Benha Journal of Applied Sciences (BJAS) **print: ISSN 2356–9751**
Vol. (9) Issue (12) (2024), (69- 72) **online: ISSN 2356–976x**
http://bjas.bu.edu.eg
Medical and Health Science

The value of machine learning in detection and assessment of liver trauma using contrast enhanced CT scans

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Abstract
Background: Over the last few years, there has been increasing interest in the use of artificial intelligence to assist with abnormality detection on medical images. **Aim of this study** was to examine how well AI performed when used with High Resolution Multi-Slice Computed Tomography to detect liver trauma. **Methods**: This prospective study examined 65 instances that were analysed using computer-aided detection techniques to automatically identify liver trauma. The study's main emphasis was the application of artificial intelligence technologies in liver multislice CT images. To check for abnormalities in the liver, we used High Resolution Multi slice Computed Tomography, which has a 16/64/128 detector and is powered by artificial intelligence. Findings: a median age of 20 and a range of 15 years for the standard deviation. Artificial intelligence's diagnostic ability in identifying liver lesions was examined. When it came to identifying liver lesions, the models were in high agreement. **Conclusion:** The liver and traumatised areas can be precisely segmented using the techniques that have been suggested. It is clear that this pipeline performs admirably when it comes to determining the proportion of traumatised liver parenchyma. Rather of relying on the sometimes-subjective AAST grading system, critical care medical staff can benefit from this approach's reproducible quantitative evaluation of liver injuries.

Keywords: Artificial Intelligence; after contrast computed tomography image, liver damage.

Introduction

The leading killer of people under the age of 46 is trauma [(1)]. Liver trauma accounts for almost 5% of all trauma admissions. The liver is the most commonly damaged abdominal organ in cases of blunt abdominal trauma [(2)] because of its enormous size, anterior position, and delicate parenchyma. There may be a considerable decrease in morbidity and death if liver damage is detected early, its severity assessed, and patients get appropriate treatment [(3)].

When it comes to assessing liver trauma and tracking its development over time, contrast-enhanced computed tomography (CT) is the method of choice [(4)].

The American Association for the Surgery of Trauma (AAST) liver damage scale is the main instrument now utilised to evaluate the amount of liver trauma and guide therapy. CT imaging is utilised for grading these injuries. [(5)]

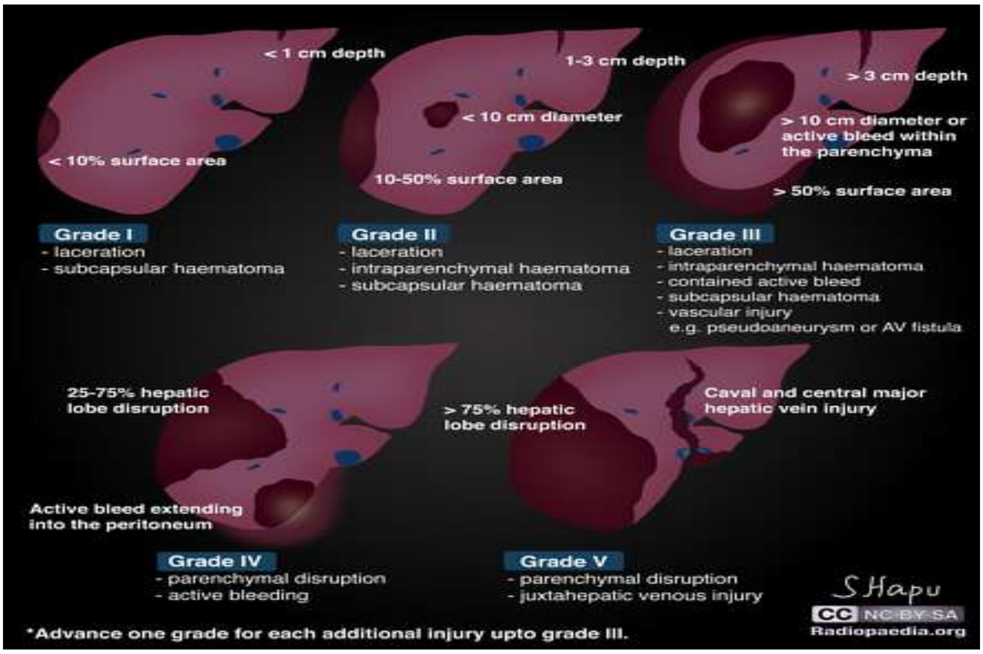

Fig 1. The most used method for evaluating liver injuries is the 2018 revision of the AAST (American Association for the Surgery of Trauma) scale.

Machine intelligence, sometimes known as artificial intelligence (AI), is a subfield of computer science that focusses on teaching computers to mimic human intellect [6].

A popular way to describe artificial intelligence is as a set of tools that can teach computers to do tasks traditionally performed by humans. On the other hand, this doesn't provide much information. Actually, all it does is reinvent the name "artificial intelligence" with new definitions. The precise nature of AI is uncertain so long as the aforementioned "complex human skills" are not defined. In a similar vein, the idea that AI is machines doing complicated tasks in complicated settings is applicable. [7]

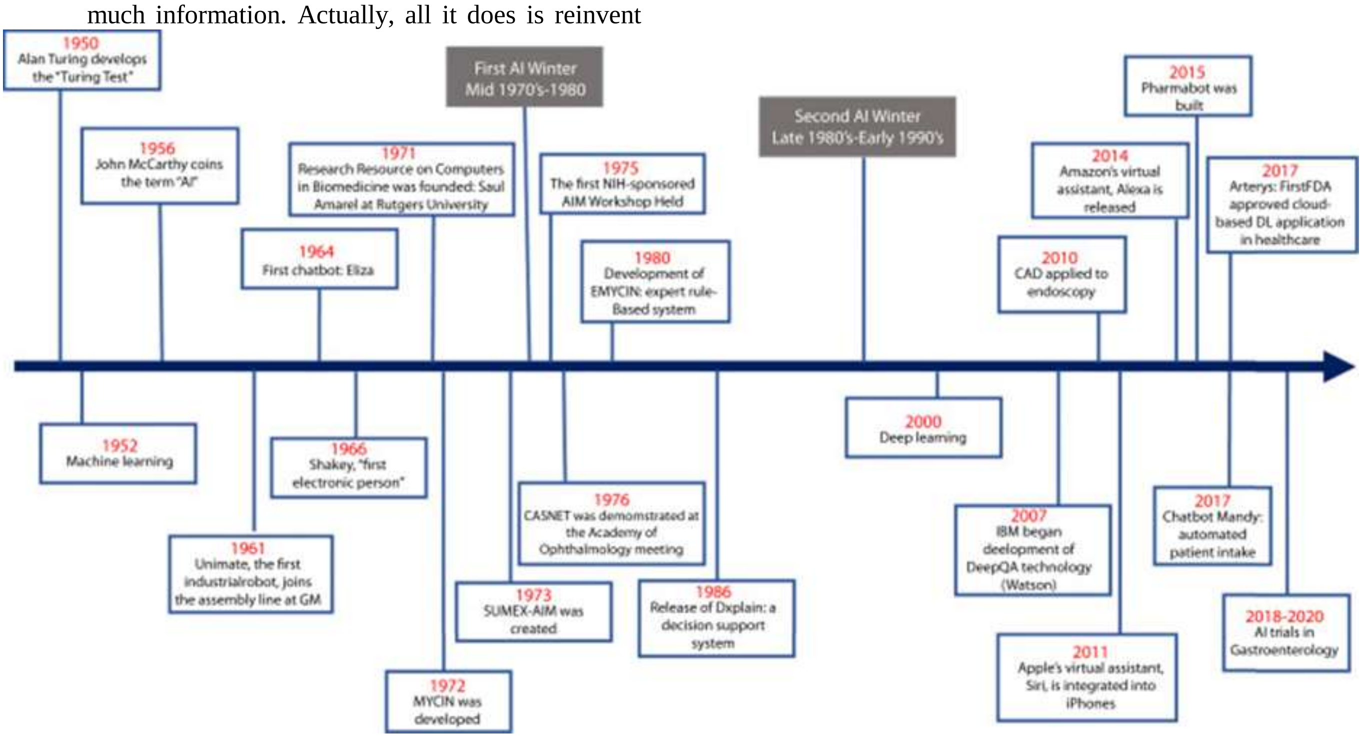

Fig 2. A chronological account of the evolution and use of AI in healthcare. AI, stand for artificial intelligence; DL, for deep learning; Like medical subspecialties, artificial intelligence (AI) has a number of subfields, such as computer vision, deep learning (DL), and machine learning (ML) [8].

AI plays a crucial role in CT imaging by analysing images and recognising patterns. Patterns suggestive of liver injury may be identified by training AI algorithms on massive datasets of CT scans. Because of the complexities of the pictures or the subtlety of the injuries, the human eye could overlook regions of concern such haematomas, contusions, or lacerations; nonetheless, these methods can reveal them. the ninth Researchers set out to create a system that could quantitatively evaluate hepatic damage using deep learning and completely automated picture processing. This model can quickly evaluate the level of liver damage and serve as a triage tool. This is why abdominopelvic CT scans automatically segment the whole liver parenchyma as well as areas affected by liver damage. This will allow us to calculate the proportion of the liver parenchyma that has been traumatised. [(10).]

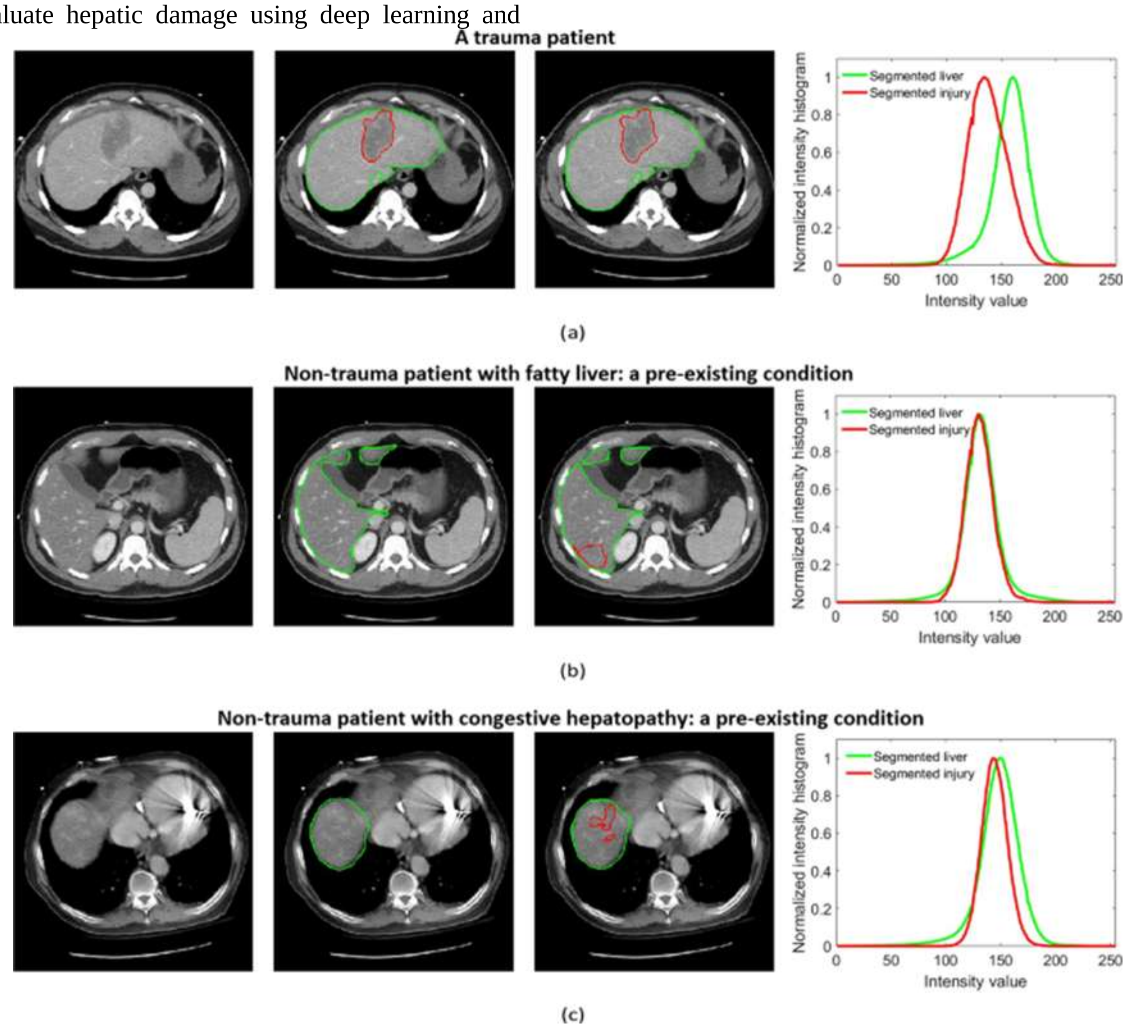

Fig 3: Findings from organ segmentation and liver trauma, together with ground truth annotations in individuals who have encountered trauma or have pre-existing diseases. (a) A contrast-enhanced CT scan of the left lobe of the liver reveals an intraparenchymal haematoma. (b) Fat buildup in the right hepatic lobe is seen by diffuse low attenuation in the axial contrast-enhanced computed tomography picture. (c) The right liver dome displays heterogeneous enhancement in the axial contrast-enhanced CT picture, which is caused by congestive hepatopathy. The third column corresponds to the findings of the automatic segmentation before post-processing. With respect to both the segmentation outcomes and the ground truth annotations. The distribution of pixel intensities inside the segmented trauma area and the segmented liver are compared in the fourth column.

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