



Diagnostic Utility of Artificial Intelligence in Brain Tumor Identification: A Systematic Review and Analysis

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Background

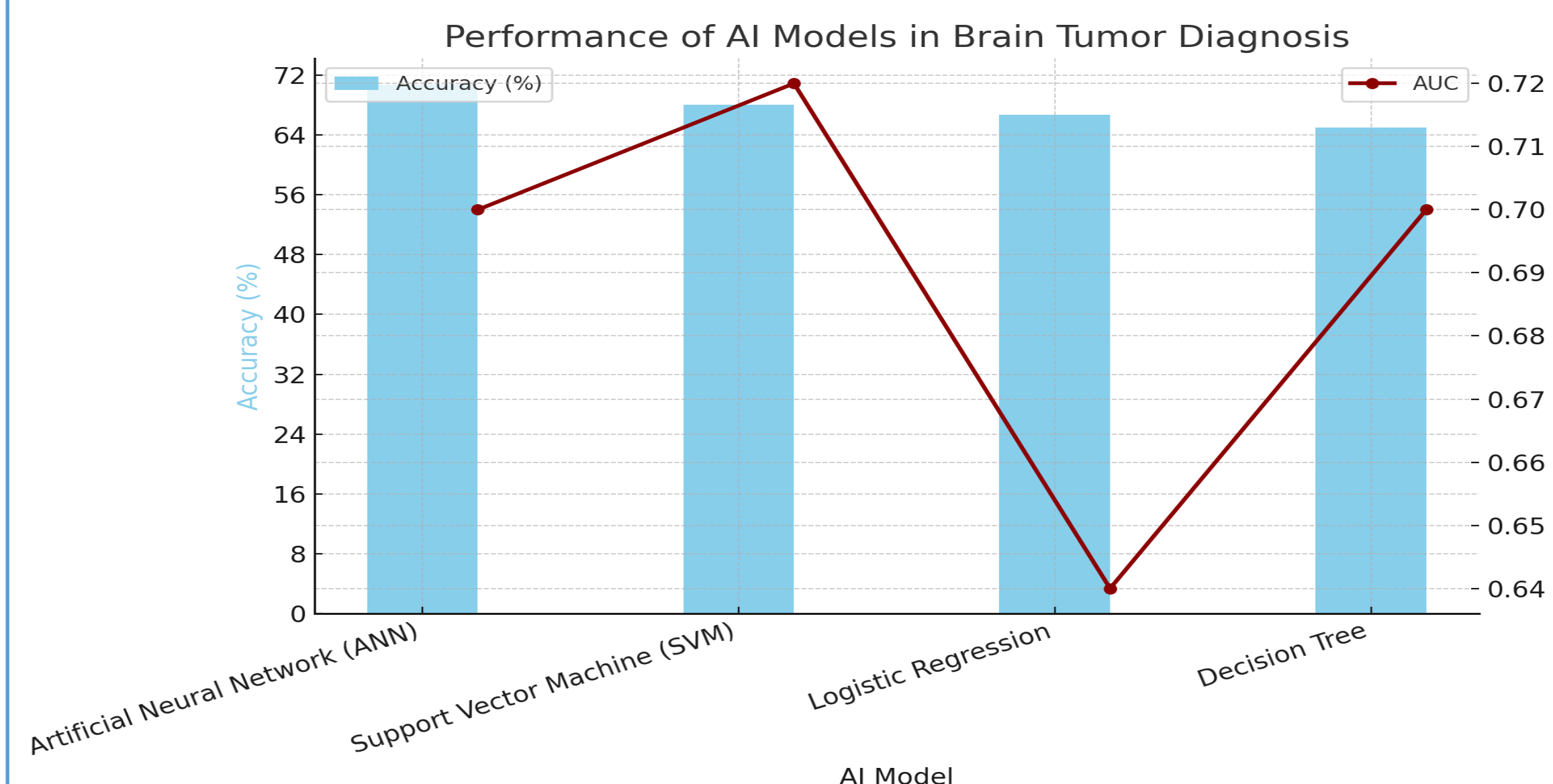
- ❖ Brain tumors present significant diagnostic challenges due to their complex imaging characteristics.
- ❖ Recently, artificial intelligence (AI) - especially machine learning (ML) and deep learning (DL)—has been explored as a way to support traditional diagnostic tools in neuro-oncology.
- ❖ This systematic review evaluates the accuracy and performance metrics of AI-based methods in diagnosing brain tumors.

Methods

- ❖ **Type of Study:** A systematic review and diagnostic accuracy analysis
- ❖ **Protocol Followed:** PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses)
- ❖ **Database:** PubMed
- ❖ **Study Group:** Population studied for the cancer describing the role of AI in diagnosing brain cancer.
- ❖ **Comparison Groups:** Gold standard vs. AI, ML, and DL
- ❖ **Inclusion Criteria:** English, full text, observational studies or clinical trials mentioning the role of AI, ML, and DL from 2013 to present.

Methods

- ❖ Studies using artificial neural networks (ANN), support vector machines (SVM), and decision trees (DT) were included.
- ❖ **Keywords:** (("artificial intelligence"[Title/Abstract] OR "machine learning"[Title/Abstract] OR "AI"[Title/Abstract] OR "deep learning"[Title/Abstract] OR "artificial neural network"[Title/Abstract]) AND ("brain cancer"[Title/Abstract] OR "brain tumor"[Title/Abstract] AND 2013/01/01:2025/06/31[Date - Publication] AND 2021/01/01:3000/12/31[Date - Publication]) AND ((clinicaltrial[Filter] OR observationalstudy[Filter] OR randomizedcontrolledtrial[Filter]) AND (fft[Filter]) AND (humans[Filter]) AND (english[Filter])).
- ❖ **Outcome:** Sensitivity, Specificity, Accuracy, and AUC
- ❖ **Software:** OpenMeta[Analyst]



Results

- ❖ Out of 9,238 studies screened, only one study met inclusion criteria for brain tumor diagnosis.
- ❖ Conducted by Panesar et al., the study involved 76 patients and compared multiple AI models.
- ❖ The ANN model achieved an accuracy of 70.7% with an AUC of 0.70. SVM yielded an accuracy of 68% and AUC of 0.72.
- ❖ Logistic regression and decision tree models achieved accuracies of 66.7% and 65%, with corresponding AUCs of 0.64 and 0.70, respectively.
- ❖ Despite moderate diagnostic performance, the study suggests potential for AI in neuro-oncology.

Conclusion

- ❖ While AI shows early promise in brain tumor diagnosis, particularly through ANN and SVM models, the limited number of studies and modest accuracy levels shows the need for more robust, large-scale research.
- ❖ Going forward, efforts should focus on using standardized data, building more explainable models, and testing them in clinical settings to better understand how AI can support brain tumor diagnosis.