DORIAN GRAY

Building Trust, Security and Resilience in AI-Driven Healthcare

A Horizon Europe project using trustworthy AI, digital twins and real-world health data

Project No. 101156266

Lelia Ataliani
Infotrend Innovations Co Ltd

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

Why “DORIAN GRAY”?

In Oscar Wilde’s *The Picture of Dorian Gray*, the portrait changes over time, revealing what is not immediately visible on the surface.

Dorian Gray project uses a similar idea in healthcare: biological, clinical and behavioural changes may develop before they become clearly visible through symptoms.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

What is DORIAN GRAY?

DORIAN GRAY is a 5-year EU funded project investigating the relationship between **cardiovascular disease (CVD)** and **Mild Cognitive Impairment (MCI)** in the ageing population.

It combines **clinical data, omics, brain imaging, lifestyle and socio-economic information, and real-world data from wearable and mobile devices** to support more personalised prevention and care.

The project develops a **trustworthy AI tool** for predicting MCI risk and integrates it into the **PORTRAIT digital twin platform**, which is designed to support personalised risk stratification, disease progression modelling and intervention.

The project's **PORTRAIT platform** brings together multimodal health data and real-world information to create a digital representation of the individual and support earlier identification of risk patterns and personalised intervention.

The portrait reveals what cannot yet be seen.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Why Cybersecurity Matters in DORIAN GRAY

Dorian Gray combines **sensitive health information, wearable-generated real-world data, AI models, digital twin technology and patient-facing applications** within one connected digital ecosystem.

Given the interdependencies between these components, a vulnerability or weakness in one part of the system may have cascading effects across the wider environment, potentially compromising its overall reliability, resilience, security, and operational continuity.

The **MIRROR app is the patient-facing interface of Dorian Gray**, connecting wearable data, personalised coaching and exergaming with the wider **Dorian Gray digital ecosystem**.

The project architecture is designed to support **privacy, data integrity, system availability, strong authentication and controlled access** across platforms, applications and APIs.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

How Does DORIAN GRAY Address Reliability, Security and Integrity in AI-Driven Healthcare?

Governance

Define how AI is used, who is responsible and how ethical and legal oversight is maintained.

Security

Protect data, AI models, applications and infrastructure against unauthorised access, loss, damage and cyber threats.

Compliance

Ensure alignment with GDPR, the EU AI Act and other applicable legal and regulatory requirements.

A secure, trustworthy and compliant approach across the AI lifecycle - from data collection and model development to deployment, monitoring and continuous improvement.

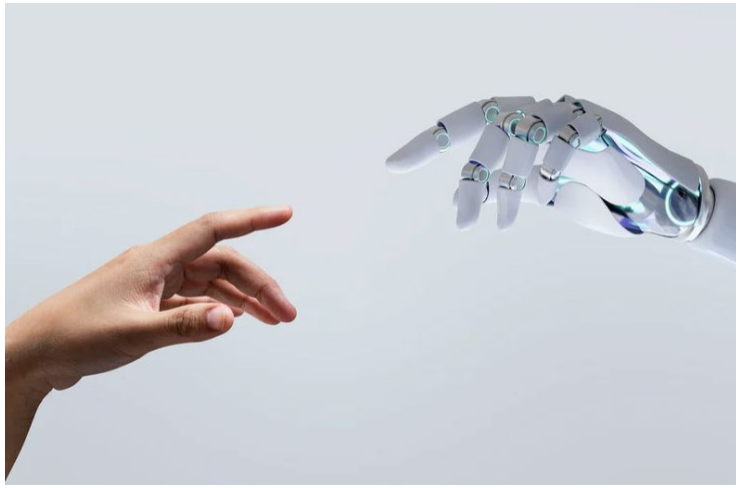
Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Can We Trust the AI?

Dorian Gray aims to develop an **explainable and trustworthy AI tool** that combines multiple dimensions of health information, including **biomarkers, omics, brain imaging, lifestyle behaviours and socio-economic data**.



The AI is designed to support **MCI risk prediction, personalised risk stratification and the identification of the most appropriate intervention** for different individuals and target groups.

The project defines a target predictive accuracy of **more than 80%**, using data from multiple countries and large patient populations.

Reliability is therefore not only about model performance. It also depends on the **quality of the input data, explainability of the model, validation of results and clinical relevance of the outputs**.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Reliability and Robustness

Dorian Gray combines data quality, rigorous model validation and continuous monitoring to support reliable AI performance.

Data Quality

- Data harmonisation and quality checks
- Robust handling of missing and erroneous data

Model Validation

- Calibration, sensitivity and specificity
- Validation across different populations

Continuous Monitoring

- Real-time model-performance monitoring
- Feedback loops for updating and retraining
- Human and clinical oversight

Reliable AI is not validated once, it is continuously tested, monitored and improved.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Protecting Data Integrity

The project relies on heterogeneous clinical, biological and real-world data that must remain accurate, consistent and trustworthy throughout the AI pipeline.

Harmonisation & Validation

Data from multiple sources are harmonised and prepared for consistent use across the project.

Structured Data Infrastructure

The project uses **Data Lake and Data Warehouse architectures**, together with metadata management, data cataloguing and ETL processes.

Reliable AI Inputs

Maintaining data integrity helps ensure that AI models and the Portrait digital twin are based on dependable information.

Trustworthy AI depends on trustworthy data.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Security by Design

Dorian Gray is developing a digital ecosystem that must remain secure, scalable and interoperable while handling sensitive health data and connected services.

☑ Identity & Access Management

*A unified IAM solution is foreseen across platforms, applications and APIs to support **strong authentication, user management and fine-grained authorisation**.*

☑ Protection of Data & Services

*The architecture includes measures to protect **privacy, data integrity and system availability**, helping secure the flow of information across the ecosystem.*

☑ Secure & Resilient Architecture

*The infrastructure is designed to be **modular, scalable and interoperable**, with security protocols and modern deployment practices supporting reliable operation as the system evolves.*

Security must be built into the architecture…not added afterwards.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Security Assurance & Testing

DORIAN GRAY complements secure architecture with concrete testing and verification measures across software and infrastructure.

- Vulnerability & Penetration Testing

  *The project foresees **full cybersecurity penetration and vulnerability assessment testing** to verify that software modules and infrastructure are appropriately secured.*

- Secure Software Lifecycle

  *Agile and **CI/CD practices** support controlled development, integration, deployment and updating of digital components.*

- Access & Infrastructure Protection

  *Security measures include **encryption, access controls, strong authentication and audit trails** across the platform.*

- AI Security Considerations

  *The project also considers the **accuracy, robustness and cybersecurity of AI components** and their interaction within the PORTRAIT platform.*

! Security must be tested and verified. Not only designed.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Privacy, Ethics & Data Protection

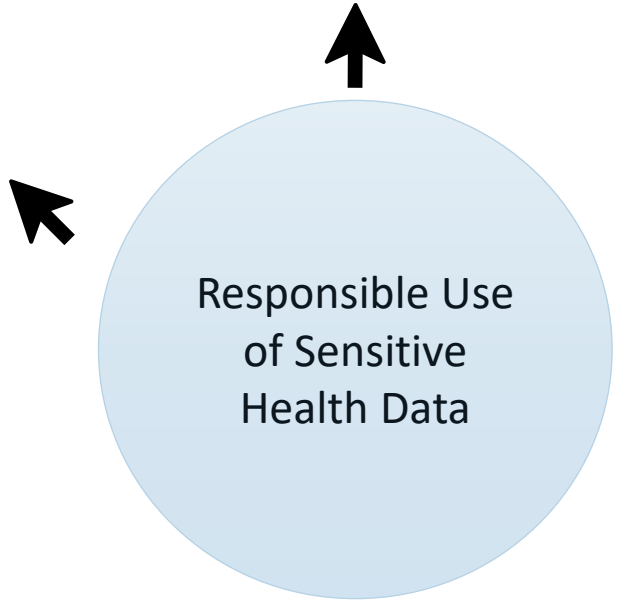
Dorian Gray treats data protection as a continuous process combining legal compliance, risk assessment and ethical oversight.

Data Minimisation

Personal data must be relevant, necessary and limited to the purposes of the research.

DPIA

Identifies risks arising from planned data-processing activities and evaluates the effectiveness of technical and organisational safeguards.



Ethical & Legal Oversight

Data Protection Officers and project-level ethical/legal supervision help protect the rights and freedoms of participants.

Trust is not only technical. It is also legal and ethical.

Funded by the European Union

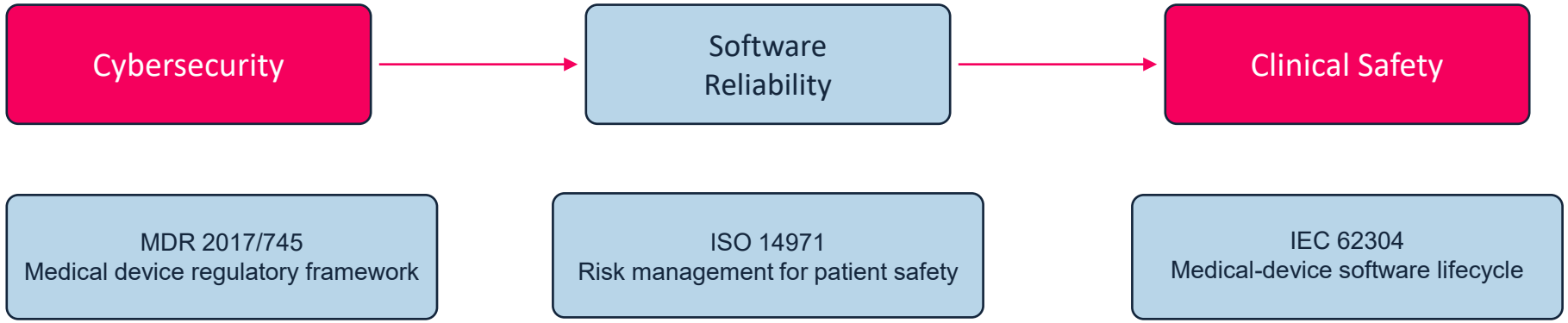
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

From Cybersecurity to Clinical Safety

In digital healthcare, a cybersecurity failure can become a patient-safety issue.

Dorian Gray places cybersecurity within a broader framework of medical-device safety, software reliability and risk management.



Cybersecurity measures include data encryption, secure storage and transmission, software updates and protection of system functionality and integrity.

☆ Security, reliability and patient safety are interconnected.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Resilience Across the Digital Health Lifecycle

Resilience means keeping the whole ecosystem trustworthy when conditions change or failures occur.

RESILIENT DIGITAL HEALTH ECOSYSTEM

High Availability

Services remain accessible and operational.

Scalability

The infrastructure can adapt to increasing data volumes and new services.

Self-Healing

The architecture supports recovery from failures with minimal disruption.

Updates & Rollbacks

Changes can be deployed and reversed in a controlled way.

Secure Integration

Connected components, applications and data flows remain protected across the ecosystem.

Resilience is not only about preventing failure. It is about recovering safely and maintaining trust.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Cross-Cutting Lifecycle Approach

DESIGN → DEVELOP → VALIDATE → DEPLOY → MONITOR → UPDATE

Reliability, security and integrity are considered throughout the full AI lifecycle, not as separate or one-off activities.

Technical safeguards are combined with governance, human oversight and regulatory compliance at each stage.

Monitoring, testing and documented evidence support accountability, adaptation and continuous improvement.

Trustworthy AI requires continuous attention across the entire lifecycle.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Conclusion

DORIAN GRAY approaches trustworthy AI in healthcare through a combination of reliability, security, integrity, governance and continuous risk management.

Reliable

Built on high-quality data, rigorous validation and continuous performance monitoring.

Secure

Supported by secure architecture, access controls, encryption and cybersecurity testing.

Integrity-Preserving

Data quality, audit trails and controlled processing help maintain trustworthy information across the ecosystem.

Compliant & Accountable

GDPR, AI Act requirements, ethical oversight and human involvement are integrated into the project approach.

Resilient

The ecosystem is designed to adapt, recover and remain dependable as conditions and technologies evolve.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

We started with Dorian Gray’s portrait, an image that revealed what could not be seen on the surface.

In our project, the PORTRAIT digital twin has a very different purpose: to make hidden health risks visible earlier, in a way that is reliable, secure and trustworthy.

The challenge is not only to see more, it is to make sure that what we see can be trusted.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

DORIAN GRAY

Thank you for your attention!

Lelia Ataliani
Infotrend Innovations Co. Ltd.

Project No. 101156266

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.