

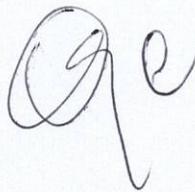
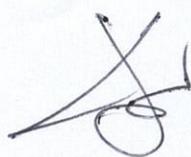
**AVVISO PUBBLICO, PER TITOLI E COLLOQUIO, PER L'ASSUNZIONE A TEMPO DETERMINATO DI N. 1 RISORSA NEL PROFILO DI COLLABORATORE PROFESSIONALE DI RICERCA, CATEGORIA D, PER LAUREATI IN BIOTECNOLOGIE (L-02) DA ASSEGNARE AL DIPARTIMENTO CLINICO SPERIMENTALE DERMATOLOGIA UOSD RADIOLOGIA A INDIRIZZO DERMATOLOGICO DELL'ISTITUTO SAN GALICANO - PROGETTO CODICE GR-2019-12369697 - P.I. DR. ANTONINO GUERRISI**

**PROVA COLLOQUIO**

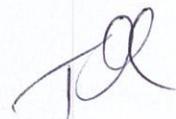
**14 MARZO 2024 h 10:00**

**Domande tecniche**

- 1) Fornire una definizione di genomica
- 2) Che cosa è una pipeline?



The stamp is circular with the text "Istituti Fisioterapici Ospitalieri - ROMA" around the perimeter. A handwritten signature is written across the stamp.



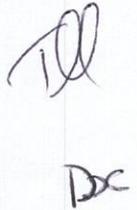
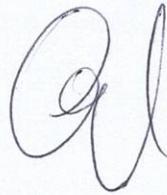
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**PROVA COLLOQUIO**

**14 MARZO 2024 H 10:00**

**Domande di informatica**

- 1) Cos'è il backup?
- 2) A cosa serve Access?



Handwritten signature and the letters "Dc" below it.



# HHS Public Access

Author manuscript

*Nat Rev Cancer*. Author manuscript; available in PMC 2022 August 01.

Published in final edited form as:

*Nat Rev Cancer*. 2022 February ; 22(2): 114–126. doi:10.1038/s41568-021-00408-3.

## Harnessing multimodal data integration to advance precision oncology

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### Abstract

1 { Advances in quantitative biomarker development have accelerated new forms of data-driven insights for patients with cancer. However, most approaches are limited to a single mode of data, leaving integrated approaches across modalities relatively underdeveloped. Multimodal integration of advanced molecular diagnostics, radiological and histological imaging, and codified clinical data presents opportunities to advance precision oncology beyond genomics and standard molecular techniques. Yet most medical datasets are still too sparse to be useful for the training of modern machine learning techniques, and significant challenges remain before this is remedied. Combined efforts of data engineering, computational methods for analysis of heterogeneous data, and instantiation of synergistic data models in biomedical research are required for success. In this Perspective, we offer our opinions on synthesizing complementary modalities of data with emerging multimodal artificial intelligence methods. Advancing along this direction will result in a re-imagined class of multimodal biomarkers to propel the field of precision oncology in the coming decade.

Handwritten signatures and a circular stamp of the Istituto Oncologico Romolo are present on the right side of the page.

### Introduction

2 { As patients with cancer traverse diagnostic, treatment, and monitoring processes, physicians order a suite of diagnostics across distinct modalities to guide management. A significant opportunity thus emerges to aggregate, integrate, and analyse these complementary digital assets across large patient populations to discover multimodal prognostic features, learning from the collective history of large cohorts of patients to inform better management of future patients. For example, genomic profiling of tumor tissue has significantly enhanced clinical decision-making, and the genomic data produced in turn yield a rich molecular repository for further study<sup>1</sup>. This leads to further understanding of the cancer genome, drug sensitivity<sup>2</sup> and resistance mechanisms,<sup>3</sup> and prognostic associations<sup>4,5</sup>. During and after treatment, serial radiological imaging, such as positron emission tomography (PET) and computerized tomography (CT), quantifies tumor burden in response to intervention, yielding digital

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Author Contributions

The authors contributed equally to all aspects of the article.

Competing Interests

S.P.S is a shareholder and consultant to Canexia Health Inc. K.M.B., P.K., R.V. and J.G. declare no competing interests.

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