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IIT Mandi helps in developing device to detect cervical cancer

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Indian Institute of Technology (IIT) Mandi researchers have contributed in developing an artificial intelligence-powered point-of-care device to screen for cervical cancer by analysing microscopy images with high accuracy.

The project has been taken up in collaboration with Aindra Systems Pvt Ltd, Bengaluru.

The research was undertaken by a team led by Dr Anil Sao and Dr Arnav Bhavsar, associate professors, with their research scholars Srishti Gautam and Krati Gupta.

The team, along with the industry collaborators, has developed AI-based algorithms that enable the device to undertake automatic screening for cervical cancer.

Cervical cancer is among the deadliest forms of cancer. Early detection and treatment are vital for those diagnosed with cervical cancer.

The gold standard in screening for cervical cancer is the 'Pap smear test,' in which cells extracted from the cervix are examined by specialists using a microscope.

While the Pap smear test has undoubtedly helped in early detection of cervical cancer, it involves subjective analysis and is associated with risks of false diagnoses. Various research studies have shown the accuracy of the Pap smear test to range between 60 per cent and 85 per cent.

Pap smear test has been the standard examination for testing for cervical cancer. However, the patients need to travel to the hospital for this test and this could be a problem, particularly in geographically distant areas or in regions without basic diagnostic infrastructure, there could be delays in interpreting results.

Speaking about the practical advantages of the device, Dr Arnav Bhavsar said the difference between a conventional system and Aindra's point-of-care system is that, the latter is portable and can be taken to the potential patients.

In the conventional system, the people have to visit the pathology laboratory to get themselves screened.

Adarsh Natrajan, Harinarayanan and Nirmal Jith from Aindra Systems Pvt Ltd collaborated on the design and the development of the device.

They applied for an international patent for the device and algorithm in 2016 and their research results have been published in many international journals and conference proceedings in the past two years.

The device prototypes are currently undergoing clinical testing at Kidwai Memorial Hospital, Bengaluru, Manipal Hospital, Karnataka, and Raja Rajeswari Medical College and Hospital, Bengaluru. The accuracy of the developed prototypes has been consistently around 88 per cent.

The IIT Mandi team first analysed Pap smear images provided by the industrial partner, Aindra, and characterised them into 'normal' and 'potentially cancerous.' They developed a computer programme that could differentiate between the two.

"We could demonstrate performance improvements over some of the contemporary methods, with relatively simpler, and arguably more efficient methods", said Dr Bhavsar.

The developed algorithm is based on the recent deep learning paradigm of artificial intelligence. The advantage of this type of program is that it can be used in situations where one can encounter a large amount and variability in data.