently depending on the culture and also on the ailment suffered, that is why there is the need of an objective pain detector.

It should be noted that this work is the extension of another similar technique adapted to recognize Alzheimer's in patients by estimating, using a predefined test of gestural movements, the advancement level of their neurodegenerative disease.

Currently, we are working on developing novel computational learning techniques that require less data to be learnt, since at present hundreds of examples are needed, together with experts that should annotate each example, which takes time and money. So, we are investigating new models that can learn from a single example, or use millions of un-annotated data from which the network is able of learning the given task autonomously, without human intervention.

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References

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