



Limits and Inadequacies of Artificial Intelligence in Radiology and Medical Imaging in Cameroon: An Analysis of Structural and Technological Barriers

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Abstract

At a time when Silicon Valley is touting the merits of AI capable of detecting cancerous tumors with greater accuracy than the human eye, a pressing question arises for developing countries. The advent of artificial intelligence (AI) has radically transformed global radiology, offering unprecedented opportunities for early diagnosis and workflow optimization to improve patient management and the quality of care. However, its application in middle-income countries, and specifically in Cameroon, faces major structural barriers. This article aims to examine the current inadequacy of AI solutions in Radiology and Medical Imaging within the Cameroonian context. To achieve this objective, we analyze infrastructural disparities, data management challenges, economic constraints, and the training of human resources capable of understanding, analyzing, and utilizing AI. Although AI offers theoretical and practical potential to address the shortage of radiologists, we argue that its hasty deployment without local adaptation risks exacerbating health inequalities.

Keywords: Artificial Intelligence, Radiology and Medical Imaging, Digital Infrastructure.

Introduction

Medical imaging is at the heart of modern medicine, playing a crucial role in the diagnosis, treatment, and monitoring of medical conditions. Globally, the integration of AI, particularly through deep learning, has demonstrated performance comparable to, or even superior to, that of human experts in detecting abnormalities (such as pulmonary nodules or diabetic retinopathy) (1).

Cameroon, facing a growing disease burden and a chronic shortage of specialized personnel (estimated at approximately 1 radiologist per 150,000 inhabitants in some areas), could theoretically benefit from these technologies to expand access to care (2). RAD-AID reports approximately 1 radiologist per 500,000 inhabitants in Cameroon (6), and Professor Joseph GONSU cited a ratio of 1 radiologist per 460,000 Cameroonians in 2007. However, the direct transposition of algorithmic models developed in high-income countries to the Cameroonian context

appears ineffective (3). Between the promise of precision medicine and the reality of a health system in the process of reconstruction, the forced marriage between AI and Cameroonian radiology today resembles a structural mismatch more than an imminent revolution.

This article aims to demonstrate why AI, in its current state, remains largely ill-suited to the reality of Cameroonian radiology.

1. Data Inadequacy: The “Data Gap” Problem

The performance of an AI system is intrinsically linked to the quality and quantity of the data on which it was trained.

Demographic and epidemiological biases: The majority of AI radiology algorithms are trained on Western databases (Caucasian or Asian populations). The phenotypic characteristics of the African population (bone density, breast composition, etc.) differ, which can lead to a significant decrease in the specificity and sensitivity of automated detection tools in Cameroon.

✚ **Neglected tropical diseases:** Current AI systems are optimized to detect diseases prevalent in industrialized countries (smoking-related lung cancer, classic cardiovascular diseases). They are often blind to tropical diseases or atypical presentations of infectious diseases (tuberculosis, severe malaria) common in Cameroon.

Neglected tropical diseases (NTDs) (of which there are about 20, according to the WHO) are often underrepresented in AI tools and digital diagnostic models. This is mainly due to a lack of high-quality data, scarce research resources, and the fact that they affect poor populations, making the market less attractive for technological innovation (7).

✚ **Lack of structured digital data:** In Cameroon, a significant portion of imaging procedures are not integrated into PACS (Picture Archiving and Communication System) systems. Many exams are still performed on film or stored in a disorganized manner, making it impossible to create the local databases necessary to train or validate AI models (4).

2. Infrastructural and Technological Barriers

AI in radiology requires more than just software; it necessitates a robust technological ecosystem that is lacking in many healthcare facilities in Cameroon.

✚ **Unstable internet connectivity:** Most modern AI solutions rely on cloud computing. Low bandwidth and unstable internet connections in rural areas—and even in some urban centers—make uploading large DICOM files (CT or MRI images) to remote servers difficult and impractical for routine clinical use.

✚ **Power outages:** The power supply remains a major challenge. Frequent outages require the use of costly generators. Critical infrastructure such as AI, which requires servers operating 24/7 or high-performance workstations, cannot function effectively without a stabilized and backup power supply, which is rarely available in both rural and urban health centers.

✚ **Obsolescence of equipment:** Integrating AI requires modern imaging machines capable of communicating via standard protocols (DICOM, HL7) (5). However, Cameroon's radiology equipment is aging and often consists of secondhand, unconnected devices that are incompatible with modern image analysis software.

3. The Economic Divide and Financial Viability

The adoption of AI in radiology is a matter of economic viability, a factor often overlooked by technology promoters. Viewed in this light, the majority of radiology departments would be unable to procure equipment featuring such technology, which would shrink the market and create a lack of interest. In addition to these limitations, there is the issue of stagnant revenue streams, which raises the question: why invest in such an expensive device if there will be no financial growth in revenue? This can be supported on two fronts:

✚ **Inappropriate business models:** AI solutions are generally marketed as subscriptions (SaaS) in dollars or euros, with per-exam fees. In a system where social security reimbursement is partial and patients' purchasing power is limited, these additional costs are prohibitive for both private clinics and public hospitals.

✚ **Investment Priorities:** Faced with urgent needs, Cameroonian healthcare decision-makers prioritize the acquisition of basic equipment (ultrasound machines, standard X-ray machines) or the development of human skills rather than investing in technological tools perceived as "accessories."

4. Shortage of Human Resources and Resistance to Change

AI does not replace radiologists but changes the way they work. Its

integration requires a workforce skilled in medical informatics, which is scarce in Cameroon.

✚ **Brain drain:** The training of biomedical AI engineers and radiologists with IT expertise is hampered by the brain drain to Western countries.

✚ **Lack of understanding and skepticism:** There is legitimate mistrust among practitioners regarding algorithmic "black boxes." Without adequate training explaining the limitations of AI, the risk of diagnostic errors due to overconfidence in the machine is high. Furthermore, the absence of a legal framework defining liability in the event of an AI-assisted diagnostic error hinders its adoption.

5. Toward Contextualized AI or a Technological Illusion

While the current unsuitability of AI in Cameroon is evident, it is not definitive. It would be a mistake to blindly import Western technologies. For AI to become relevant, a "bottom-up" approach is necessary:

- ✚ **Development of Edge Computing solutions:** Prioritize lightweight algorithms capable of running locally on laptops or even smartphones, without requiring a constant internet connection.
- ✚ **Creation of local data consortia:** Encourage the anonymized sharing of data among Cameroonian hospitals to develop algorithms trained on local data that are relevant to the local population.
- ✚ **Public-Private Partnerships:** Solutions must be subsidized or integrated into national digital health plans, as evidenced by Cameroon's e-health initiative, but with a specific focus on imaging.

Conclusion

Artificial Intelligence in radiology in Cameroon is currently at a crossroads. The digital divide renders current market solutions largely unsuited to the realities on the ground. AI cannot be the silver bullet for the shortage of radiologists unless basic infrastructure, connectivity, and data governance are first strengthened. A locally driven approach, taking into account local economic and health constraints, is essential to prevent AI from becoming an additional factor contributing to inequalities in access to quality care.

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