Turkish Society of Radiology artificial intelligence applications guide: a roadmap to help navigate the artificial intelligence landscape

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This article introduces the artificial intelligence (AI) applications guide developed by the Turkish Society of Radiology (TSR) and provides a commentary on its framework, strengths, and areas for future development. The proliferation of accessible data, accelerated information processing capabilities, and the development of advanced algorithmic tools such as convolutional neural networks have led to a significant leap in AI studies. The field of radiology, with its growing imaging workload and reliance on archivable data, has naturally assumed a pioneering role in AI applications.

Amid ongoing concerns that AI may pose a threat to the profession, the TSR recognized its responsibility to support its members by providing a guide that promotes the responsible use of AI to enhance diagnostic speed, accuracy, and efficiency–ultimately benefiting patient care. The preparation of the guide involved a dedicated team effort, beginning with a comprehensive literature review, followed by expert-led identification of the main sections, and collaborative content development through group discussions.

This article introduces the guide, assesses its strengths and areas for improvement, and encourages feedback from the scientific community to inform future updates. The guide was published in both Turkish and English on the society's website on April 10, 2025.[1]

Overview of the guide and key contents

The TSR AI applications guide is organized into six sections, structured around three core thematic pillars that provide a clear framework for understanding its content. First, the guide establishes foundational elements by outlining the rationale for its development and defining key AI terminology. These definitions are supported by the TSR Imaging Informatics Dictionary,[2] which provides a more comprehensive glossary. This section also presents a set of general principles in bullet-point format for clarity. These principles, developed in line with international recommendations, address the fundamental elements of health ethics–such as respect for autonomy, beneficence, informed consent, and confidentiality–in the context of AI.[3-6]

Second, the guide outlines the AI application development process, offering clear guidance and explanations for each phase. It covers the identification of clinical problems, data management (collection, curation, and privacy protection), the critical process of image labeling and annotation, and a comparison of traditional machine learning versus deep learning methodologies. It also outlines the selection of appropriate performance metrics for different tasks, emphasizes the need for model calibration, and highlights the importance of evaluating true clinical benefit in addition to discriminatory performance. Challenges related to AI interpretability and explainability are also addressed, along with strategies to improve transparency.

Third, the guide focuses on the clinical deployment and use of AI applications, as well as the responsibility issues that arise through their use. It lists principles to be followed when selecting and using AI applications in clinical settings and for informing patients about their

use. This section also specifies the required reliability levels, provides considerations for quality control and continuous improvement, and addresses the responsibilities of the parties involved.

Strengths and limitations

Combining a comprehensive framework with evidence-based content, the guide serves as an accessible and practical resource for radiologists, data scientists, researchers, and other stakeholders.

As with other rapidly developing technologies, one of the main difficulties in developing an AI guide lies in defining its theoretical scope while maintaining up-to-date information. To maintain clarity and focus, the guide intentionally omits extensive quantitative data and detailed application examples, which, though potentially helpful, would have compromised its conciseness. Furthermore, it should be noted that the guide does not fully encompass the complex and ongoing ethical and social discussions surrounding the clinical adoption of AI technologies.

Future directions

A fundamental goal of the guide is to ensure periodic updates, informed by community feedback, to keep pace with rapid technological developments. Key areas for future consideration should include emerging topics such as best practices for clinical deployment strategies, the establishment of standardized benchmarking protocols for model comparison, and the impact of large-scale foundation models on radiology.

Future content should address the practical challenges of deployment, including information technology infrastructure requirements, integration with picture archiving and communication systems and electronic health records.

To ensure fair and transparent comparisons between AI models, the field needs standardized benchmarking protocols. Future guidance could explore the creation and use of curated, public datasets and consensus-based evaluation frameworks, allowing for reproducible and objective performance assessments of new technologies.

The paradigm is shifting from narrow, single-task algorithms to large-scale, pre-trained foundation models that can be adapted to multiple tasks. Subsequent versions of the guide should include recommendations on the unique challenges and opportunities presented by these models, including fine-tuning strategies, human–computer interactions (e.g., overreliance and automation bias), managing their inherent complexity (e.g., hallucinations), and ethical and societal implications, such as high costs and environmental impact.

In conclusion, this guide is more than a collection of recommendations–it provides a structured framework for standardizing the development and clinical integration of AI in radiology. By systematically addressing each stage of the AI implementation process, it offers a practical and actionable roadmap. Through its introduction in this journal and commitment to ongoing updates, we aim to foster responsible innovation among developers and clinicians alike.

Footnotes

Conflict of interest disclosure

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