THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Revolutionising cancer diagnosis with data driven detection for cures

Breakthroughs in genomics and machine learning hold the clue to defeating cancer.

Almost 10 million people die from cancer every year, mainly because of late diagnosis or resistance to drug treatment.

To deliver an earlier diagnosis and effective drugs to treat cancer patients, our solution is to use cancer tissue sections. Most cancer patients have tumour tissues removed, which provide precious clues for doctors to decide on the optimal treatment plan to save lives. However, these tissues are mostly examined by human eyes under the microscope, leading to the risk of missing invisible molecular signatures underlying cancer risks.

We develop machine learning and genomics technologies to incorporate both visible and invisible information from patient tissues to uncover cancer types and treatment options. We discover new cells and their molecular profiles that can be used as indicators to predict cancer risks and drug responses.

Creating breakthroughs in cancer tissue diagnosis

For a century, visual inspection of cancer tissues has been a routine clinical test that is required at the start of the cancer diagnosis and treatment program. The ability to accurately assess these tissues is therefore essential for curing cancer patients.

We develop spatial technologies to generate never-before accessible data. With our methods, tissues are not cut but left intact, and we can therefore acquire both tissue images (as in standard pathology) and molecular information (for invisible tissue signatures). Using these cutting-edge approaches, we can identify cells within a tumour that drive drug responses and improve our understanding of the molecular and cellular basis of these responses. The data allow us to detect cancer onset or cancer responses to drug treatment before it can be seen by the human eye, allowing for early diagnosis and treatment decisions.

Our research can be applied to all types of cancer. For now, we are focusing on 'Australia's national cancer', skin cancer, which would reduce its cost burden of over $272M. We are helping to examine about 250,000 "suspicious" pigmented lesions every year. For melanoma, the deadliest form of skin cancer, we will help to find lesions with high metastasis potential and suggest appropriate treatment options. The research outputs will contribute to faster, cheaper, and more accurate diagnosis of cancer.

We aim to potentially save millions of lives through using revolutionary diagnosis technologies to detect and identify cancer earlier and improve treatment options.

NOT IF, *WHEN.*
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Researcher profile

Dr Quan Nguyen

Dr Quan Nguyen is a Group Leader at the Institute for Molecular Bioscience (IMB), The University of Queensland. He is leading the Genomics and Machine Learning (GML) lab to study development and diseases at single-cell resolution and within spatial tissue context.
Dr Quan Nguyen completed a PhD in Bioengineering at the University of Queensland in 2013, postdoctoral training at RIKEN institute in Japan in 2015, a CSIRO (OCE) Research Fellowship in 2016, an IMB Fellow in 2018, and is currently an ARC DECRA research fellow. His research focuses on quantifying cell-type diversity and the dynamics of cancer-immune cell interactions within the tissues to find solutions to improve early cancer diagnosis, seek new cellular targets for treatments of cancer and neuronal disease. Using machine learning and genomic approaches, his group are integrating single-cell spatiotemporal sequencing data with tissue imaging data to find causal links between cellular genotypes, tissue microenvironment, and disease phenotypes. GML lab is also developing experimental technologies that enable large-scale profiling of spatial gene and protein expression (spatial omics) in a large range of cancer tissues (e.g. human brain, kidney, and skin cancer and mouse patiend derived xenografts) and in mouse central nervous system.

Your opportunity to support game-changing research at IMB

Together, our greatest days lie ahead.

Here are just a few ways that giving to research at UQ's Institute for Molecular Bioscience can help transform how we save lives from the impact of cancer.

$2,500	Enables studying a tumour tissue from one patient to find possible reasons for why this patient did not respond to treatment.
$10,000	Realises a research program investigating patient's tumour tissues in unprecedented detail to discover molecular signatures that distinguish the tumour and uncover the reasons for different responses to different treatment options.
$50,000	Creates a pilot project to create a computational diagnosis tool that can help analyse pathological imaging data to better understand cell behaviour in their environment to enhance treatment.
$100,000	Launches a patient study across different cancer stages and response types to develop and test a diagnosis tool that could identify a cancer and lead to smarter more targeted treatment options for better outcomes.

We welcome your suggestions for other ways to support IMB's research and help accelerate the translation of discoveries into patient benefits.

"Cancer causes death, pain and suffering to many patients and their loved ones. A better understanding of cancer, especially at its earliest stages, is urgently needed for the human race to ever be able to stop cancer completely. I wake up every morning believing that our research to decipher cancer complexity through the power of computers, statistics, and genomics technologies is the best way to make a giant step toward fighting all types of cancer."

Dr Quan Nguyen
Institute for Molecular Bioscience

For more information contact:

Kamyra Laurenson
Director, Advancement, Institute for Molecular Bioscience

E k.laurenson@uq.edu.au **M** +61 429 518 792

T +61 7 3346 2185 **W** imb.uq.edu.au/donate

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