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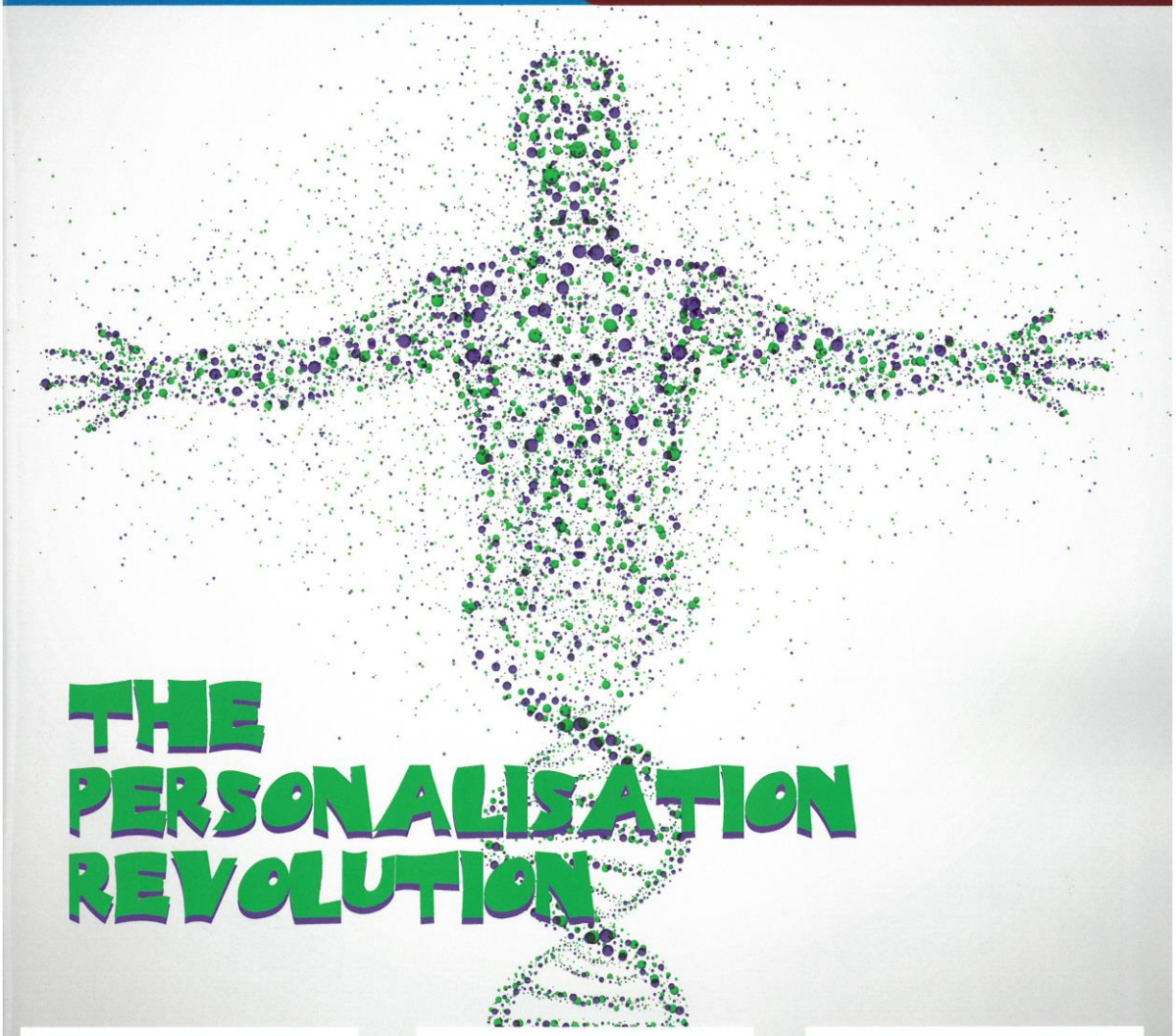

THE PERSONALISATION REVOLUTION

Improving the Early Detection of Lung Cancer

The rising support role of AI in transforming image processing speed & accuracy

By Daniel Drieling of MeVis Medical Solutions

Lung cancer is the number one cancer globally, across populations of men and women combined, yet it is notoriously challenging to spot sufficiently early to enable positive treatment outcomes, which is prompting new approaches to disease detection.

In 2018, lung cancer accounted for 2.09 million of cancer cases globally, and some 1.76 million deaths – more than twice the number of the next biggest killer cancer (colorectal), according to the World Health Organization.[1] The trouble is that symptoms of lung cancer tend to occur predominantly in the late stages of the disease, when successful treatment becomes more and more difficult. Unlike various other types of cancer, such as breast cancer (accounting for 627 000 deaths in 2018), which can be checked for in a number of different ways, lung cancer requires targeted medical imaging to determine what's going on.

Radiologists equipped with software that has been created using machine-learning algorithms are able to detect significantly more cancerous structures or nodules than without, clinical studies have shown

Strategic screening

Because of the high rates of lung cancer, and the poor prognosis when it is found too late in patients, governments internationally are increasingly launching strategic screening campaigns. One example is NHS England's mobile lung health checks. Here, portable CT scanners are being dispatched to areas of the country where rates of lung disease are found to be higher than average.

The thinking is that by looking out for the earliest signs of problems among at-risk groups (smokers, those working in potentially harmful environments, and so on), health services will save more lives, and reduce the significant long-term costs of trying to treat late-stage cancer.

The potential flaw in this plan is that qualified radiologists are not an abundant resource and, as more images are taken, their workloads will soar.

Alleviating bottlenecks in image processing

Supported by standard, static imaging solutions, even the most experienced radiologists can take up to 10 minutes (or longer) to read a patient's lung scans in sufficient detail to be able to inform next steps. As screening programmes intensify, radiologists' capacity will be a challenge. It is all very well screening more patients proactively, but if this leaves radiologists with a backlog of images to read, there are likely to be processing bottlenecks which ultimately could delay interventions.

Development and training of algorithms

So it is encouraging and very timely that artificial intelligence is now sufficiently mature and robust to offer a solution. It's a technology we've been working within a range of cancer detection solutions; since 2014 we've been applying AI and machine learning to reading lung images. By showing our software all sorts of cancer-based images, even the most subtle early signs, we have trained our computer-aided detection algorithm to spot suspicious structures which even expertly-trained eye might miss – those which could indeed be cancer.

Developed using machine-learning techniques, Veolity's algorithm aim is to recognise potential signs of lung cancer, to the point that it now offers an indispensable and highly stable diagnostic support tool.

Combining this technology with radiologists' own readings has been seen to produce the best detection rates ever known - an impressive improvement compared to human-based readings alone, according to clinical studies of computer-aided detection success rates. This is crucial: radiologists retain complete control of their diagnostic process, but can benefit from support of valuable automatic features.

The vital support role of AI in aiding rapid, reliable early disease detection

Working symbiotically, human and machine are now detecting even the most difficult to spot signs of cancer – the signals that might otherwise have been overlooked, especially where radiologists are under increased time pressure. Importantly, the software has the ⇨

potential to process heavy workloads at high speed too, allowing experienced radiologists to comfortably and reliably assess more cases per hour.

It isn't only in the reading of baseline studies and complex follow-up comparisons that AI-based technology is leaving its mark, and lightening workloads. Our Veolity software automatically extracts lung nodules from medical images and provides comparable volumetric measurements that help to assess findings. It also makes short work of planning further patient treatment, by matching findings and established reporting guidelines including management recommendations.

For hard-pressed health services, and at-risk populations, use of AI-based detection techniques in mass-scale lung cancer screening is a win-win. Thanks to our implementation of Veolity directly for large OEM healthcare equipment providers, and via strategic distribution partnerships including that with SynApps Solutions in the UK, MeVis Medical Solutions AG is recognised to be the world's leading specialist in image-based lung cancer screening solutions - with established deployments on and continuously increasing enquiries worldwide. This illustrates the scale of the technology's potential in making more of radiologists' time, and improving outcomes for lung cancer patients.

High mortality rates necessitate innovative intervention

As instances of cancer continue to rise, it is critical that medical professionals are able to draw on every tool available to them, to keep ahead of symptoms and apply early treatment.

According to a study of 4 million cancer patients reported in Lancet Oncology[2], the UK had the lowest five-year survival rate for lung cancer (14.7% between 2010-2014) compared to other high-income nations, specifically Australia, Canada, Denmark, Ireland, New Zealand and Norway (Canada had the highest survival rate at 21.7%).

Certainly, better patient outcomes and more effective use of healthcare budgets depend on the success of intensified screening initiatives, supported by smarter tools that enable radiologists to analyse and process their findings quickly, efficiently and reliably.

References

1. Cancer – key facts. World Health Organization, September 2018
2. The Lancet Oncology, Sept. 11, 2019: *https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(19)30456-5/fulltext*

About the author

Daniel Drieling is product manager at MeVis Medical Solutions AG. Headquartered in Bremen, Germany, MeVis Medical Solutions develops and supplies intelligent, ground-breaking software and services for image processing in medicine. Innovative, competent and richly experienced in its field, MeVis contributes significantly to the early detection and diagnostics of cancer, enabling early, tailor-made treatments of the disease. ■