# Study suggests AI may soon be able to detect cancer
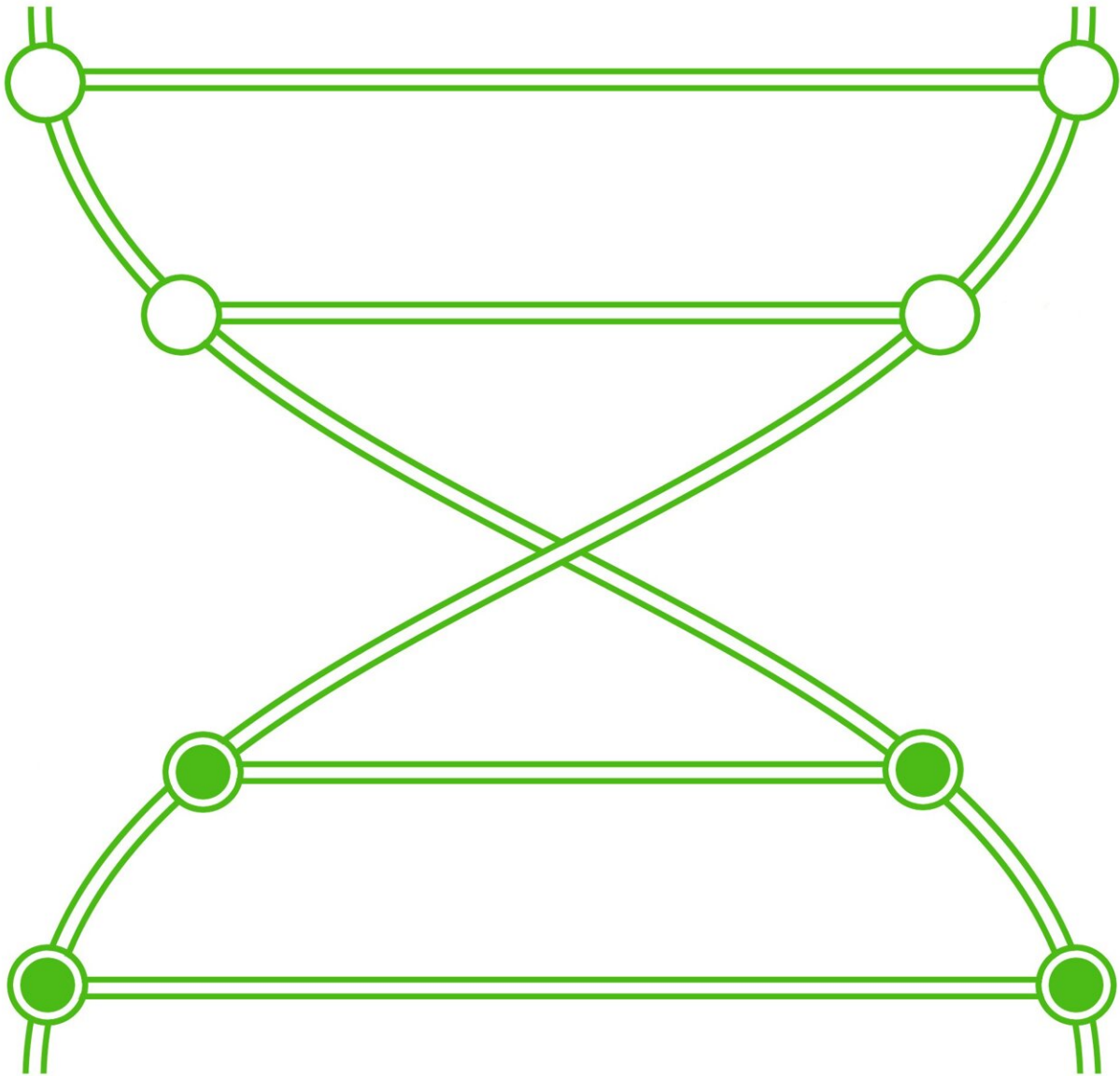
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A new paper in *Biology Methods & Protocols* indicates that it may soon be possible for doctors to use artificial intelligence (AI) to detect and diagnose cancer in patients, allowing for earlier treatment. Cancer remains one of the most challenging human diseases, with over 19

million cases and 10 million deaths annually. The evolutionary nature of cancer makes it difficult to treat late-stage tumors.

Genetic information is encoded in DNA by patterns of the four bases—denoted by A, T, G and C—that make up its structure. Environmental changes outside the cell can cause some DNA bases to be modified by adding a methyl group. This process is called "DNA methylation."

Each individual cell possesses millions of these DNA methylation marks. Researchers have observed changes to these marks in early cancer development; they could assist in early diagnosis of cancer. It's possible to examine which bases in DNA are methylated in cancers and to what extent, compared to healthy tissue.

Identifying the specific DNA methylation signatures indicative of different cancer types is akin to searching for a needle in a haystack. This is where the researchers involved in this study believe that AI can help.

Investigators from Cambridge University and Imperial College London trained an AI mode, using a combination of machine and deep learning, to look at the DNA methylation patterns and identify 13 different cancer types (including breast, liver, lung, and prostate cancers) from non-cancerous tissue with 98.2% accuracy. This model relies on tissue samples (not DNA fragments in blood) and would need additional training and testing on a more diverse collection of biopsy samples to be ready for clinical use.

The researchers here believe that an important aspect of this study was the use of an explainable and interpretable core AI model, which

provided insights into the reasoning behind its predictions. The researchers explored the inner workings of their model and showed that the model reinforces and enhances understanding of the underlying processes contributing to cancer.

Identifying these unusual methylation patterns (potentially from biopsies) would allow health care providers to detect cancer early. This could potentially improve patient outcomes dramatically, as most cancers are treatable or curable if detected early enough.

"Computational methods such as this model, through better training on more varied data and rigorous testing in the clinic, will eventually provide AI models that can help doctors with early detection and screening of cancers," said the paper's lead author, Shamith Samarajiwa. "This will provide better patient outcomes."

**More information:** Izzy Newsham et al, Early detection and diagnosis of cancer with interpretable machine learning to uncover cancer-specific DNA methylation patterns, *Biology Methods & Protocols* (2024). DOI: 10.1093/biomethods/bpae028

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