Developing a new AI breast cancer diagnostic tool

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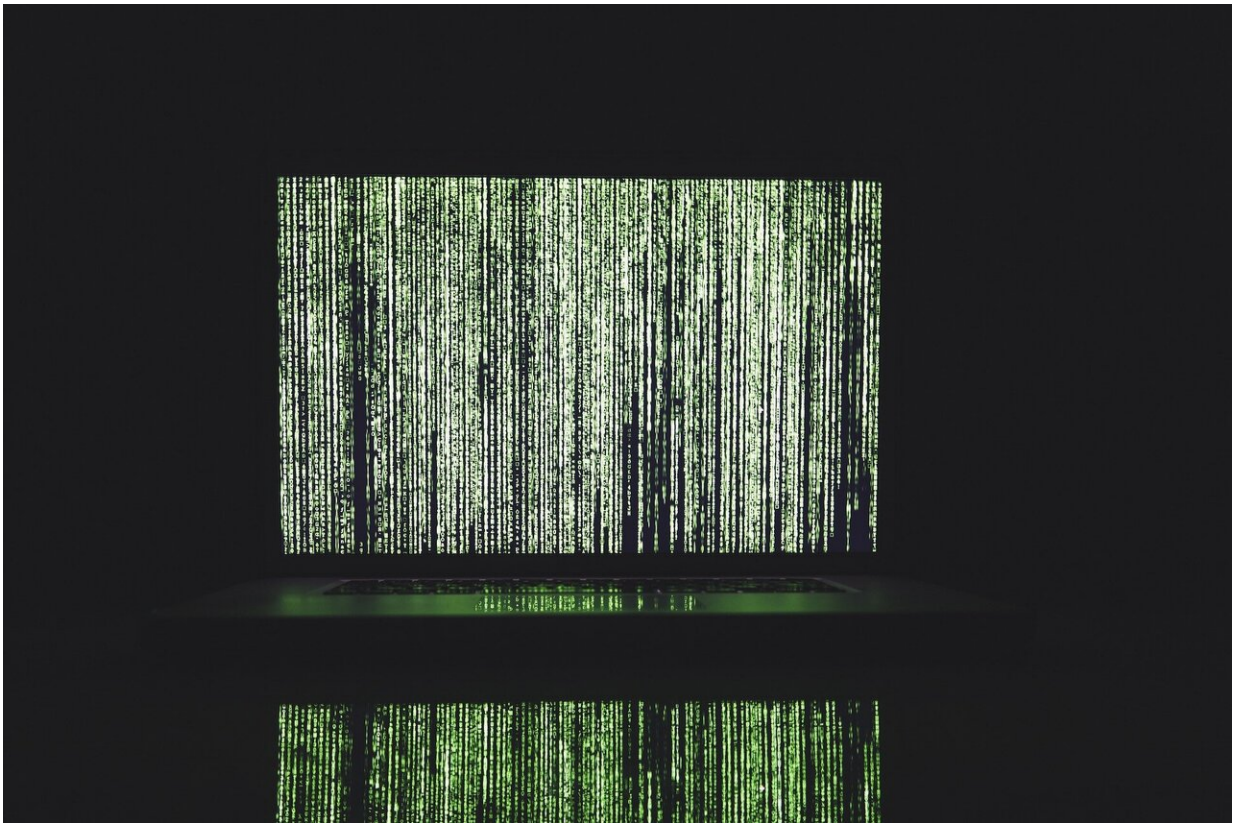

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Scientists are developing a new way to identify the unique chemical 'fingerprints' for different types of breast cancers.

These new chemical footprints will be used to train AI software—creating a new tool for rapid and accurate diagnosis of breast cancers.

The team of researchers from Lancaster University and Airedale NHS Foundation Trust are using a specialised chemical analytical technique called Raman Spectroscopy on biopsies to identify the molecular structure of different types of breast cancer, as well as variations within each cancer cell group.

Raman analysis is able to provide real-time information on cells and can be used to check how the cells are behaving, spreading and emerging elsewhere in the body.

After identifying the chemical fingerprints of breast cancer cells, and observing how they change, the researchers used this information to train complex machine learning algorithms to identify four subtypes of cancer.

The algorithms successfully predicted diagnostic patterns for each subtype with a high level of accuracy ranging between 70 per cent and 100 per cent.

Similar versions of these algorithms have previously been used to identify other forms of cancers and diseases such as skin, oral and lung cancers.

The next stage of the research will look at creating databases of the chemical structures of many more different types of breast cancer cells and the forms they can take.

These databases will be then used to train more artificial intelligent algorithms using machine learning—eventually leading to a new

diagnostic tool to sit alongside mammograms and MRI scans.

The new algorithms promise to provide rapid information to help medical specialists to make quicker diagnosis.

In addition, the approach will help to determine the state of the disease at various points in its progression and will become critical in planning the therapeutic approach of individual patients.

Professor Ihtesham Rehman, Chair in Bioengineering at Lancaster University and senior author of the study, said: "This research is an important step in developing a new way to identify the chemical structures of different types of breast cancers. We have been able to use these 'fingerprints' to develop complex algorithms that are accurately able to identify cells of four different types of cancer types.

"Vibrational spectroscopy combined with data mining and machine learning has the potential to offer a real-time analysis in biological samples, including cancer, with excellent accuracy—creating a powerful new tool to sit alongside existing techniques and helping medical specialists deliver accurate and timely diagnosis for their patients, and for monitoring the progression of the disease."

More information: Abdullah C.S. Talari et al, Advancing cancer diagnostics with artificial intelligence and spectroscopy: identifying chemical changes associated with breast cancer, *Expert Review of Molecular Diagnostics* (2019). DOI: 10.1080/14737159.2019.1659727

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