

MEDIA RELEASE FOR IMMEDIATE RELEASE

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NEW ALGORITHM PREDICTS TREATMENT TARGETS FOR CANCER USING 'WISDOM OF THE CROWD'

Singapore scientists develop intelligent system that sifts through massive genetic datasets to pinpoint targets for cancer treatment

SINGAPORE – Scientists in Singapore have made a unique discovery about how to treat cancers – when it comes to pinpointing cancer treatment targets, it is better to listen to many computer programmes rather than just one. Researchers have developed an advanced system that integrates this 'wisdom of the crowd' through a powerful consensus algorithm to isolate the Achilles heel of each individual cancer tumour, helping scientists to better study different cancers and identify targeted treatments.



(Image source: A*STAR's Genome Institute of Singapore)
Singapore scientists discover new computer system that uses data from multiple sources to better treat cancer.

Cancer cells have thousands of genetic lesions but only a handful of these mutations give rise to a tumour. Identifying the 'driver' mutations that promote the uncontrolled growth of cancer cells in the body is a key challenge for the emerging field of precision oncology. This is the first time that scientists have identified a consensus algorithm that integrates various expert systems into a single accurate prediction for treatment targets in individual cancers.

To develop this system, researchers analysed data from more than 3,000 tumours, across 15 different cancer types including colon, breast, lung, stomach and liver cancer. They studied 18 different existing algorithms and found that each one of them on its own could not identify driver mutations in a significant proportion of patients. Furthermore, no single method was able to identify treatable drivers in more than 60 percent of patients. By noting that the methods had very different strengths and by combining them, the new system, known as ConsensusDriver, was able to identify treatment targets in nearly all patients studied, 80 percent of whom could be treated with existing drugs.

This work, recently published in *Cancer Research*, was jointly led by Dr Denis Bertrand and Professor Niranjana Nagarajan from A*STAR's Genome Institute of Singapore (GIS), and included researchers from the National Cancer Centre Singapore (NCCS) and the National University of Singapore (NUS).

Cancer is among the leading causes of death worldwide and was responsible for 8.8 million deaths in 2015, and an estimated global economic impact of approximately US\$ 1.16 trillion in 2010¹. Over the years, breakthroughs in DNA sequencing technologies have allowed researchers to determine the complete genetic makeup of cancers. The challenge now lies in crunching massive datasets to understand the unique genetic basis of an individual's disease. Researchers around the world and in Singapore are now racing to develop new computer algorithms, and participate in large collaborative projects such as The Cancer Genome Atlas² to unlock the mysteries of different cancers.

Dr Denis Bertrand, Staff Scientist at GIS and lead author of this work said, "Developing ConsensusDriver and working with The Cancer Genome Atlas has been an eye-opening experience. This is collaborative science on an international scale and we are making rapid advances in being able to give the right drug to the right patient at the right time."

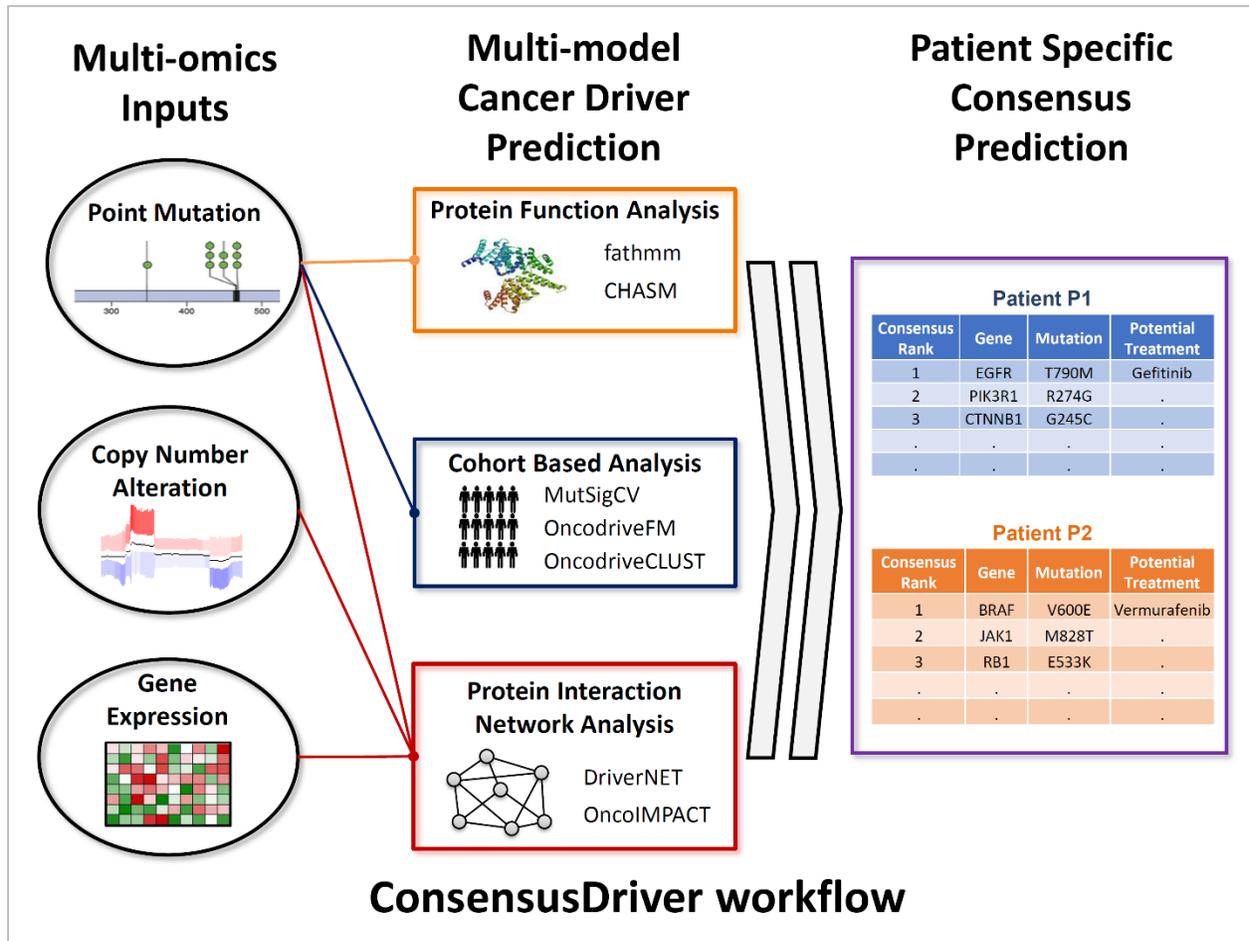
Professor Nagarajan, Associate Director and Senior Group Leader at GIS, noted, "It is remarkable that computer algorithms have become a new weapon in the battle against cancer. Instead of clubbing cancer cells with drugs indiscriminately, we are now trying to computationally pinpoint genetic weaknesses to target them with drugs more precisely."

GIS Executive Director Professor Ng Huck Hui said, "The complexity of cancer genetics is one of the biggest challenges that we face in treating it. By precisely identifying actionable mutations, and tailoring treatments to individuals, we are moving a step closer to precision medicine. I am delighted to note the ongoing development of new algorithms and technologies by GIS scientists to achieve this vision."

¹ <http://www.who.int/mediacentre/factsheets/fs297/en/>

² <https://cancergenome.nih.gov/>

ADDITIONAL IMAGES



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Workflow for the ConsensusDriver system in analysing patient tumours and identifying target treatments.

Notes to Editor:

The research findings described in this media release can be found in the scientific journal *Cancer Research*, under the title, "ConsensusDriver Improves upon Individual Algorithms for Predicting Driver Alterations in Different Cancer Types and Individual Patients" by Denis Bertrand¹, Sibyl Drissler^{1,2}, Burton K. Chia¹, Jia Yu Koh¹, Chenhao Li¹, Chayaporn Suphavilai^{1,3}, Iain Beehuat Tan^{4,5}, and Niranjana Nagarajan¹.

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Note: Supplementary data for this article are available at Cancer Research Online (<http://cancerres.aacrjournals.org/>).

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About A*STAR's Genome Institute of Singapore (GIS)

The Genome Institute of Singapore (GIS) is an institute of the Agency for Science, Technology and Research (A*STAR). It has a global vision that seeks to use genomic sciences to achieve extraordinary improvements in human health and public prosperity. Established in 2000 as a centre for genomic discovery, the GIS will pursue the integration of technology, genetics and biology towards academic, economic and societal impact.

The key research areas at the GIS include Human Genetics, Infectious Diseases, Cancer Therapeutics and Stratified Oncology, Stem Cell and Regenerative Biology, Cancer Stem Cell Biology, Computational and Systems Biology, and Translational Research.

The genomics infrastructure at the GIS is utilised to train new scientific talent, to function as a bridge for academic and industrial research, and to explore scientific questions of high impact.

For more information about GIS, please visit www.gis.a-star.edu.sg

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector agency that spearheads economic oriented research to advance scientific

discovery and develop innovative technology. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit society.

As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by contributing to societal benefits such as improving outcomes in healthcare, urban living, and sustainability.

We play a key role in nurturing and developing a diversity of talent and leaders in our Agency and Research Institutes, the wider research community and industry. A*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities primarily located in Biopolis and Fusionopolis.

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