Leveraging Molecular Signature Tile Model (MSTM) and Multi-Modal Data for Advancing Personalized Cancer Care on Mobile Platforms

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Abstract

The field of personalized medicine is rapidly evolving, focusing on developing robust models capable of precisely identifying customized treatment options for patients. While multi-omics tools have been transformative in oncology, their predictive power is often limited by the types of data they can incorporate. This paper addresses this limitation by integrating various multi-omics data—including genomics, transcriptomics, proteomics, and phenotypic information—into Molecular Signature Tile Models (MSTM). As a result, these enhanced molecular signature tiles emerge as more potent and individualized diagnostic tools in cancer care.

Furthermore, this paper delves into cutting-edge technologies that promise to revolutionize personalized cancer treatment by enabling the smooth integration of MSTM and multi-modal data on mobile platforms. We introduce a novel mobile platform that combines various data types, from multi-omics information to real-time sensor data, patient-supplied details, and environmental factors. This integrated data offers a comprehensive view of the patient's condition, facilitating highly accurate diagnoses and personalized treatment plans.

We have successfully navigated the challenges related to computational limitations on mobile platforms and the necessity for real-time data processing. By leveraging a pre-analysis for general data such as TCGA and employing lightweight machine learning algorithms tailored for mobile environments, we identified key molecular features relevant to cancer. Despite these advances, certain challenges remain, such as the need to guarantee data privacy and security and further refine molecular feature identification's accuracy.

Keywords : Personalized Medicine, Molecular Signature Tile Models (MSTM), Multi-Omics Data, Mobile Platforms, Real-Time Data Processing, Cancer Diagnosis and Treatment