

# Impactomics: From Raw Reads to Decision-ready Intelligence

The Impactomics Team



Clinical genomics laboratories face exploding sequencing volumes, complex variant interpretation, and acute regulatory scrutiny. Impactomics is a cloud-native genomics platform that automates NGS analysis, accelerates variant interpretation with clinician-grade explainability, and integrates with clinical systems to produce audit-ready reports at scale.

In internal validation, Impactomics reduces manual curation effort by up to 70–80% and ranks pathogenic candidates in the top positions in 96% of benchmarked clinical cases substantiated by our internal curated datasets. These outcomes translate into faster diagnoses, lower operational costs, and a reproducible route from sequence to clinical decision.

## The Landscape: Why Platforms Like Impactomics Can No Longer Be an Afterthought

The commercial and clinical tailwinds for precision genomics are clear. With over explosive NGS data and multi-modal patient records, a burgeoning market for **precision medicine and NGS diagnostics** across 2024–2030, and an estimated CAGR of 16%, we're at the cusp of an incredible breakthrough.

But every such exciting journey comes with its own set of roadblocks.

Clinics and labs face three persistent bottlenecks:



### Interpretation burden

Variant classification and evidence collection remain manual and slow, leading to prolonged time-to-diagnosis and higher analyst burden.



### Siloed data & reproducibility gaps

These burning issues across LIMS, EHR, and research datasets block cohort assembly, federated learning, and consistent, reliable audit trails.



### Governance & clinical defensibility

Black-box models jeopardize clinical sign-out and regulatory validation.

These constraints create a pressing need for a cloud-native, AI-enabled genomics platform that bridges FASTQ to decision-making while remaining audit-ready, explainable, and interoperable.

At the same time, healthcare organizations are accelerating the adoption of generative and domain AI, especially in data-intensive diagnostics and clinical workflows, thus creating an operational window for platforms that can deploy explainable AI safely and at scale. Notably, sequencing density and throughput have also increased, as cited in the **Nature GenomeAsia 100K** reports, which continue to show genomic throughput growth, making scalable, governed bioinformatics essential for operationally viable genomic services.

These realities require a single platform that couples production bioinformatics, explainable AI, and enterprise integration, rather than a point tool.



**“In the era of genome-scale medicine, speed without explainability is risk. Impactomics was built to deliver clinically defensible, audit-ready genomics that scales – so teams can focus on biology and patients, not pipeline plumbing.”**

**Chandra Ambadipudi**

Founder & CEO, ClairLabs

# Architecture: Engineered for Reproducibility, Scale, and Clinical Trust

At its core, Impactomics is engineered as a modular, cloud-native architecture that prioritizes reproducibility, traceability, and horizontal scale – not as a monolith but as interoperable layers that each solve a specific clinical problem. This design lets labs treat compute, data, and models as managed services, minimizing technical debt while increasing clinical confidence.



## Here a step-by-step flow:



### Ingest & Standardize (FASTQ to uniform data fabric)

Automated QC, BAM/VCF normalization, and metadata indexing. The platform indexes FASTQ/BAM/VCF with clinical metadata to create model-ready cohorts.



### Reproducible Pipeline Layer (cloud-native, containerized)

Reproducible WGS/WES/panel pipelines with automated QC gates, variant calling (SNV/indel/CNV/SV/mtDNA/STR), and audit trails. These pipelines support CAP/CLIA readiness and can scale horizontally in cloud environments.



### AI Orchestration & Explainability

Agentic orchestration inspects metrics, flags anomalies, and triggers re-runs. AI ranks variants, applies AutoACMG heuristics, and produces evidence maps for explainable review – critical for clinician acceptance and audit requirements.



### Governance & Integration fabric

FHIR/HL7/OMOP connectors, role-based access controls, audit trails, and federated learning support. APIs and LIMS/EMR integrations automate report delivery and accelerate deployment into clinical workflows.

## Clinical Applications

Variant Interpretation  
Dashboard | Reporting Engine

## AI Interpretation Layer

Variant Ranking Agent | Literature Mining Agent |  
AutoACMG Agent | Supervisory AI Agent

## Bioinformatics Pipelines

FASTQ QC | Alignment | Variant Calling  
Annotation | Variant Prioritization



### Data Fabric Layer

Genomic Data | Clinical Metadata | Cohort  
Database OMOP / FHIR Comootable Data Model

### Infrastructure Layer

Cloud Compute | Storage | RBAC Encryption  
Audit Logging | Tenant Isolation

Impactomics is rooted in three pillars:



Production-grade  
NGS pipeline  
automation



Governed data fabrics  
that harmonize  
LIMS/EHR/OMOP



Clinical-grade AI for  
variant ranking and  
explainable Auto  
ACMG classification

Impactomics Platform also has distinguished proven metrics such as:

**96%**

pathogenic variant  
ranking accuracy

**70–80%**

reduction in manual  
curation burden

a validated corpus of

**~500K**

patient samples

These signals show a mature solution intent on enterprise adoption rather than “lab demo” novelty.

## So how does Impactomics agentic AI layer stand out from the rest?

Impactomics uses specialized AI agents that independently validate sequencing quality, evaluate variant evidence, mine literature, and produce candidate rankings. A supervisory agent consolidates agent outputs into AutoACMG-style classifications and evidence maps for human review—ensuring modular fault isolation, traceability, and iterative tuning. This agentic design creates explainability at each decision point rather than a single opaque score.



Recently, clinical engines and peer groups have demonstrated that AI-assisted interpretation can approach clinical-grade performance in targeted evaluations, such as public programs driving toward **explainable AI in variant interpretation**.

These architectural layers, from standardized ingestion to explainable model hosting and governed APIs, are foundational to reliably convert raw signals into decision-ready artifacts, which the platform then operationalizes through its core functions for interpretation, reporting, and integration.

## Core Functions & Capabilities

Impactomics executes a compact, tightly integrated set of functions – each tuned to remove friction in the path from sample to sign-out. These functions are implemented as production workflows so that outputs are predictable, repeatable, and clinically defensible.



### Automated Variant Ranking & AutoACMG Classification

Reduces classification time and conserves expert time, reportedly up to 75–90% time savings for certain workflows.



### Audit-ready Reporting

Templates, custom reporting, and traceable decision logs for regulatory compliance.



### Cloud Migration and Scale

Move legacy pipelines to the cloud, reduce OPEX, and shorten time-to-scale.



### Monetization Paths

Packaged pipelines and validated biomarker panels can drive recurring revenue through data subscriptions, co-developments, and white-label services.

Taken together, these functions shorten turnaround, reduce expert effort, and produce evidence maps and reports that clinical teams can trust – outcomes that underpin the platform's differentiated capabilities and value propositions described next.

## What Sets Impactomics Apart

Here's a set of tightly coupled advantages that clinical, medical, and healthcare experts can leverage to translate technical wins into operational and commercial outcomes.



### Clinician-grade explainability

Evidence maps and AutoACMG that make model outputs defensible in clinical review.



### Multi-omics fusion

Not just variants, transcriptome, and proteome context to improve diagnostic yield and accelerate biomarker discovery.



## Enterprise integrations

FHIR/HL7/OMOP connectors and robust APIs for LIMS/EMR/CDS interoperability (reduces friction for hospital adoption).

Collectively, these advantages lower adoption friction and accelerate value capture — positioning Impactomics to deliver immediate clinical impact while providing a sustainable platform for future research, regulatory validation, and commercial expansion.

## Integration & Rapid Onboarding

Diagnostic labs require fast, low-overhead onboarding. Impactomics' SaaS Tenant Onboarding Workflow is designed to make a tenant ready for first sample analysis in 5–10 days.

Onboarding typically spans 1-2 weeks. Here's a brief walkthrough:



### Pre-onboarding Discovery (1–2 days)

Collect lab name/tenant ID, test types (panel/WES/WGS), sample volumes, LIMS/EMR endpoints, reference genome (hg19/hg38), and regulatory needs. Deliverable: tenant configuration profile.



### Tenant Provisioning (automated, 1–2 hours)

Dedicated namespace, storage bucket, metadata DB, RBAC, audit logging.



### User & Role Configuration (1 day)

Lab Admin, Bioinformatician, Variant Analyst, Clinical Reviewer; SSO/MFA optional.



### Pipeline Template Deployment (1–2 days)

Select pre-validated templates, tune gene panels, and ACMG rules.



## Data Ingestion Setup (1 day)

Secure upload portal / S3 sync / LIMS API.



## AI Interpretation Configuration (1 day)

Enable variant ranking, AutoACMG, literature mining; tune disease focus and filters.



## Validation Run (2–3 days)

Run known positives, measure reproducibility and AI concordance; deliver validation report.



## Go Live (1 day)

Production enabled: sample submission, automated analysis, report generation.



## Optional Integrations (post-go-live)

EMR, billing, federated learning at cost.

### Pre-onboarding Discovery

(Lab setup, test types, LIMS info)

01

### User & Role Setup

(Admins, analysts, reviewers)

03

### Data Ingestion Setup

(Portal / API / LIMS)

05

### Validation Run

(Known samples)

07

02

### Tenant Provisioning

(Automated cloud environment)

04

### Pipeline Deployment

(Panel / WES / WGS pipelines)

06

### AI Interpretation Setup

(AutoACMG, filters)

08

### Go Live

## Clinical & Research Use Cases

While the promise of **AI-driven precision medicine** is widely recognized, clinical laboratories and translational research teams still struggle to operationalize genomics at scale. For instance, research in movement disorders such as Parkinson's disease demonstrates how disease progression involves multilayer molecular and neurological pathways that require integrated biological data for **accurate characterization and treatment development**. The following real-world use cases illustrate where platforms like Impactomics create immediate value across diagnostics, translational research, and healthcare delivery.



### Rare Disease Diagnostics

Rare disease patients often undergo a long diagnostic odyssey, sometimes lasting years before a causal variant is identified. By combining automated variant ranking, multi-omics evidence, and AI-driven literature mining, Impactomics accelerates the identification of pathogenic variants in WES and WGS datasets. Clinical teams can rapidly prioritize high-confidence variants and generate AutoACMG-based evidence reports, significantly reducing time to diagnosis.

### Oncology Variant Interpretation

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## Population-scale Genomic Screening

Public health initiatives and national genomics programs increasingly require scalable platforms capable of processing tens of thousands of samples. Impactomics provides a cloud-native genomics infrastructure that supports automated pipeline execution, cohort analytics, and federated learning models – enabling population-level insights while maintaining data governance and privacy.

For today's leaders, it is essential to view Impactomics not just as a platform that translates genomic data into clinical insights, but also as a capability tailored for various industry verticals across health, diagnostics, and research.

## How Impactomics Benefits Teams Across Health, Life Sciences and Diagnostics



### Clinical geneticists & medical genetics teams

Faster, explainable variant triage; higher diagnostic yield; standardized evidence maps that reduce inter-rater variability and speed sign-out.



### Laboratory directors & operations managers

Automate QC gates, scale throughput without linear headcount growth, and measurably reduce turnaround time.



### Healthcare C-suite & managers

Lower OPEX, predictable SaaS/OEM licensing options, and new revenue streams via validated panels and data subscriptions – turning genomics into a repeatable business line.



### Research leads & translational scientists

Rapid cohort assembly, literature-backed prioritization, and RAG-accelerated discovery to shorten validation cycles and reduce early-stage attrition.

## Why This Matters for Buyers

Currently, there's an abundance of specialist tools that excel at interpretation or at pipeline automation. ClairLabs Impactomics differentiates by combining production-grade pipelines, explainable AI, and enterprise governance, plugging them into monetization playbooks. Here's a pragmatic product & market roadmap:



### Regulatory & clinical partnerships

Expand CAP/CLIA validations and partner with academic genetics centers for continuous clinical benchmarking.



### Federated networks

Enable privacy-preserving model training across hospital networks to capture geographically diverse genomic signals.



### Population genomics & screening

Collaborate with public programs to operationalize large-scale screening pipelines.



### Verticalized offerings

Build pre-validated modules for oncology, rare disease, and pharmacogenomics so buyers can deploy domain-specific stacks rapidly.

Vendor literature from variant-interpretation vendors highlights time savings and the importance of explainability. Interestingly, buyers increasingly demand platforms that also support **scalability, monetization, and EMR/LIS integration**, not just a standalone engine.

Capability	Impactomics	Typical Variant Tool
End-to-end pipeline	Yes	No
AutoACMG & evidence maps	Yes	Partial
Explainable AI (agentic)	Yes	Partial
Multi-omics integration	Yes	Rare
LIMS/EMR integration	Yes	Limited
Audit & governance	Enterprise-grade	Varies



## The Final Call to Elevated Disease Treatment

The convergence of scalable NGS, **explainable AI**, and cloud engineering means genomics is shifting from bespoke, local workflows to repeatable, audit-ready platforms that deliver clinical and commercial value. **Impactomics** is designed for that transition: it reduces the manual yield drain, improves diagnostic speed and defensibility, and opens new pathways to monetize and reuse genomic assets – all while meeting the rigorous governance demanded in clinical settings. For clinical geneticists, lab directors, and healthcare leaders, the question is no longer whether to adopt AI in genomics, but how to adopt it safely, at scale, and with a business model that sustains investment in discovery and care.

Partner with us to run a short discovery sprint and see how Impactomics can accelerate your path from sequence to clinical decision – faster, explainably, and with clear ROI.

### Talk to the Experts

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