



GÖRÜNTÜLEME TEKNİKLERİNDE YAPAY ZEKA: ACİL SERVİSTE BT VE MR

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GİRİŞ

Tıp bilimi, teknolojiyle birlikte evrimleşmekte ve bu evrim, sağlık hizmetlerinin sunumunda yeni bir çağın kapısını aralamaktadır. Bu dönüşümün en dikkat çekici unsurlarından biri, yapay zekânın (YZ) sağlık sistemlerine entegrasyonudur (1). Derin öğrenme, makine öğrenmesi ve yapay sinir ağları gibi ileri algoritmaların klinik karar verme süreçlerine katılması, sağlık hizmetlerinde verimlilik, doğruluk ve hız gibi temel parametrelerde çarpıcı iyileşmeler sağlamaktadır. Acil tıp, bu teknolojik dönüşümden en çok etkilenen alanlardan biridir; çünkü bu dalda hızlı karar verme, sınırlı zaman içerisinde karmaşık klinik verilere dayalı tanı koyma ve erken müdahale esastır (2).

Acil servislerde en sık başvurulanan tanı yöntemlerinden ikisi olan bilgisayarlı tomografi (BT) ve manyetik rezonans görüntüleme (MR), anatomik ve patolojik verileri hızlı ve ayrıntılı şekilde sunabilmeleri nedeniyle kritik öneme sahiptir (3). Bu görüntüleme yöntemlerinin yapay zekâ algoritmaları ile desteklenmesi, hekimlerin görsel veriyi yorumlama yükünü azaltmakta, gözden kaçabilecek bulguları saptamakta ve tanı doğruluğunu artırmaktadır.

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Bu bağlamda, yapay zekânın potansiyelinden tam anlamıyla faydalanmak için teknoloji geliştiricileri, klinisyenler, sağlık yöneticileri ve politika yapımcılar arasında yakın ve sürdürülebilir bir iş birliği tesis edilmelidir.

KAYNAKLAR

1. Reddy S, Fox J, Purohit M. Artificial intelligence-enabled healthcare delivery. *J R Soc Med.* 2018;112(1):22-28. doi:10.1177/0141076818815510
2. Rajpurkar P, Chen E, Banerjee O, Topol E. AI in health and medicine. *Nat Med.* 2022;28(1):31-38. doi:10.1038/s41591-021-01614-0
3. Muhmmmed B, Muhmmmed A, Mohammed D, et al. Radiology in Emergency Medicine: Life-Saving Imaging. *Power Syst Technol.* 2024. doi:10.52783/pst.1027
4. Castiglioni I, Rundo L, Codari M, et al. AI applications to medical images: From machine learning to deep learning. *Phys Med.* 2021;83:9-24. doi:10.1016/j.ejmp.2021.02.006
5. Puttagunta M, Subban R. Medical image analysis based on deep learning approach. *Multimed Tools Appl.* 2021;80:24365-24398. doi:10.1007/s11042-021-10707-4
6. Esteva A, Chou K, Yeung S, et al. Deep learning-enabled medical computer vision. *NPJ Digit Med.* 2021;4:5. doi:10.1038/s41746-020-00376-2
7. Pateriya N, Thakre N, Anjum G. A review paper on machine learning in pattern recognition. *Int J Innov Res Comput Commun Eng.* 2024. doi:10.15680/ijircce.2024.1203514
8. Long J, Xie L, Wang X, et al. A comprehensive review of signal processing and machine learning technologies for UHF PD detection and diagnosis (II): Pattern recognition approaches. *IEEE Access.* 2024;12:29850-29890. doi:10.1109/ACCESS.2024.3368866
9. Rawat W, Wang Z. Deep convolutional neural networks for image classification: A comprehensive review. *Neural Comput.* 2017;29(12):2352-2449. doi:10.1162/neco_a_00990
10. Ebrahimian S, Kalra M, Agarwal S, et al. FDA-regulated AI algorithms: Trends, strengths, and gaps of validation studies. *Acad Radiol.* 2021;28(11):1530-1542. doi:10.1016/j.acra.2021.09.002
11. Kocher K, Meurer W, Fazel R, et al. National trends in use of computed tomography in the emergency department. *Ann Emerg Med.* 2011;58(5):452-462.e3. doi:10.1016/j.annemerg-med.2011.05.020
12. Hu P, Yan T, Xiao B, et al. Deep learning-assisted detection and segmentation of intracranial hemorrhage in noncontrast computed tomography scans of acute stroke patients: a systematic review and meta-analysis. *Int J Surg.* 2024;110:3839-3847. doi:10.1097/JS9.0000000000001266
13. Lee H, Yune S, Mansouri M, et al. An explainable deep-learning algorithm for the detection of acute intracranial haemorrhage from small datasets. *Nat Biomed Eng.* 2018;3:173-182. doi:10.1038/s41551-018-0324-9
14. Kang D, Kim M, Park G, et al. Deep learning-assisted detection of intracranial hemorrhage: validation and impact on reader performance. *Neuroradiology.* 2025. doi:10.1007/s00234-025-03560-x
15. Cho J, Park K, Karki M, et al. Improving sensitivity on identification and delineation of intracranial hemorrhage lesion using cascaded deep learning models. *J Digit Imaging.* 2019;32(3):450-461. doi:10.1007/s10278-018-00172-1
16. Yeo M, Tahayori B, Kok H, et al. Evaluation of techniques to improve a deep learning algorithm for the automatic detection of intracranial haemorrhage on CT head imaging. *Eur Radiol Exp.* 2023;7:15. doi:10.1186/s41747-023-00330-3
17. Pu J, Gezer N, Ren S, et al. Automated detection and segmentation of pulmonary embolisms on computed tomography pulmonary angiography using deep learning but without manual outlining. *Med Image Anal.* 2023;89:102882. doi:10.1016/j.media.2023.102882
18. Vliegenthart R, Fouras A, Jacobs C, Papanikolaou N. Innovations in thoracic imaging: CT, radiomics, AI and x-ray velocimetry. *Respirology.* 2022;27(9):818-833. doi:10.1111/resp.14344

19. Park B, Park H, Lee S, et al. Lung segmentation on HRCT and volumetric CT for diffuse interstitial lung disease using deep convolutional neural networks. *J Digit Imaging*. 2019;32(6):1019-1026. doi:10.1007/s10278-019-00254-8
20. Shiraishi Y, Tanabe N, Sakamoto R, et al. Longitudinal assessment of interstitial lung abnormalities on CT in patients with COPD using artificial intelligence-based segmentation: a prospective observational study. *BMC Pulm Med*. 2024;24:230. doi:10.1186/s12890-024-03002-z
21. Cheng C, Lin H, Hsu C, et al. Deep learning for automated detection and localization of traumatic abdominal solid organ injuries on CT scans. *J Digit Imaging Inform Med*. 2024;37(5):1113-1123. doi:10.1007/s10278-024-01038-5
22. Shen X, Zhou Y, Shi X, et al. The application of deep learning in abdominal trauma diagnosis by CT imaging. *World J Emerg Surg*. 2024;19:21. doi:10.1186/s13017-024-00546-7
23. Stuhlfaut J, Anderson S, Soto J. Blunt abdominal trauma: Current imaging techniques and CT findings in patients with solid organ, bowel, and mesenteric injury. *Semin Ultrasound CT MR*. 2007;28(2):115-129. doi:10.1053/j.sult.2007.01.004
24. Wei X, Jiang J, Cao W, et al. Artificial intelligence assistance improves the accuracy and efficiency of intracranial aneurysm detection with CT angiography. *Eur J Radiol*. 2022;149:110169. doi:10.1016/j.ejrad.2022.110169
25. Huan X, Yang Y, Niu S, et al. AI-based automated quantification of arterial stenosis in head and neck CT angiography: A comparison with manual measurements from digital subtraction angiography and CT angiography. *Clin Neuroradiol*. 2024. doi:10.1007/s00062-024-01464-6
26. Nagel S, Sinha D, Day D, et al. e-ASPECTS software is non-inferior to neuroradiologists in applying the ASPECT score to computed tomography scans of acute ischemic stroke patients. *Int J Stroke*. 2017;12(6):615-622. doi:10.1177/1747493016681020
27. Liu Y, Yu Y, Ouyang J, et al. Functional outcome prediction in acute ischemic stroke using a fused imaging and clinical deep learning model. *Stroke*. 2023;54(8):2316-2327. doi:10.1161/STROKEAHA.123.044072
28. Yu Y, Christensen S, Ouyang J, et al. Predicting hypoperfusion lesion and target mismatch in stroke from diffusion-weighted MRI using deep learning. *Radiology*. 2022;305(2):407-417. doi:10.1148/radiol.220882
29. Liu Y, Yu Y, Ouyang J, et al. Functional outcome prediction in acute ischemic stroke using a fused imaging and clinical deep learning model. *Stroke*. 2023;54(8):2316-2327. doi:10.1161/STROKEAHA.123.044072
30. Freund P, Seif M, Weiskopf N, Friston K, Curt A. MRI in traumatic spinal cord injury: From clinical assessment to neuroimaging biomarkers. *Lancet Neurol*. 2019;18(12):1123-1135. doi:10.1016/S1474-4422(19)30138-3
31. Sharafi A, Klein A, Koch K. Quantitative MRI assessment of post-surgical spinal cord injury through radiomic analysis. *J Imaging*. 2024;10(12):312. doi:10.3390/jimaging10120312
32. Freund P, Seif M, Weiskopf N, Friston K, Curt A. MRI in traumatic spinal cord injury: From clinical assessment to neuroimaging biomarkers. *Lancet Neurol*. 2019;18(12):1123-1135. doi:10.1016/S1474-4422(19)30138-3
33. Gore S, Chougule T, Jagtap J, Saini J, Ingalthalikar M. A review of radiomics and deep predictive modeling in glioma characterization. *Acad Radiol*. 2020;27(12):1854-1867. doi:10.1016/j.acra.2020.06.016
34. Fan H, Luo Y, Gu F, et al. Artificial intelligence-based MRI radiomics and radiogenomics in glioma. *Cancer Imaging*. 2024;24:52. doi:10.1186/s40644-024-00682-y
35. Wang Q, Zhao W, Xing X, et al. Feasibility of AI-assisted compressed sensing protocols in knee MR imaging: A prospective multi-reader study. *Eur Radiol*. 2023;33(12):8585-8596. doi:10.1007/s00330-023-09823-6
36. Zhao Q, Xu J, Yang Y, et al. AI-assisted accelerated MRI of the ankle: Clinical practice assessment. *Eur Radiol Exp*. 2023;7:44. doi:10.1186/s41747-023-00374-5

37. Yun T, Choi J, Han M, et al. Deep learning-based automatic detection algorithm for acute intracranial haemorrhage: A pivotal randomized clinical trial. *NPJ Digit Med.* 2023;6:103. doi:10.1038/s41746-023-00798-8
38. Langius-Wiffen E, De Jong P, Hoessein F, et al. Retrospective batch analysis to evaluate the diagnostic accuracy of a clinically deployed AI algorithm for the detection of acute pulmonary embolism on CTPA. *Insights Imaging.* 2023;14:122. doi:10.1186/s13244-023-01454-1
39. Ziegelmayer S, Graf M, Makowski M, Gawlitza J, Gassert F. Cost-effectiveness of artificial intelligence support in computed tomography-based lung cancer screening. *Cancers (Basel).* 2022;14(7):1729. doi:10.3390/cancers14071729