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Optimization in Multimodal AI for Cancer Diagnosis: A Critical Survey and Future Directions

Communication Info

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Abstract

Advances in artificial intelligence, enabled by multimodal deep learning models that utilize diverse medical data, have significantly improved cancer diagnosis. Key contributions include Chen's [1] deep learning model for breast cancer screening, Alzahrani's [2] multimodal image fusion framework leveraging Discrete Wavelet Transform and metaheuristic optimization, Wu et al.'s [3] integration of CT and MRI for surgical planning, and Lokaj et al.'s [4] classification of breast lesions using DCE-MRI and deep learning. Sarwar's [5] cross-attention-based architecture for brain cancer further exemplifies these advancements. Despite these advances, the majority of frameworks still in use lack adaptive optimization mechanisms designed for multimodal architectures and mainly rely on traditional gradient-based training techniques. This survey critically examines recent multimodal AI models for cancer diagnosis, focusing on optimization techniques and fusion strategies.

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References

- [1] J. Chen, T. Pan, and Z. Zhu, "A deep learning-based multimodal medical imaging model for breast cancer screening," *Scientific Reports*, vol. 15, p. 14696, 2025.
- [2] A. A. Alzahrani, "Enhanced multimodal medical image fusion via modified DWT with arithmetic optimization algorithm," *Scientific Reports*, vol. 14, p. 19261, 2024.
- [3] B. Z. Wu, L. H. Hu, and S. F. Cao et al., "Deep learning-based multimodal CT/MRI image fusion and segmentation strategies for surgical planning of oral and maxillofacial tumors: A pilot study," *Journal of Stomatology, Oral and Maxillofacial Surgery*, vol. 126, no. 5S, p. 102324, 2025.
- [4] B. Lokaj, V. D. De Gevigney, D. Djema, J. Zagher, J. Goldman, M. Bjelogrljic, H. Turbé, K. Kinkel, C. Lovis, and J. Schmid, "Multimodal deep learning fusion of ultrafast-DCE MRI and clinical information for breast lesion classification," *Computers in Biology and Medicine*, vol. 188, p. 109721, 2025.
- [5] S. Sarwar, S. Majeed, A. Nawaz, R. Bibi, and S. W. Lee, "MDL-CA: A multimodal deep learning approach with a cross-attention mechanism for accurate brain cancer diagnosis," *Frontiers in Public Health*, vol. 13, p. 1687335, 2026.

