

Can AI make our healthcare system greener?

The World Health Organisation has stressed that climate change poses a fundamental threat to human health¹, yet the healthcare sector is responsible for an estimated 5% of greenhouse gas (GHG) emissions and the production of over 5.9 million tonnes of waste annually². The system which plays an indispensable role in saving lives is failing to do so sustainably.

There is scope for artificial intelligence (AI) to play a role in making our healthcare systems greener. For example, it can optimise radiology, automate waste management, improve scheduling, and use anomaly detection to identify abnormal electricity usage.

Case study 1: Radiology

Opportunities

Radiology describes medical imaging, such as MRIs and CTs, which aid clinicians in diagnoses and treatment. An estimated 45 million imaging tests are completed by the NHS annually³, and whilst invaluable for healthcare, the manufacture and powering of these machines is electricity intensive.

1% Estimated global GHG emissions from medical imaging each year⁴

AI can reduce electricity usage in radiology by performing image processing (such as denoising) on scans, so that the time taken to scan can be reduced without compromising the quality of the resulting images. Equally, diagnostic support tools could reduce the number of scans which don't yield useful data.

One study found 2/3 of the energy consumed by a CT scanner occurred whilst the system was idle⁴. Here an AI system, or even a more rudimentary algorithm, could automatically turn off idle scanners.

AI image enhancement can also reduce the amount of contrast medium required for a scan. Contrast mediums are injected before a scan to improve organ visibility but cause environmental pollution as they can't be absorbed by the body.

Limitations

One must consider the potential ethical issues of AI for diagnostics; a system may inherit human biases, and may be trusted blindly by clinicians even when in error.

Case study 2: Medical Waste

Opportunities

Some hospital waste requires specific disposal procedures, whilst others can be treated as domestic waste. Despite this, misclassification of waste is extremely common, often due to misinformation⁵.

AI image classification could identify different types of medical waste and sort accordingly so that more can be recycled and less incinerated, and to reduce accidental pollution. For example, the Bin-E system is a self-sorting, AI-based recycling bin designed for use in hospitals⁶.

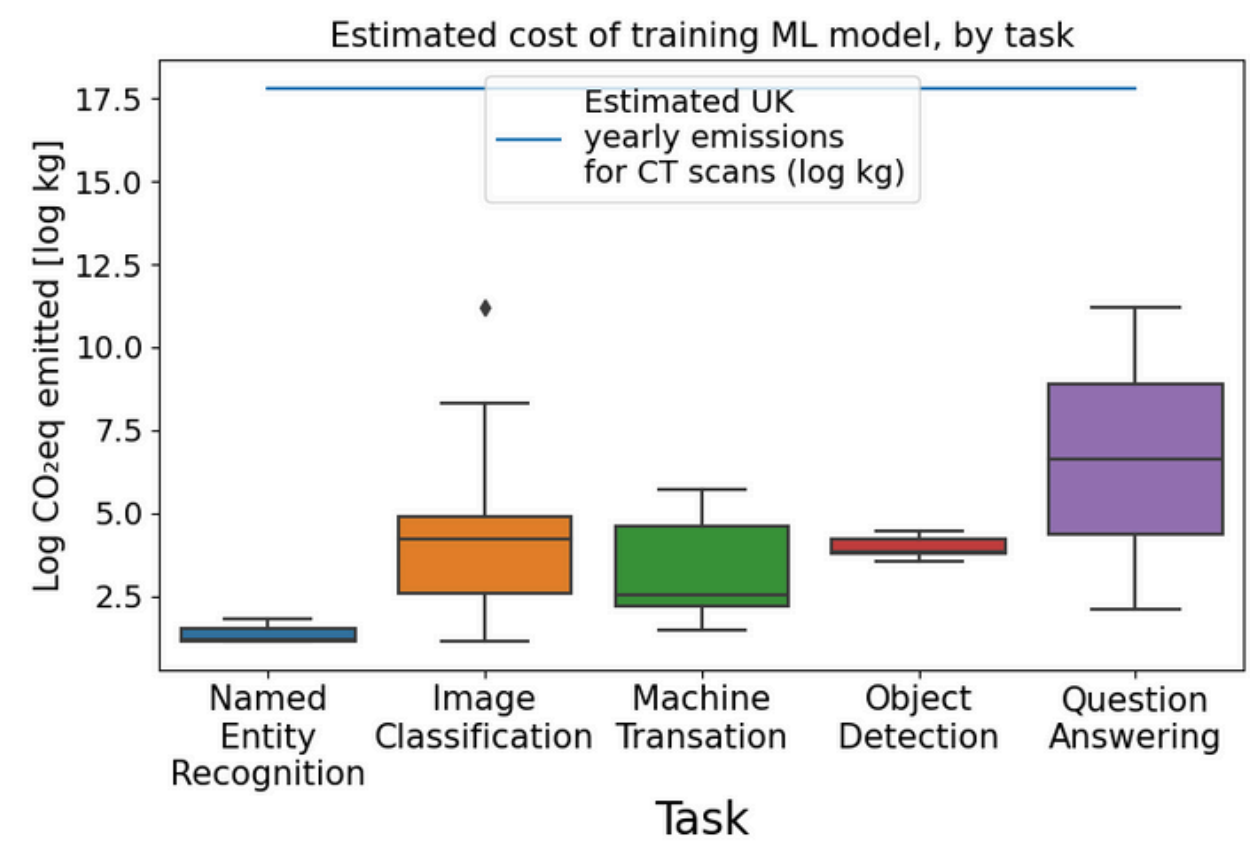
Limitations

Although AI can distinguish between general classes of medical waste, like gloves, gauze, and syringes, it is more difficult for such a system to tell if something is contaminated. Furthermore, it may be difficult to prevent cross contamination in an automated sorting system. Given the results of incorrect disposal can be dangerous, any such AI implementation should be undertaken with care and thorough testing.

Furthermore, other interventions, such as improving training, may prove more effective than an AI system at reducing waste and would likely have lower cost and risk.



Help or hindrance: The environmental cost of AI



Despite its potential to reduce emissions, the environmental cost of AI can't be ignored:

- Training and using an AI consumes a lot of electricity, as does storing data
- Data centres require cooling, which can use large amounts of water
- GPUs contain metals which harm the environment during acquisition

Although some environmental impact can be reduced, for example by running servers in cooler climates so less cooling is required, it is important to consider the relative environmental cost of any system.

Graph uses data from [3], [7], [8]

In focus: The NHS

With a focus on NHS specific challenges, one must note the financial cost of AI design and implementation. Regardless of cost, AI may only be effective if embraced by staff and patients; one recent survey found 50%⁹ don't trust the NHS to use AI to analyse their patient data, even if it could improve healthcare.

The NHS¹⁰ also notes that challenges for AI include:

- data ownership and control
- lack of liability
- privacy, ethical and regulatory issues
- lack of explainability.



Conclusion

AI presents promising opportunities to enhance sustainability within the healthcare sector, yet these avenues are not without limitations. Successful implementation requires a careful comparison of the environmental costs and benefits of AI, and a consideration of the associated ethical and technical challenges.

References

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