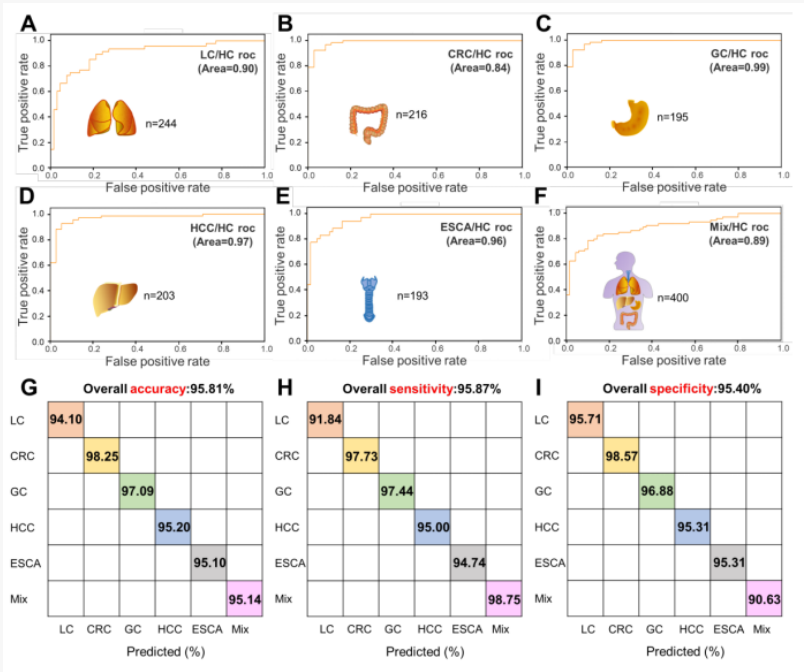
Predicting early cancers with molecular vibration in serum

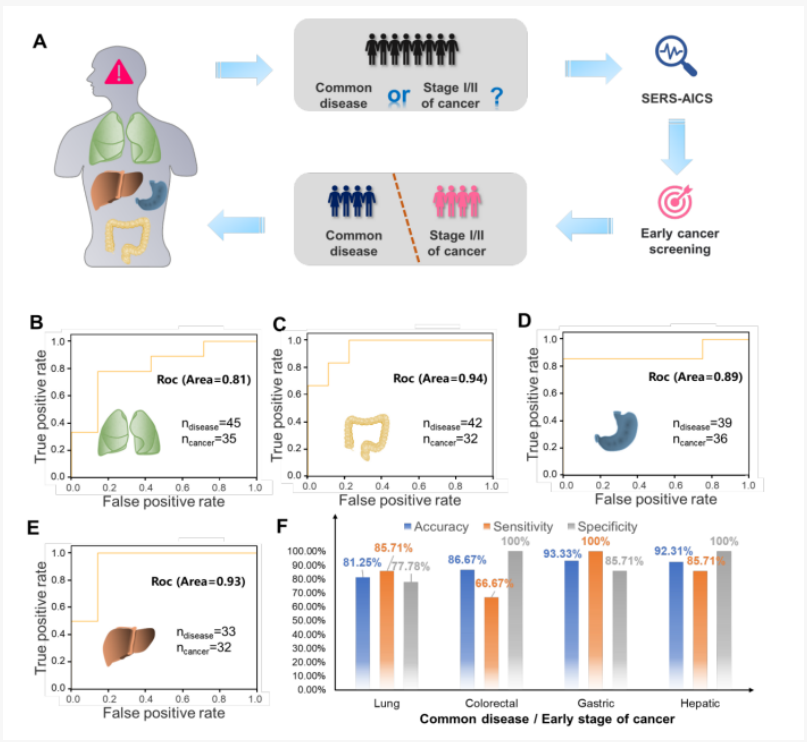
FAYETTEVILLE, GA, USA, July 31, 2023 /EINPresswire.com/ -- Cancer, a leading cause of death worldwide is typically diagnosed at an advanced stage when survival rates are low. Most early-stage cancers are asympotmatic, and tranditional methods such as imaging or histopathological testing are not feasible as routine screening tests for the general population due to high cost and other clinical constraints. While several surface-enhanced Raman scattering (SERS)-based cancer detection methods have been developed to boast high sensitivity and selectivity, they tend to focus on a single or just a few biomarkers, and often only for a narrow range of cancer types, hampered by an insufficient sample size. Moreover, many researches remain at the preliminary stagesm lacking data that us easy to interpret and failing to leverage more efficient high-throughput analysis methods.



ROC curves with covariance matrices-assisted SVM model for distinguishing (A) 244 lung cancer patients, (B) 216 colorectal carcinoma patients, (C) 195 gastric cancer patients, (D) 203 hepatocellular carcinoma patients, (E) 193 esophageal carcinoma patien

In a new paper published in eLight, a team of scientists, led by Professor Xiangheng Xiao from College of Physical Sciences, Wuhan University, have taken a significant leap foward by developing a lable-free SERS-Artificial intelligence method for cancer screening (SERS-AICS). This technology ingeniously merges the detection strengths of traditional SERS system with the analytical power of advanced big data tool. The team tested as little as 15ul of patient serum samples with Ag nanowires each for lung, colorectal, hepatic, gastric, and esophageal cancers, capturing the subtle changes in vibrational signals of molecules in cancer samples due to their altered physiology and pathology. The researchers then trianed and validated their predictive workflow to recognize cancer by analyzing molecular vibrational spetrum from two independent cohorts involving 382 healthy individuals and 1,582 cancer patients. The system demonstrated

impressive efficay with an accuracy of 95.81%, a sensitivity of 95.40% and a specificity of 95.87% overall for five cancer types. Additionally, it was successful in distinguishing samples at an early stage of cancer from those with common diseases, while facilitating the creation of a data platform for more in-depth analysis.



(A) The SERS-AICS method could also effectively distinguish common diseases from early cancers in stage I and II with high accuracy. (B) ROC curves with covariance matrices-assisted SVM model for distinguishing 45 common disease patients from 33 early sta

“This was very promising, as early-stage screening should detect changes in molecular fingerprinting information that are intermediate between healthy and disease states,” said Prof. Xiao. “And what’s truly exciting is that it isn’t restricted to one or a just handful biomarkers, but expand to encompass an all-inclusive ‘panoramic’ view for every single alternative signals in cancers.”

“Our study demonstrates the potential for developing a sentive tool for the early detection of various cancers,” Xiao said. “The predictive technique can identify individuals potentienlly harboring cancer from their blood sample obtained in routine heanlthy exam. Anyone with suspicious findings would then be referred further evaluation by definitive diagnosis.”

In future work, the researchers plan to analyze the spectrum of molecular vibration associated with various clinial characteristics of caner to gain a comprehensive understanding of the disease, potentially aiding in selecting targted therapies. They also aim to broaden the application of the SERS-AICS method to detect a wider range of cancers and other diseases, promising a transformative step forward in early-state cancer detection and patient monitoring.

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References

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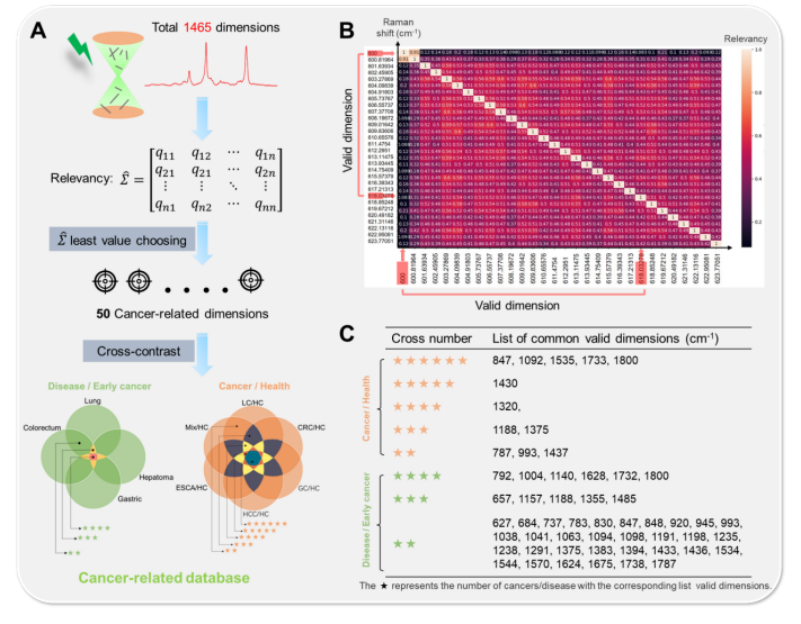
Wendy Chen
TranSpread
+1 865-405-5638
email us here



(A) The original spectral data of 1465 dimensions of serum with no obvious specificity can obtain 50 valid dimensions with the best specificity after the correlation between dimensions is judged by the covariance matrix, which related to the molecular bon