

REFS™ Platform Licensing

Game changing AI platform that accelerates drug discovery and development

The average drug takes twelve years to develop and can cost over \$1 billion¹. Unlocking key information from emerging patient data sets is changing the landscape of how drugs are developed. Unfortunately, current computational approaches are insufficient. Whether the data set is large and complex, or patient sample size is limited, it is difficult to scale.

Identifying patients that fit clinical trial protocols involves time-consuming research – an often hit or miss process that increases costs and extends timelines. Researchers are using standard statistical modeling, univariate analysis, regression, and predictive modeling but these methods don't account for the many causal relationships between variables. These relationships can dramatically influence the outcome of the statistical tests and identify the true drivers for a drug's success or failure.

Without understanding the interactions between molecular biomarkers or how clinical, environmental and other variables impact one another, it's difficult for researchers to discover novel insights. Without these discoveries, biopharma is limited in its ability to develop new drug targets, improve drug efficacy and effectiveness, and understand patient response and outcomes.

GNS REFS™ Platform Solution: Rigorous Math, Powerful Science

GNS Healthcare's pioneering artificial intelligence platform transforms large and complex data sets into insights and actions at scale, condensing years of research into months. REFS creates a collection of objective, machine learning models that uncover causal relationships within the data. This allows clients to go beyond analytical approaches that only answers questions like "How many?" and "What else?" to "What if?" and "What's next?" Instead, REFS presents

an efficient and streamlined way of analyzing complex systems of patient attributes which are crucial when developing new drugs or designing or improving clinical trials.

Identifying which patients are going to respond positively or adversely and uncovering the reasons one therapy is more effective than another is critical in the clinical trial setting. The methodology of REFS is also effective for potential drug target identification, as it can pinpoint molecular or clinical biomarkers that show the most promise for patient response.

REFS license

REFS is a cloud-based platform, accessible through an R programming language interface and command line APIs that allows you to build, simulate and then interpret complex analytic models. It can be hosted by GNS or through your own provider inside your firewalls and is fully HIPAA compliance and ePHI data protected.

Licensing the REFS platform enables our clients to gain unprecedented insights– driving new knowledge and actionable findings within their native environment. It provides a powerful tool for internal users to apply on the most complex and valued data assets.

Key benefits of REFS Platform:

- Accelerates the clinical trial process to move drugs to market faster
- Improves the chance of success of clinical trials
- Uncovers new insights to elongate drug patents
- Promises earlier success in clinical trials through better-to-worse drug target ranking
- Increases efficiency by being able to handle both large and small datasets in different clinical trial stages
- Provides R-studio Integrated Development Environment for biostatisticians and data scientists to streamline their analysis and programming efficiency

¹ *Drugs, Devices, and the FDA: Part 1: An Overview of Approval Processes for Drugs, April 2016*

- Provides APIs for subpopulation discovery and biomarker analysis based on REFS models

REFS Platform and Modeling Support

REFS is also available with computational modeling support. Our clients frequently turn to GNS as a source of analytics, data science and machine learning expertise. Our expert causal machine learning team has been leveraged in leading healthcare companies across the country. Our data scientists can work with your organization to identify targeted goals, develop appropriate models, build and perform simulations on multiple analysis models, conduct subpopulation analysis and drug target identifications, and develop reports, abstracts and presentations.

About GNS Healthcare

GNS Healthcare solves healthcare's matching problem for leading health plans, biopharma companies, and health systems. We transform massive and diverse data streams to precisely match therapeutics, procedures, and care management interventions to individuals, improving health outcomes and saving billions of dollars. Our causal learning and simulation platform, REFS, accelerates the discovery of what works for whom and why.

To learn how GNS Healthcare can help support your initiatives, email us at info@gnshealthcare.com.