POLITECNICO MILANO 1863

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GenoGra

Genome Analysis, Unleashed

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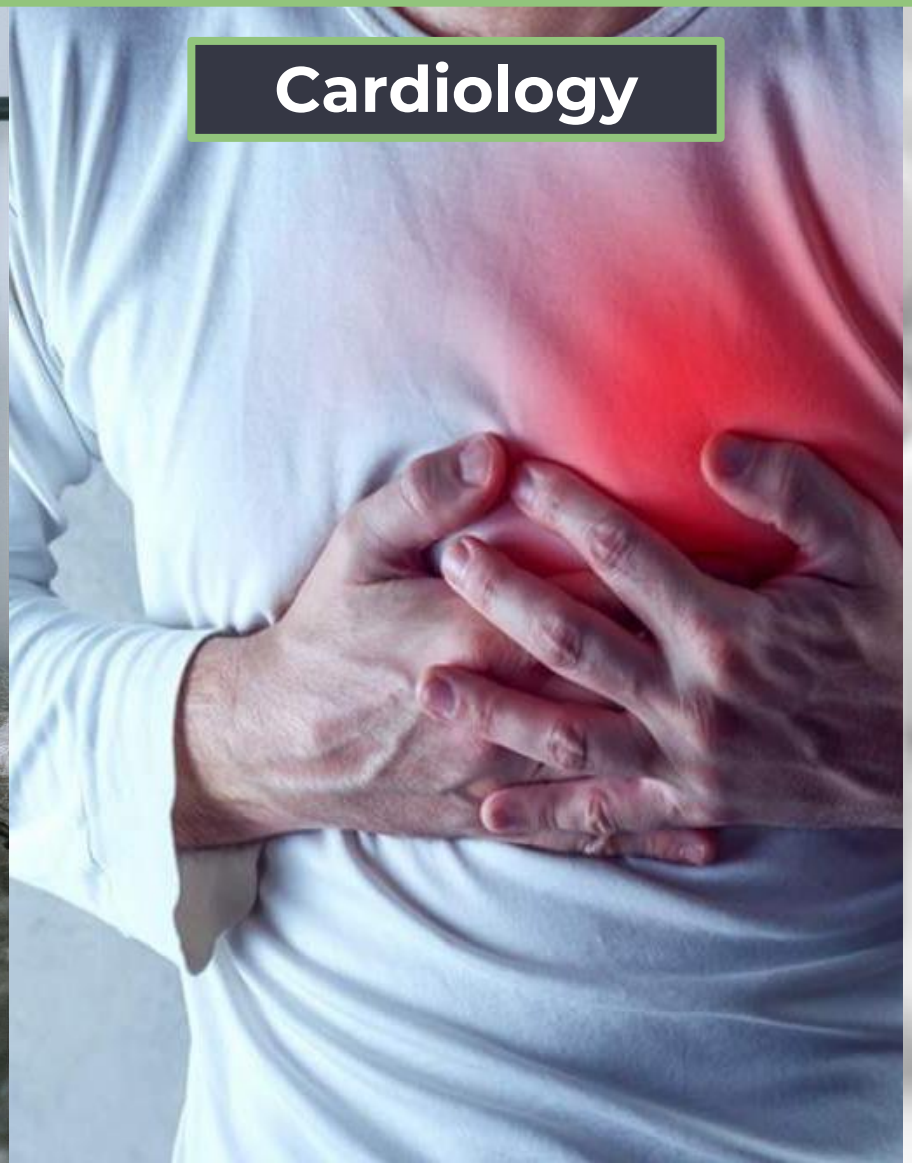
IEEE EUROCON, Turin, Italy

July 7th 2023

Genome Analysis enables **early diagnosis** and **targeted therapy** in different medical fields:

Oncology

Cardiology



Rare Diseases

Genome Analysis enables **early diagnosis** and **targeted therapy** in different medical fields:

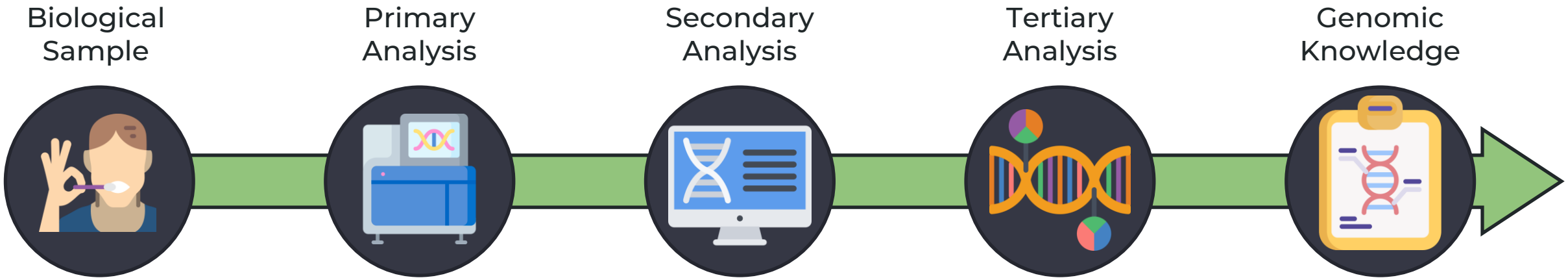
Oncology

Cardiology

Rare Diseases

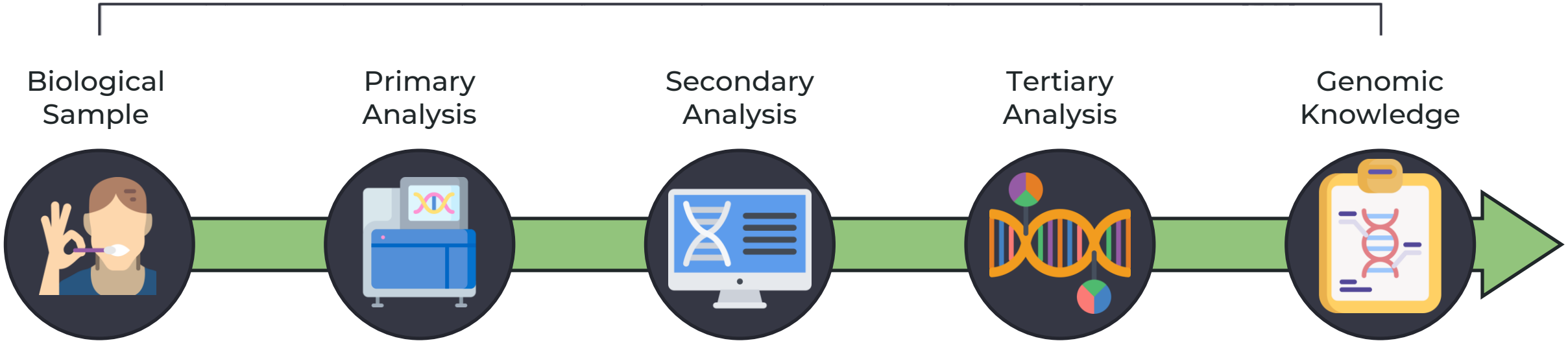
However, **only ~7% of patients** can benefit of genome analysis today

Problem: Genome Analysis Does Not Scale



Problem: Genome Analysis Does Not Scale

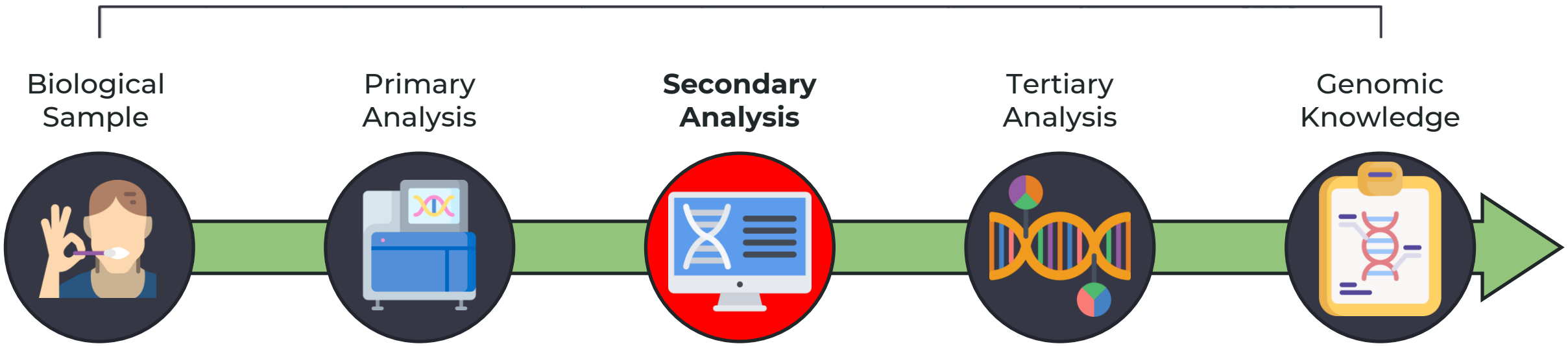
10 days - up to 18 MONTHS! *



* Emerged from customer interviews

Problem: Genome Analysis Does Not Scale

10 days - up to 18 MONTHS! *



Secondary analysis is the main bottleneck of the genome analysis workflow due to:

- **Redundant & error-prone processes**
- **Hard-to-use software tools**
- **Insufficient scalability**

* Emerged from customer interviews

Problem: Genome Analysis Does Not Scale

10 days - up to 18 MONTHS! *

We are not leveraging **Genomics' full potential**, yet.

- **Redundant & error-prone processes**
- **Hard-to-use software tools**
- **Insufficient scalability**

→ **LACK OF QUALIFIED PERSONNEL***

* Emerged from customer interviews

Our Goal: Scaling up Genome Analysis

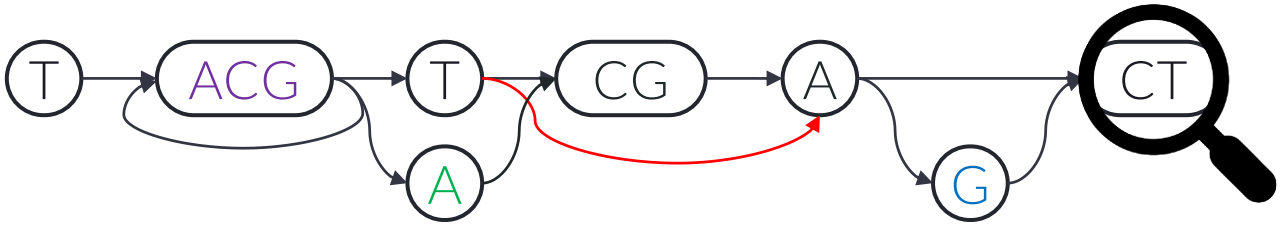
Scaling up **established bioinformatics pipelines is not sufficient** for leveraging the full potential of **always richer genomic data sets**.

All humans
share 99.9%
of their DNA!

Our Goal: Scaling up Genome Analysis

Novel computational paradigms and are needed, and it makes sense to re-think the idea of a **'reference' genome**.

GenoGra



Genome **Gra**phs naturally encode **variations** as alternative paths in a directed graph

Our Goal: Scaling up Genome Analysis

Novel computational paradigms and are needed, and it makes sense to re-think the

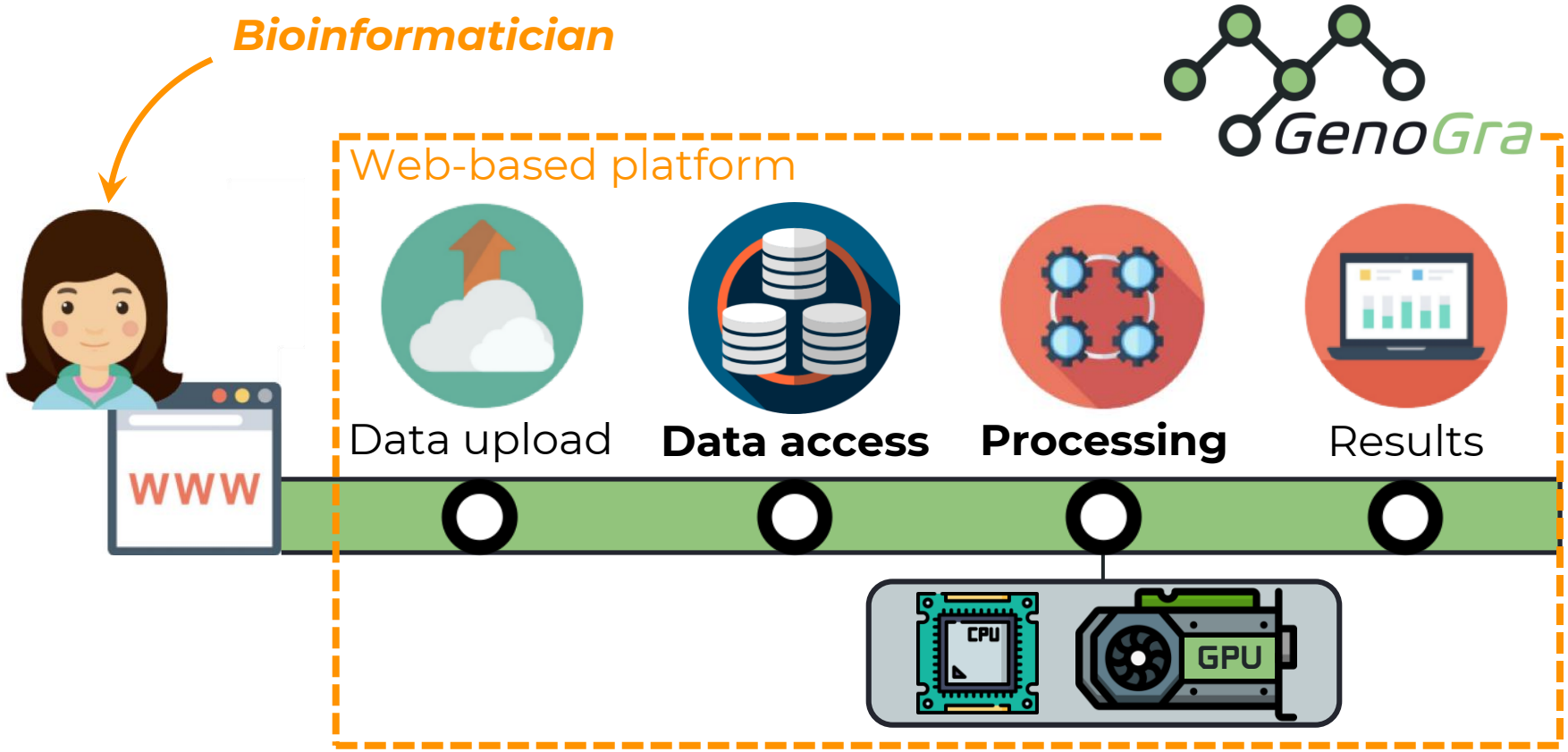
Advantages of Graph-based Genomics:

Great Scalability
Optimal Quality
Unexplored Applications

Genome **Gra**phs naturally encode **variations**
as alternative paths in a directed graph

A Vertical Solution to Scale Up Genome Analysis

GenoGra proposes a suite of **innovative graph-based genomic pipelines**, **leveraging hardware accelerators** without any effort by the end user.



- 90%
SW TOOLS

MUCH
EASIER

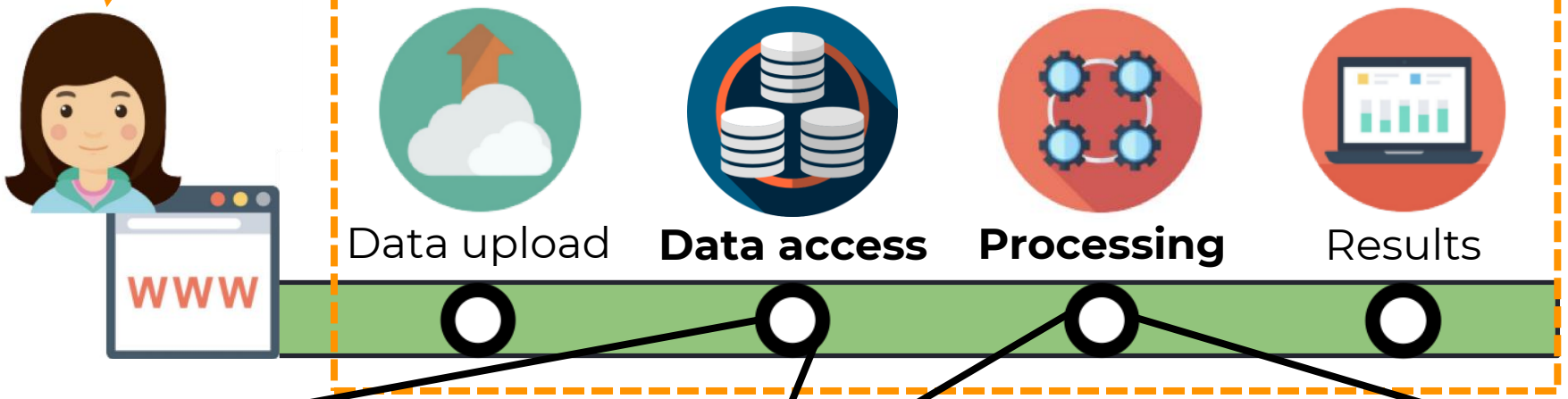
≥ 3x
FASTER

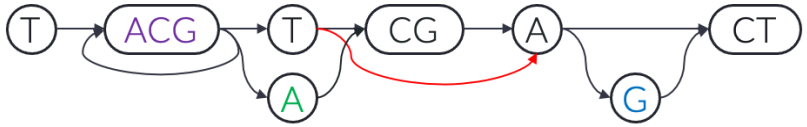
A Vertical Solution to Scale Up Genome Analysis

Bioinformatician

GenoGra

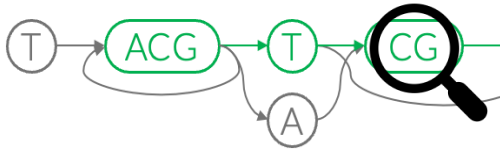
Web-based platform

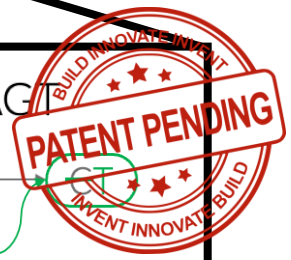




A **Graph-DB** storing **sequences** and **metadata** in a **genome graph**

Query sequence: ACGTCGAGT





Map DNA sequences onto the genome graph **leveraging HW accelerators**

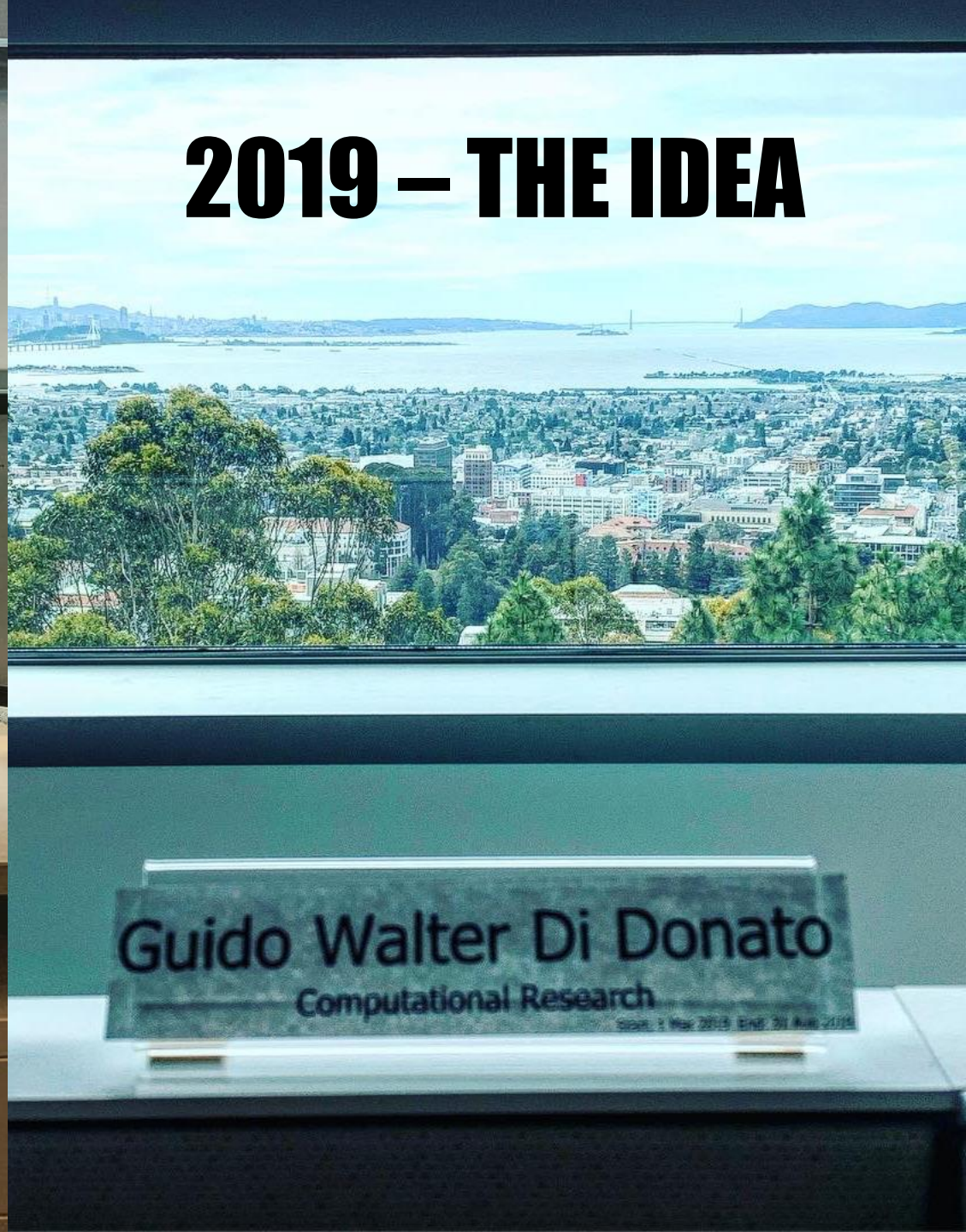
HUMANITAS RESEARCH HOSPITAL

BROAD INSTITUTE

IEO European Institute of Oncology

(and others…)

2019 – THE IDEA



BERKELEY LAB

2020 – THE TEAM

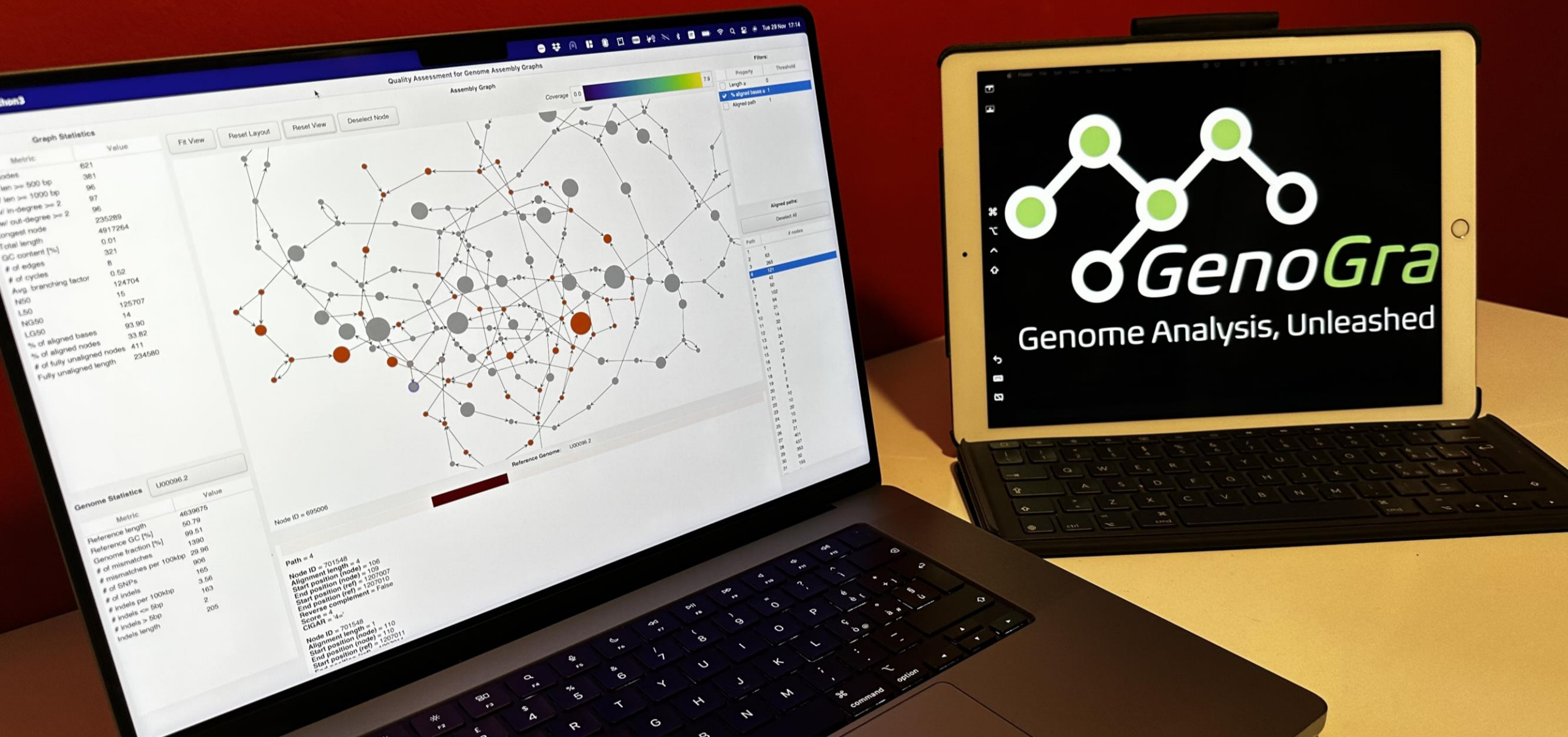
POLITECNICO MILANO 1863
NECST laboratory

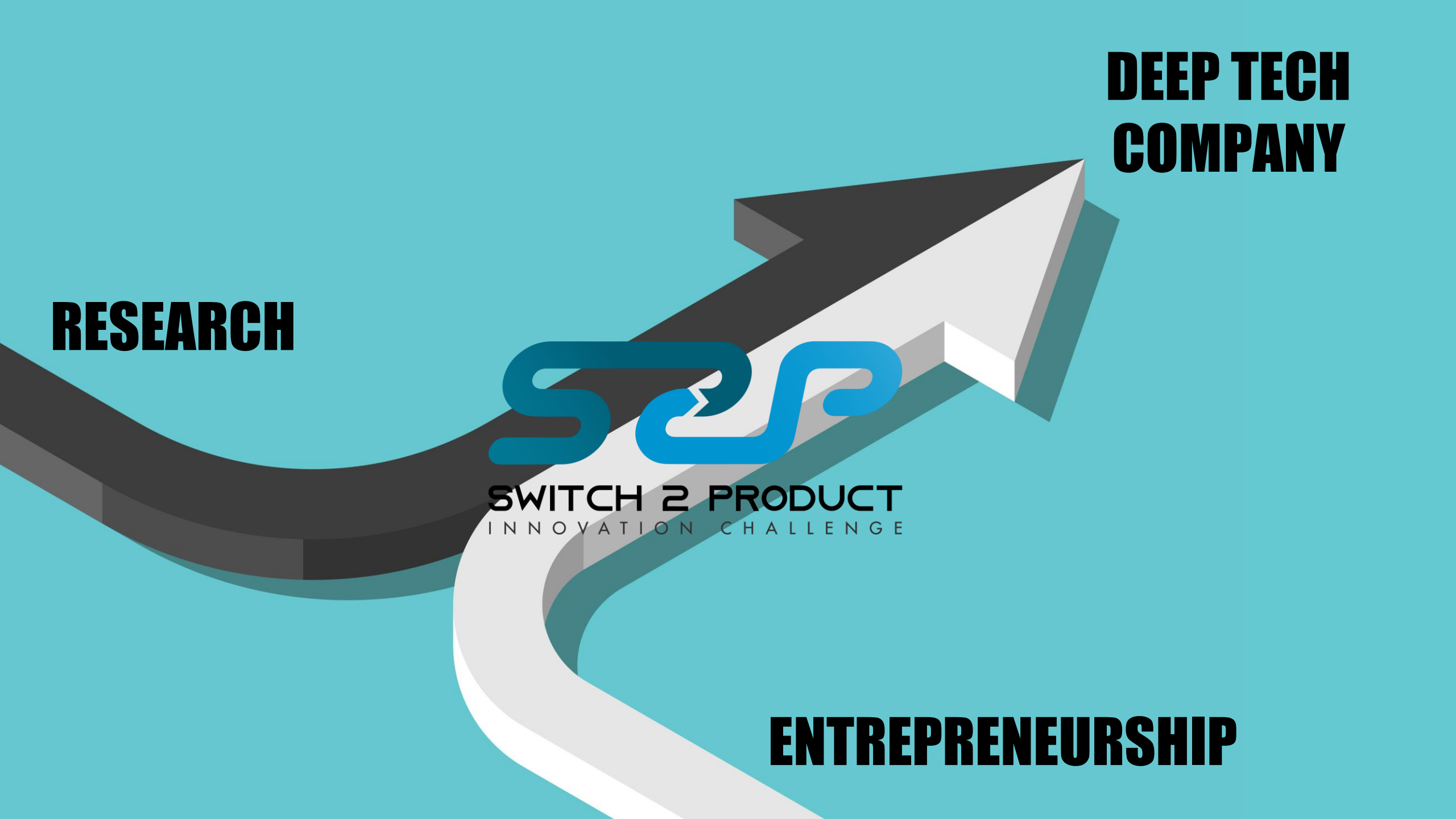
Marco Santambrogio

Mirko Coggi

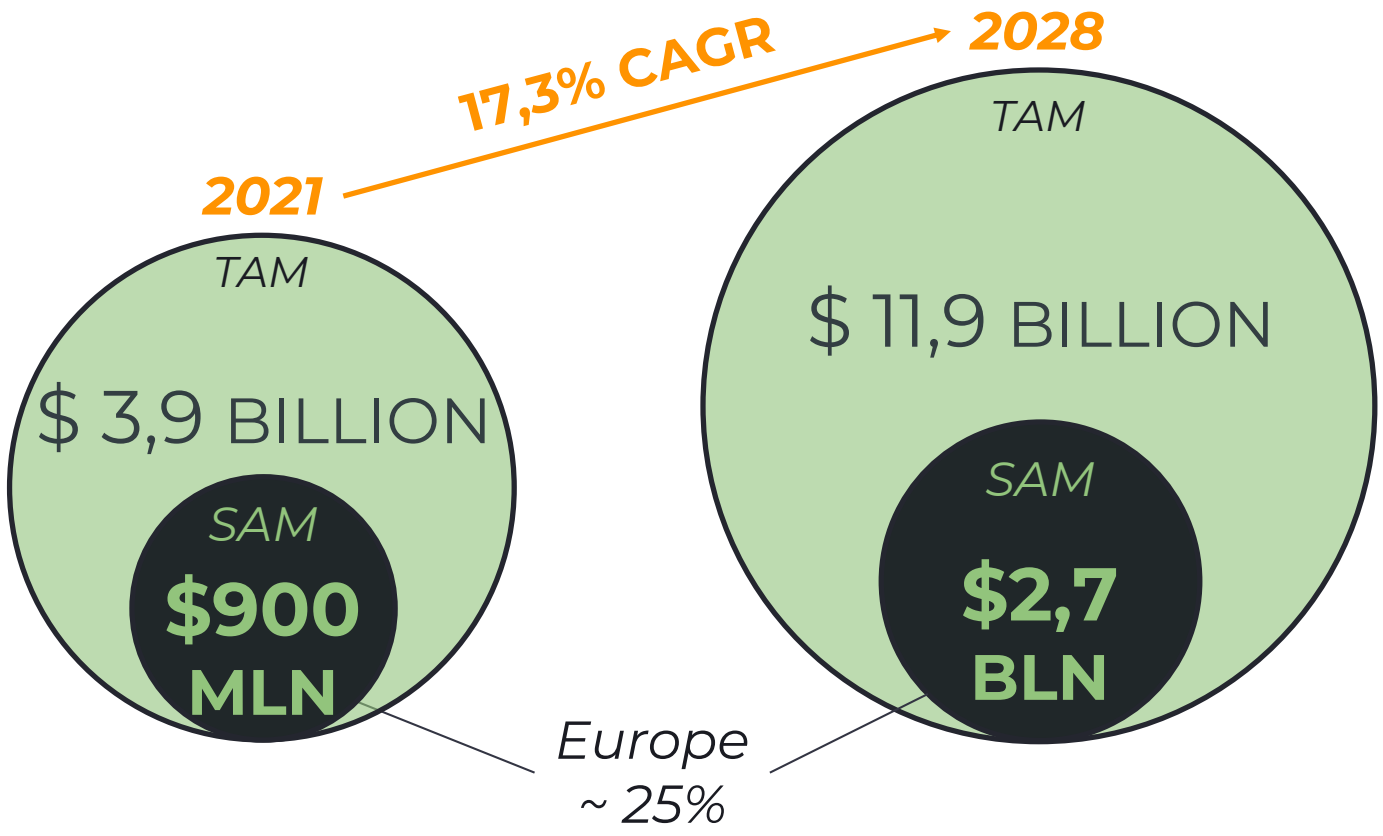
Guglielmo Bruno

2021 – THE FIRST PROTOTYPE




DEEP TECH
COMPANY
RESEARCH
S2P
SWITCH 2 PRODUCT
INNOVATION CHALLENGE
ENTREPRENEURSHIP

Genome Analysis Market size



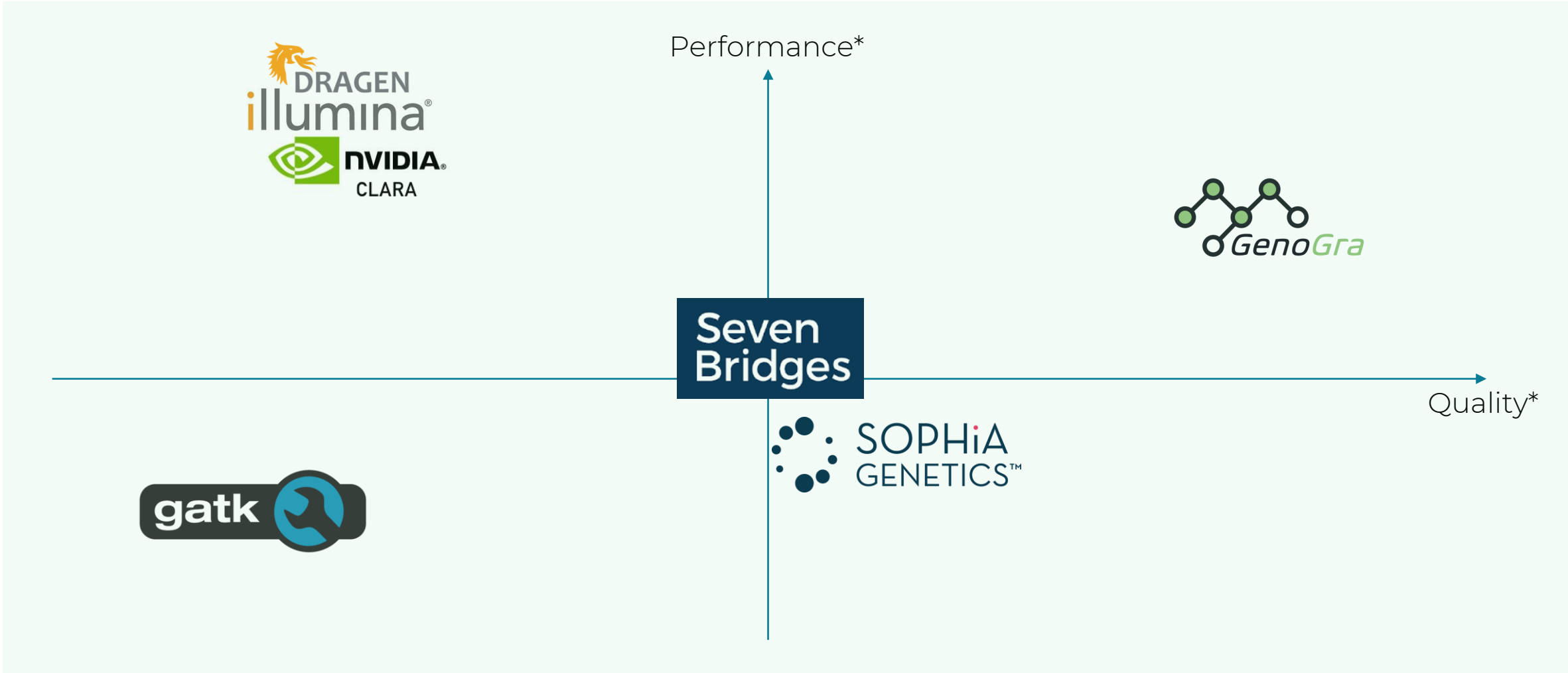
Market Segmentation:

1. *Diagnostic*
2. *Base Research*
3. *Biotech & Pharma*

Sources: Fortune Business Insights, Markets and Markets

Go-To-Market(s) Strategy

Competitive Scenario



*Value Drivers emerged from customer interviews

GenoGra's Business Model

Base/Applied Research

Clinical Diagnostics

On Cloud

On Premise

CUSTOM DEPLOYMENT

Users' Needs

- Available tools
- Available services
- Custom UI/UX

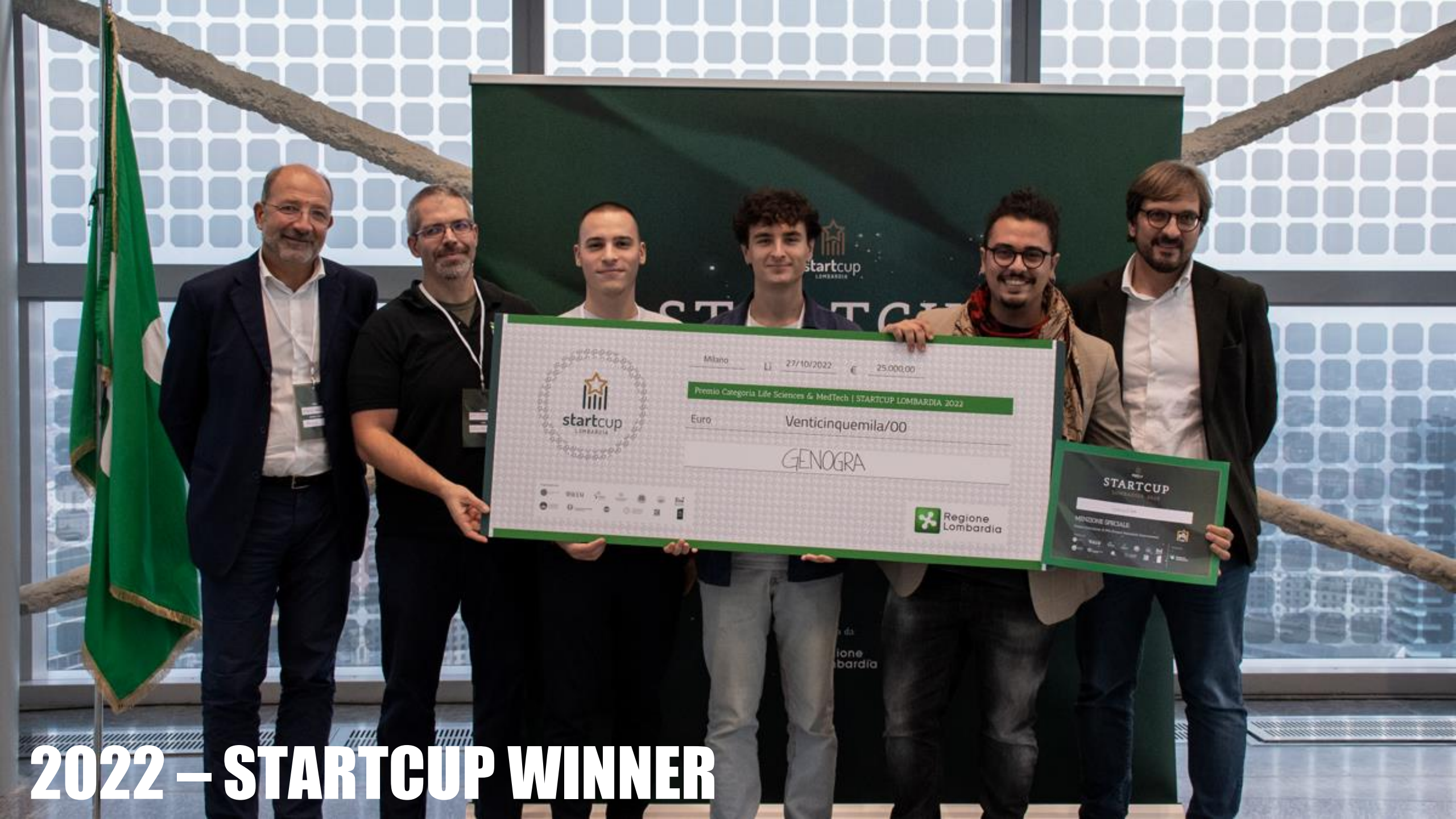
Customers' Needs

- Number of users
- On private data-center (On Premise)
- On Cloud (Software as a Service)

CUSTOM SUBSCRIPTION FEE

2021 – THE FIRST ACHIEVEMENT

2022 – POLIMI REPRESENTATIVE



2022 – STARTCUP WINNER

2022 – WINNING ALBERTO ZENI

Our Team

Guido Walter Di Donato

Ph.D. Student in CS&E

Chief Executive Officer

Alberto Zeni

Ph.D. Student in CS&E

Chief Technology Officer

Mirko Coggi

Ph.D. Student in CS&E

Developer

Guglielmo Bruno

Biomedical Eng.

Developer

Marco Santambrogio

Professor of CS&E

Scientific Advisor

Our Experience (operative team):

3 to 7 years

High-Performance Computing

3 to 6 years

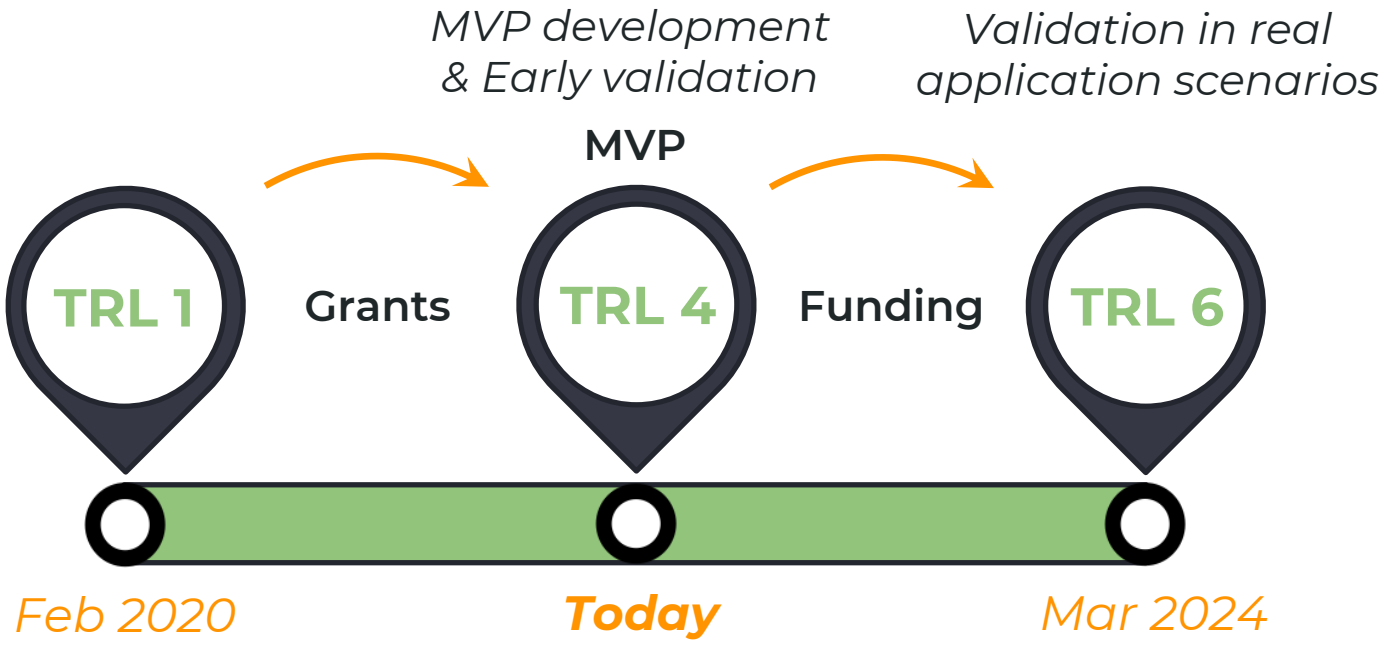
Genome Analysis

3 to 5 years

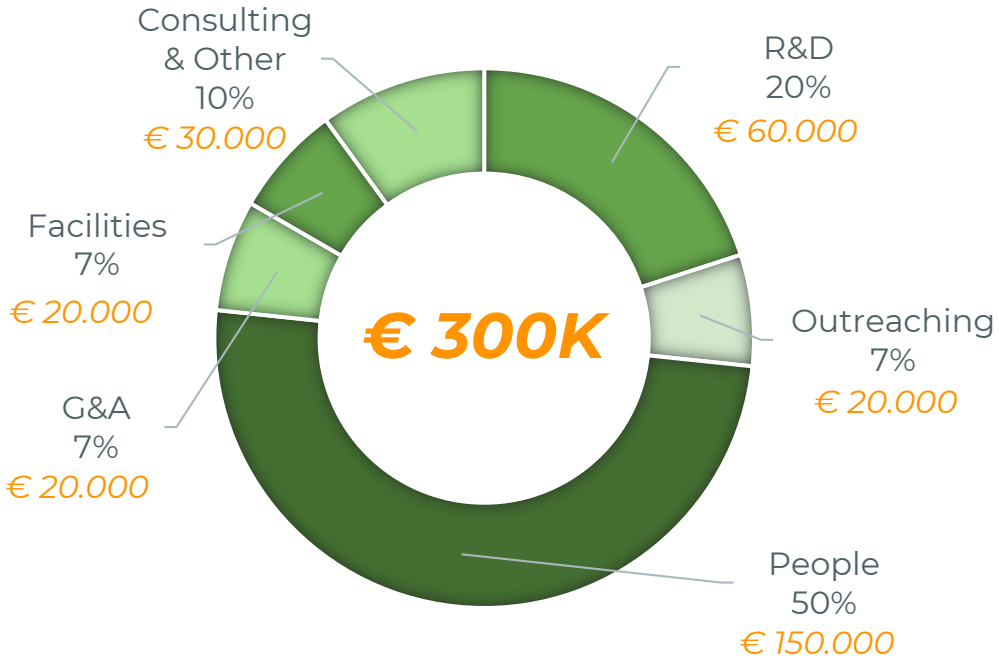
Graph Analysis

Current & Past Affiliations:

Current State



Financial Needs to TRL6



- ~ 4 years of R&D
- 1 patent pending
- 2 patent in progress

- Raised € 55.000, no dilution

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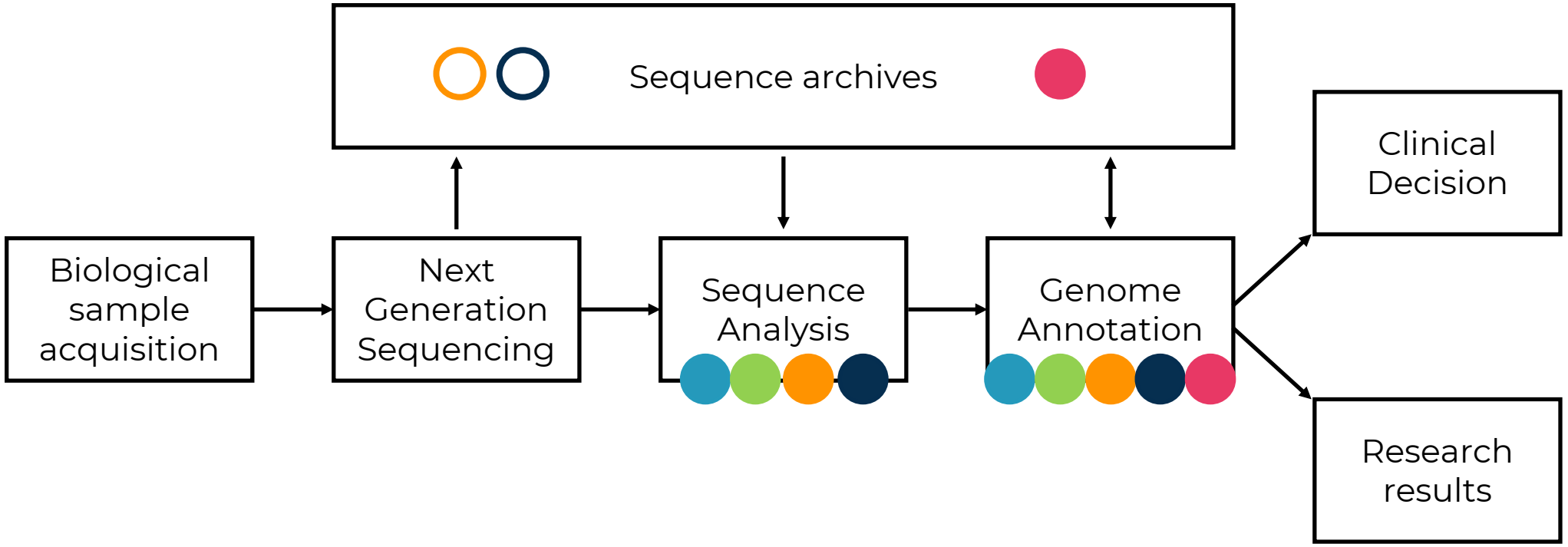
Genomic Analysis - Today



Seven Bridges

SOPHiA GENETICS™

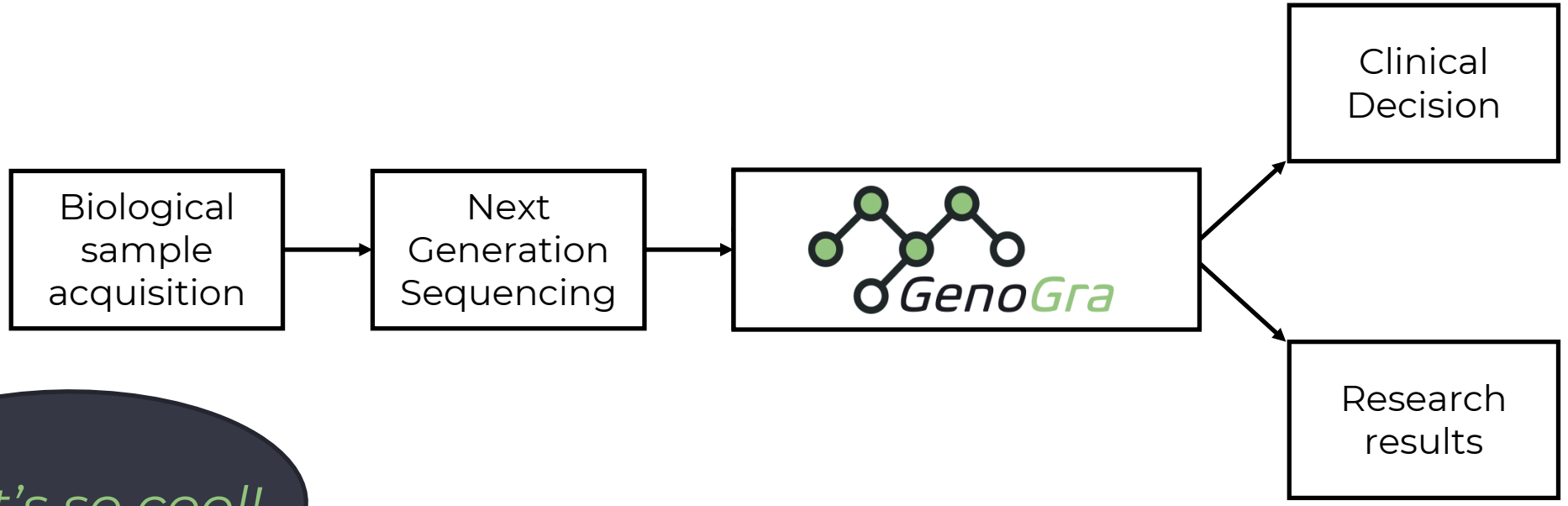
NVIDIA CLARA

DRAGEN illumina

gatk

Genomic Analysis - Tomorrow

Our **software platform** allows to **analyze genomic data** for **research and clinical purposes** through a **much easier and faster workflow**, while providing **more accurate results**.

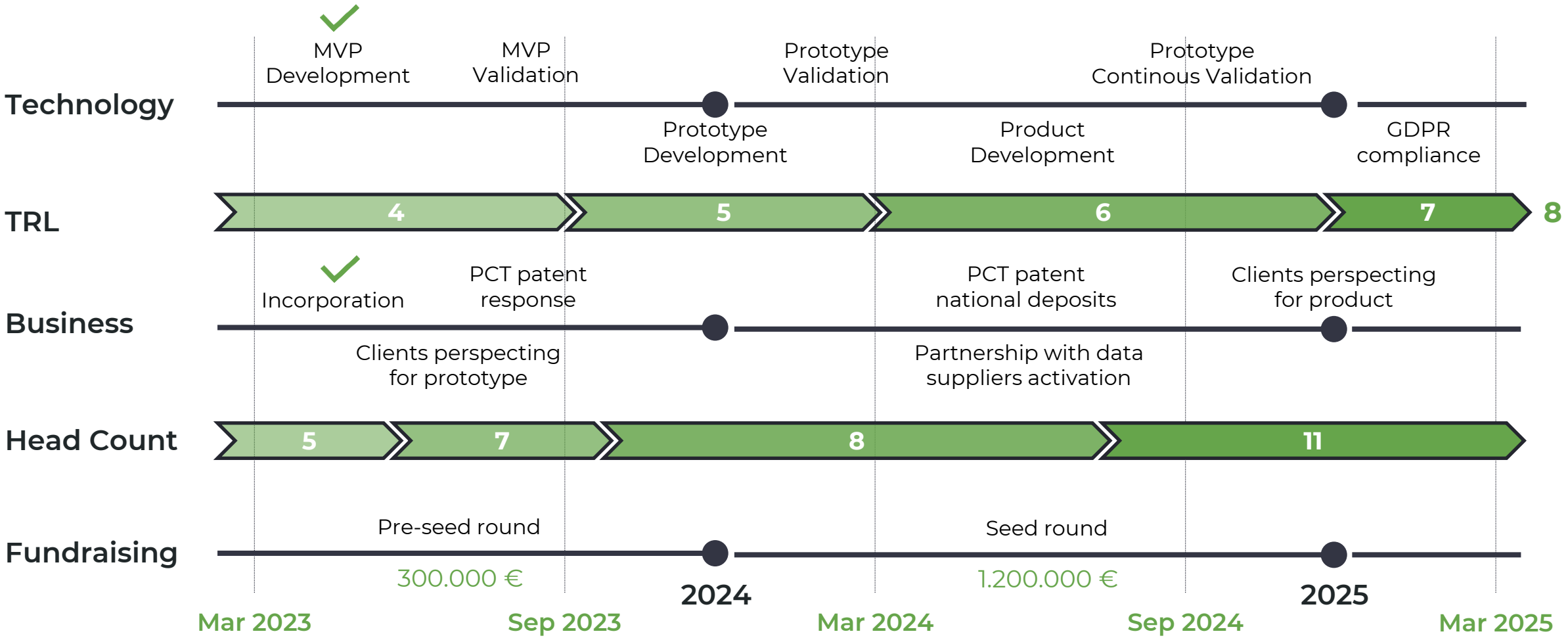


BROAD INSTITUTE

IEO European Institute of Oncology

OSPEDALE SAN RAFFAELE

Our Roadmap


Technology
MVP Development
MVP Validation
Prototype Development
Prototype Validation
Product Development
Prototype Continous Validation
GDPR compliance
TRL
4
5
6
7
8
Business
Incorporation
PCT patent response
Clients perspecting for prototype
PCT patent national deposits
Partnership with data suppliers activation
Clients perspecting for product
Head Count
5
7
8
11
Fundraising
Pre-seed round
300.000 €
Seed round
1.200.000 €
2024
2025
Mar 2023
Sep 2023
Mar 2024
Sep 2024
Mar 2025