MedicalXpress

Google goes cancer: Researchers use search engine algorithm to find cancer biomarkers

May 17 2012

The strategy used by Google to decide which pages are relevant for a search query can also be used to determine which proteins in a patient's cancer are relevant for the disease progression. Researchers from Dresden University of Technology, Germany, have used a modified version of Google's PageRank algorithm to rank about 20,000 proteins by their genetic relevance to the progression of pancreatic cancer. In their study, published in *PLoS Computational Biology*, they found seven proteins that can help to assess how aggressive a patient's tumor is and guide the clinician to decide if that patient should receive chemotherapy or not.

The researcher's own version of the Google algorithm has been used in this study to find new cancer biomarkers, which are molecules produced by cancer cells. Biomarkers can help to detect cancer earlier in body fluids or directly in the cancer tissue obtained in an operation or biopsy. Finding these biomarkers is often difficult and time consuming. Another problem is that markers found in different studies for the same types of cancer almost never overlap.

This problem has been circumvented using the Google strategy, which takes into account the content of a web page and also how these pages are connected via hyperlinks. With this strategy as the model, the authors made use of the fact that proteins in a cell are connected through a network of physical and regulatory interactions; the 'protein Facebook' so to speak.

"Once we added the network information in our analysis, our biomarkers became more reproducible," said Christof Winter, the paper's first author. Using this network information and the Google Algorithm, a significant overlap was found with an earlier study from the University of North Carolina. There, a connection was made with a protein which can assess aggressiveness in pancreatic cancer.

Although the new biomarkers seem to mark an improvement over currently used diagnostic tools, they are far from perfect and still need to be validated in a larger follow-up study before they can be used in clinical practice. It remains an open problem to turn these insights into novel drugs which slow down cancer progression. A first step in this direction is the group's cooperation with the Dresden-based biotech company RESprotect, who are running a clinical trial on a pancreas cancer drug.

TU Dresden is a leading German university, whose Center for Regenerative Therapies was awarded excellence status in the national excellence initiative. The work was a cooperation between the bioinformatics group of Prof. Dr. Michael Schroeder and the medical groups of Dr. Christian Pilarsky and Prof. Robert Grützmann.

More information: Winter C, Kristiansen G, Kersting S, Roy J, Aust D, et al. (2012) Google Goes Cancer: Improving Outcome Prediction for Cancer Patients by Network-Based Ranking of Marker Genes. PLoS Comput Biol 8(5): e1002511. doi:10.1371/journal.pcbi.1002511

Provided by Public Library of Science

cancer-algorithm-biomarkers.html