

ABSTRACT

Comput Biol Med. 2022 Dec 7;152:106405. doi: 10.1016/j.compbimed.2022.106405.
Online ahead of print.

Brain tumor segmentation of MRI images: A comprehensive review on the application of artificial intelligence tools.

Ranjbarzadeh R(1), Caputo A(2), Tirkolaee EB(3), Jafarzadeh Ghouschi S(4), Bendeche M(5).

Author information:

(1)School of Computing, Faculty of Engineering and Computing, Dublin City University, Ireland. Electronic address: ramin.ranjbarzadehkondrood2@mail.dcu.ie.

(2)School of Computing, Faculty of Engineering and Computing, Dublin City University, Ireland. Electronic address: annalina.caputo@dcu.ie.

(3)Department of Industrial Engineering, Istinye University, Istanbul, Turkey. Electronic address: erfan.babaee@istinye.edu.tr.

(4)Faculty of Industrial Engineering, Urmia University of Technology, Urmia, Iran. Electronic address: s.jafarzadeh@uut.ac.ir.

(5)Lero & ADAPT Research Centres, School of Computer Science, University of Galway, Ireland. Electronic address: malika.bendeche@universityofgalway.ie.

BACKGROUND: Brain cancer is a destructive and life-threatening disease that imposes immense negative effects on patients' lives. Therefore, the detection of brain tumors at an early stage improves the impact of treatments and increases the patients survival rates. However, detecting brain tumors in their initial stages is a demanding task and an unmet need.

METHODS: The present study presents a comprehensive review of the recent Artificial Intelligence (AI) methods of diagnosing brain tumors using MRI images. These AI techniques can be divided into Supervised, Unsupervised, and Deep Learning (DL) methods.

RESULTS: Diagnosing and segmenting brain tumors usually begin with Magnetic Resonance Imaging (MRI) on the brain since MRI is a noninvasive imaging technique. Another existing challenge is that the growth of technology is faster than the rate of increase in the number of medical staff who can employ these technologies. It has resulted in an increased risk of diagnostic misinterpretation. Therefore, developing robust automated brain tumor detection techniques has been studied widely over the past years.

CONCLUSION: The current review provides an analysis of the performance of modern methods in this area. Moreover, various image segmentation methods in addition to the recent efforts of researchers are summarized. Finally, the paper discusses open questions and suggests directions for future research.

Copyright © 2022 Elsevier Ltd. All rights reserved.

DOI: 10.1016/j.compbimed.2022.106405
PMID: 36512875

Conflict of interest statement: Declaration of competing interest The authors declare that there is no conflicting or financial interests.