Artificial Intelligence for Curing Coma: An Analytical Study

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Received Date: 20 May 2024 | Accepted Date: 27 May 2024 | Published Date: 03 June 2024
Citation: Dalvinder Singh Grewal, (2024), Prof Emeritus, Desh Bhagat University, Clinics in Nursing; 3(3): DOI: 10.31579/2835-8147/072

Abstract
This paper is further to my paper defining artificial intelligence. [1] Artificial Intelligence as defined in this paper is the "mechanical simulation system of collecting knowledge and information and processing intelligence of universe: (collating and interpreting) and disseminating it to the eligible in the form of actionable intelligence". [1] Actionable intelligence is information that can be immediately used or acted upon -- either tactically in direct response to an evolving situation, or strategically as the result of an analysis or assessment. [2] Here the first step is to understand the brains of coma patients using machine learning methods and neuro-technologies; in second step artificial intelligence is to be used to convert into actionable intelligence on the coma patient to utilize his body for certain needed reaction and the third step will be to bring him to consciousness by manipulated inputs. [2]

Key Words: artificial intelligence; coma; brain tumor; stroke

Introduction

Coma is a state of prolonged loss of consciousness. It can have a variety of causes, including traumatic head injury, stroke, brain tumor, or drug or alcohol intoxication. A coma may even be caused by an underlying illness, such as diabetes or an infection. It is a medical emergency. Quick action is needed to preserve life and brain function. Health care providers typically order a series of blood tests and a brain scan to try to learn what's causing the coma so that proper treatment can begin. A coma doesn't usually last longer than several weeks. People who are unconscious for a longer time might transition to a lasting vegetative state, known as a persistent vegetative state, or brain death. [3]
Artificial intelligence system if developed 'will never replace doctors' but it can trace brain activity invisible to the human eye. [4] It will never replace doctors. It is just a tool to help doctors and families make better decisions. "The AI system assumes that every patient still has consciousness," Song said. "Its job is to determine the likelihood they will come to within a certain period. Dr Song Ming. But IA's locating a disease and its cause has never been doubted. Yang Yi, a doctor in the neurosurgery department at PLA General Hospital the AI system had been improved since the project's launch in 2010. It is now part of the hospital's daily operation and has helped diagnose more than 300 people". The AI system, developed after eight years of research by the Chinese Academy of Sciences and PLA General Hospital in Beijing, has achieved nearly 90 per cent accuracy on prognostic assessments, according to the researchers. [4] This is however, the first step. The more important are the second and third steps i.e., providing appropriate AI tools for correcting or removing the disease. The tools of AI needed have to be very efficient and zero error effect. Trial and error method is dangerous for coma patients. A coma patient's brain damage, or why they're trapped in an unconscious state and how to help them awake, will be unique to that patient. The coma may be (a) Toxic-metabolic encephalopathy (b) Persistent vegetative state or (c) Medically induced. [5] It may be due to traumatic brain injury (TBI) or acquired brain injury. [6] "This process cannot be done by humans; it requires finding patterns within highly complex signals," Park said. "We are designing our own machine learning tools to extract human understandable computation that's happening in the brain." [7]
Patients are assessed using a brain scan with functional magnetic resonance imaging, a technology that charts brain activity by measuring tiny changes in blood flow. The neural activities are too numerous and sophisticated to be directly visible to doctors but the AI system, equipped with machine-learning algorithms, is able to scrutinise these changing details and discover previously unknown patterns from past cases. For instance, the machine can look into regions in charge of different functions – including motion control, verbal capability, hearing and vision – to see how they interact with one another after suffering physical damage. [7] When patients suffer cardiac arrest, more than half of those who remain comatose never regain consciousness. Early and accurate prediction of neurological outcome is

hence key when deciding whether to treat or not. Researchers from the Netherlands have trained an algorithm to read electroencephalograms (EEGs) and predict outcomes. They found that the algorithm's results matched those of trained specialists. Trained specialists analysing EEG traces (recordings of the brain electrical activity) as specific features can give hints of the outcome. For example, a flat EEG is associated with a poor outcome while a continuous EEG is often an indicator of a more favourable result. Visual analysis of EEGs does not, however, capture their integral richness and is prone to intra- and inter-observer variability. EEGs also require highly trained analysts, who might not always be available to provide a prognosis within the paramount 12 to 24 hr window. To remedy this training deep convolutional neural networks (CNNs) to analyse the EEG and provide an outcome prediction. The CNN uses the ECG trace as an input that goes through a set of connected filters and mathematical functions that can extract specific features, in a similar way to neurons in the brain. [8] It was found at University of Pittsburgh Medical Centre (report published online on April 26 in Radiology). that improved accuracy compared with the predictions of the neurosurgeons, TBI prognostication over the qualitative assessments made by neurosurgeons provided quantitative prognostic information to better enable neurosurgeons to make rapid, reproducible and more accurate decisions to guide the care of patients with severe TBI." [9] Artificial intelligence shows promise predicting patients' need for CT after traumatic brain injury [10] An artificial intelligence model could potentially predict pediatric patients' need for CT after a mild traumatic brain injury, according to research published Saturday in JACR. Only about 10% of such scans end up revealing positive findings for TBI. This raises of possible overuse of imaging and unnecessary radiation exposure among children, Australian imaging experts noted. Tools including the Pediatric Emergency Care Applied Research Network (PECARN) clinical rule could help to eliminate unnecessary imaging exams. But they can suffer from potential limitations in their accuracy. Scientists with the University of Queensland, Brisbane, developed a "deep artificial neural network" to improve the selection process. Applying it to a dataset of almost 15,000 patients, this produced promising early returns. AI resulted in 98.6% sensitivity and 99.7% specificity when predicting the need for CT utilizing the parameters from the previously mentioned clinical rule. [11, 12].

Conclusion

The results produced by AI are certainly better than human minds of the neurologists and radiologists. The research in Artificial Intelligence for curing coma is going in globally though it has limitations as yet which can be removed with continuous forward looking research though it may take some morer years for the coma patients waiting consciousness.

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