AI Nanotech Sensor Detects Cancer Signals in Blood

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AI machine learning and a nanotech sensor spots ovarian cancer from blood.

A new study published in Nature Biomedical Engineering shows how artificial intelligence (AI) machine learning combined with nanotechnology are able to detect ovarian cancer signals in blood with a high degree of accuracy.

Cancer is a leading cause of death globally that caused close to 10 million patient deaths in 2020, according to the World Health Organization (WHO). Among women diagnosed with gynecological cancers, ovarian cancer is the leading cause of death, according to the National Library of Medicine.

Early detection and intervention improve outcomes and increase the chances of survival for those with cancer. Ovarian cancer is challenging to detect early because it causes few symptoms, and a majority of cases are diagnosed at a later stage which leads to poor patient outcomes. According to the American Cancer Society (ACS), 80% of ovarian cancers are not found in the early stage when the tumor is typically small and has not spread to the lymph nodes or nearby tissues.

The study was conducted by researchers affiliated with the Memorial Sloan Kettering Cancer Center (MSKCC), Weill Cornell Medicine, Cornell University, University of Maryland, National Institute of Standards and Technology (NIST), Lehigh University, Hunter College High School, and Albert Einstein College of Medicine.

“Serum biomarkers are often insufficiently sensitive or specific to facilitate cancer screening or diagnostic testing,” wrote the study authors. “In ovarian cancer, the few established serum biomarkers are highly specific, yet insufficiently sensitive to detect early-stage disease and to

impact the mortality rates of patients with this cancer.”

To address this lack of biomarkers for ovarian cancer, the scientists developed an AI-enabled nanosensor using carbon nanotubes. Using over 260 blood serum samples, the researchers trained and validated several machine-learning classifiers to spot ovarian cancer.

Carbon nanotubes, also called buckytubes, are lightweight hollow tubes consisting of carbon of nanoscale diameter. These chemically neutral nanotubes are up to three nanometers in diameter and the length is typically just a few micrometers. Consisting of a two-dimensional folded graphene, these corrosion-resistant carbon nanotubes have higher thermal capacity and are stronger than steel.

The scientists developed models based on artificial neural networks (ANN), Random Forest, Support Vector machine for binary classification, decision tree, and logistic regression. Bayesian optimization was used, as well as custom Python and MATLAB code. According to the researchers, their solution had 87% sensitivity at 98% specificity, and could be adapted to spot other types of cancer.

This proof-of-concept shows that AI machine learning increases the accuracy of detecting ovarian cancer versus current biomarker-based methods. Through the combination of the innovation of artificial intelligence machine learning and nanotechnology, scientists have found a novel way to detect ovarian cancer that outperforms existing biomarkers.

Read the original article on Psychology Today.