



Montage

Fighting cancer one cell at a time

Modern medicine has been waging war against cancer since the discovery of the first chemotherapy agents nearly 100 years ago. Our progress in fighting cancer has been continuous but slow – the expectations of many evolutionary breakthroughs have been tempered as we gain new knowledge of the incredible complexity and expressions of the disease. As an example, scientists have discovered that each individual tumor is unique, formed by a complex system of diverse interacting cells of many different types. It is this characteristic that makes some cancers so tenacious; highly targeted treatments that kill off 99 percent of a tumor will leave behind a small population of treatment-resistant cancer cells that reestablish malignancy after time.

Montage is a software platform that helps accelerate single cell sequencing research.

That's why the genomic research started at the University of British Columbia – now collaborated on by a multi-national team of researchers – has become so important in the fight against cancer. Using existing DNA sequencing techniques to obtain the genome for a single cell is very inaccurate, making it nearly impossible to fully understand a tumor's cell population. The Montage project team has created an alternative approach that enables a single cancer cell's DNA to be accurately sequenced. With this, the genetic structure of an entire cancer's cell population can be mapped, making a powerful weapon for understanding a malignant growth's diversity and learning how to stop it.

Comprehending cancer dynamics

Montage is a software platform that helps accelerate single cell sequencing research at scale. By studying a cancer as a population of individual cells, each of which can have unique mutations, the

tumour's composition and behaviour can be understood. Montage helps biologists and clinicians investigate how tumour cells interact with each other, how cancer cells recruit and evade normal cells, and how drugs impact individual cells. This knowledge may lead to analyzing the weaknesses of the individual disease, making it possible to create highly effective treatments. One promising avenue includes the combination of chemotherapy and immunotherapy, tagging otherwise evasive cancerous cells to allow them to be destroyed by the body's natural defenses.

Canadian initiative in a global battle

Montage is a CANARIE-funded project emphasizing that the value of software reuse easily extends to medical research. By creating a cloud-based web service that unifies a number of pre-existing genomic, cancer, and analysis software packages, Montage provides a platform specifically tailored to cancer study, allowing researchers to quickly have the best tools at their disposal for interactively

Software Evolution

Montage was funded by CANARIE and was designed to study ovarian and breast cancers but, due to its broad applicability towards single cell genomics, the team is also engaged with other researchers interested in using it for lung, colon, pancreatic, multiple myeloma, and other cancers. Since the platform has a modular architecture, it also shows promise in other treatment areas that involve multiple cell populations such as neurological disorders – Alzheimer's, dementia, Parkinson's and the like – as well as developing drug protocols. This lets the Montage platform be reused with minor specific adaptations in many areas of study.

The Montage platform has been contributed back to the Research Software Registry where it can be re-used by the global research community.

visualizing and assessing the genomes of individual tumour cells. This Canadian initiative is an essential part of the global cancer research effort, as the computational power provides the instrument allowing scientists to interpret, analyze, and make new discoveries. Examples of institutions that are taking early advantage of Montage are BC Cancer, Cancer Research UK, and Memorial Sloan Kettering Cancer Center. Meanwhile, a template to allow other research facilities to replicate the laboratory components of the project is underway. Increasingly precise tools such as Montage that help deepen our knowledge of all cancers is critical in the global fight to eradicate this disease.

Platform: Montage

Description	Montage is an end-to-end web-based solution for single cell genomics analysis with functionalities spanning from sample tracking to analysis and visualization of the data.
Contributor(s)	University of British Columbia
Research Subject	Genetics
Supports Separate Projects	Yes
Software License	MIT License
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