

Data-driven biomarker R&D

Current challenges and strategic opportunities


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Data-driven biomarker R&D: The path to better diagnostics and therapeutics

A biomarker is a measurable biological signal that offers insights into various facets of health, including normal physiological functions, the onset or evolution of diseases, and the efficacy of therapeutic interventions. Whether biomarkers stem from cells, molecules, proteins, or observable physical manifestations, they provide a quantifiable means of assessing biological processes. By analyzing biomarkers, we not only gain insights into diseases, but also acquire predictive capabilities regarding disease onset and progression, and the effectiveness of therapeutic measures. Therefore, biomarkers serve as essential tools in advancing both diagnostic and treatment strategies in healthcare.

Technological advances benefit biomarker R&D

Omics technologies in particular have revolutionised the profiling of biological molecules across various states and conditions, advancing biomarker R&D. These advancements allow for the identification of subtle molecular changes indicative of diseases even before clinical symptoms manifest. Through omics approaches, researchers can characterize the unique molecular signatures, or endotypes, associated with different diseases, providing valuable insights into disease biology, facilitating patient stratification and the development of targeted therapies. Such personalized approaches hold the promise of more effective treatments, bringing us closer to the goal of personalized medicine.

USING BIOMARKERS TO DE-RISK FUTURE DRUG DEVELOPMENT

Biomarker discovery and development is a powerful tool for de-risking your future drug development activities. Biomarkers provide insights and predictive capacity that pave the way for more targeted therapeutic development and application of precision medicine.

EARLY DIAGNOSIS = BETTER TREATMENT & PROGNOSIS

Early detection of diseases plays a pivotal role in improving treatment efficacy and enhancing patient outcomes. It enables prompt intervention and tailored care, ultimately leading to better patient management and paving the way for personalized medicine.



Top 3 challenges for data-driven biomarker R&D

1

Data overload and interpretation complexity

With the advent of high-throughput omics technologies, researchers are overwhelmed with vast amounts of data. This data overload poses significant challenges in terms of storage, processing, and analysis. Moreover, the complexity of omics data, which often comprises multidimensional datasets with interconnected variables, complicates interpretation. Extracting meaningful insights from such data requires sophisticated computational algorithms and bioinformatics tools, adding another layer of complexity to the analysis process.

2

Biological variability and reproducibility

Biological systems are inherently dynamic and heterogeneous, exhibiting variability across different individuals, tissues, and experimental conditions. This variability introduces noise into omics datasets, making it challenging to distinguish true biological signals from random fluctuations. Ensuring the reproducibility of findings across independent studies and experimental replicates is also a major concern, as subtle differences in experimental protocols or sample handling procedures can significantly impact results.

3

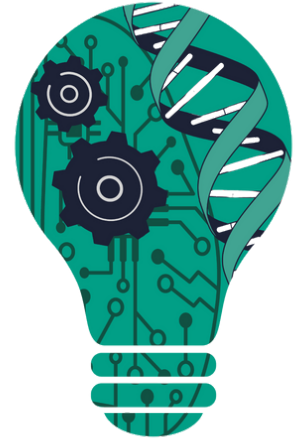
Integration of multi-omics data

Omics technologies enable the simultaneous profiling of various biological molecules, such as genes, proteins, and metabolites, providing a comprehensive view of cellular processes. However, integrating data from different omics platforms poses technical challenges due to differences in measurement technologies, data formats, and normalization procedures. Achieving seamless integration of multi-omics data is essential for uncovering complex molecular interactions and identifying robust biomarker signatures.



Leveraging machine learning for biomarker R&D

The considerable challenges in biomarker R&D have led to the development of a diverse array of machine learning (ML) methods specifically tailored to address the complexities inherent in early biomarker detection. ML algorithms have proven highly effective in managing scale, diverse data distributions, and non-linear relationships within biological datasets, offering a significant promise in revolutionizing early disease detection by leveraging vast amounts of data to identify patterns and trends that may be imperceptible to human analysis alone.



However, knowledge in AI and ML alone is not enough to result in success. Deep biological knowledge and a respect for the complexity of biomedicine is also essential to generate real, clinically- and biologically-relevant insights. BioLizard is well-positioned to provide this dual expertise in data science and biomedicine, as illustrated by the client case below.

BACKGROUND

- Client is an undisclosed precision medicine company developing personalised tests to predict patient & organ response risk in transplantation procedures
- Personalised predictive diagnostic tests have immense potential to improve post-transplant care
- AI-based development of biomarkers to predict adverse effects and personalised risk scoring is highly complex and requires both AI expertise and an understanding of the requirements of clinical settings, e.g. scalable calculation of personalised risk scores

STRATEGY & PROCESS

- Develop novel biomarker panels suitable for clinical use based on high-throughput RNA profiling
- Create an ML algorithm to calculate personalised risk scores
- Implement a custom data processing platform for high-volume processing & analysis

OUTCOME

- ML model provides highly reliable personalised risk scoring based on biomarker readouts that are scalable and usable in a clinical setting
- Created a 5-day sample to results pipeline by streamlining processing time with automated technical & biological quality control and enhancing cost-efficiency of sequencing depth via in silico simulation

ADDED VALUE

BEST IN CLASS PREDICTIVE ALGORITHM: BioLizard delivered a best in class diagnostic test by implementing a fully automated, scalable cloud-based solution and designing algorithms for full transparency using explainable AI.

CLEAR PATH FORWARD: CLIA validation is currently undergoing.

CUSTOMER-CENTRIC COMMUNICATION: Client received a detailed report clearly explaining algorithm design, training, & testing.



A perfect match for your unique requirements

At BioLizard, we don't believe in cookie-cutter solutions. We know that to extract new knowledge out of your data, data science solutions need to be customized to suit your unique goals and requirements.

Due to our deep understanding of both AI and biology, we have a unique ability to ensure that your data is leveraged effectively to overcome your R&D bottlenecks and challenges. We understand the complexity and challenges of biomedical data, and have proven success in supporting clients in becoming more data-driven by:

- 1 Grounding our work in an understanding of your science.** We start from your scientific questions, and relate every data science decision to those, effectively building the bridge between your data and your unique research goals. Our approach is always customized to match your needs.
- 2 Understanding the unique qualities of biomedical data,** and knowing how to curate and otherwise prepare your data to extract data-driven, biomedically relevant insights.
- 3 Helping you to institute a data-driven approach that remains biology-centric.** We help you implement data-driven approaches in a targeted manner, leveraging cutting-edge tools only where it makes the most sense for your business and seamlessly embedding them into scientists' workflows. Our goal? To empower you as a citizen data scientist.

OUR SERVICES

- Assess data quality
- Develop coherent workflow & analysis strategy
- Perform comprehensive ad hoc analysis
- Construct predictive machine learning models
- Rigorously test & validate developed models
- Provide detailed interpretation of results
- Perform & present proof of concept studies
- Publication-ready documentation & reporting
- Process automation & implementation strategy
- Support in biological validation
- Ensure ethical & regulatory compliance
- Continued monitoring & support

**START NOW**

Do you want to develop better biomarkers to improve your diagnostics R&D or de-risk your drug discovery efforts?

Reach out to BioLizard today to get started!

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