



NEWROAD Proceedings Year I

EU4Health Programme EU4H-2021-PJ2-16

Action grants for the Computer-aided Drug Repurposing for Cancer Therapy Project

GA No: 101080024

31 October 2023



**Co-funded by
the European Union**

Project Acronym:	NEWROAD
Project Full Name:	Open Platform for European Networking and Repurposing of Oncological Assets and Drugs
Grant Agreement #	101080024
Work Package	WP1
Task	Deliverable D2.2
Document Name:	NEWROAD Proceedings – Year I
Nature (R, P, D, O) ¹	R
Dissemination Level (PU, PP, RE, CO) ²	PU
Document Reference:	SM-NRD-D2.2
Version / Submission	v1.0 / Oct 31 2023
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Abstract

The NEWROAD project, co-funded by the European Union, is a groundbreaking initiative aimed at advancing the field of Systematic Drug Repurposing (SDR) with a primary focus on oncology, particularly rare and paediatric cancers. This innovative project is dedicated to developing an open platform designed to foster collaboration and data sharing, incorporating cutting-edge Augmented Intelligence (Aul) architecture layered on top of Artificial Intelligence (AI) algorithms. The primary objectives of the NEWROAD project are to reduce the costs associated with therapy development and harness existing compounds for the creation of novel therapies, all while facilitating the exchange of clinical data across Europe.

Keywords

Proceedings, Systematic Drug Repurposing, Drug Discovery, In Silico Analysis, Drug Repurposing, Data Sharing, [...]

MODIFICATION CONTROL			
Version	Date	Status	Author (s)
0.5	23/10/2023	Draft	Dr Francesco Marrafino Dr Stefano Piotto
0.8	30/10/2023	Draft	Dr Francesco Marrafino Dr Stefano Piotto
1.0	31/10/2023	Final version	Dr Francesco Marrafino Dr Stefano Piotto

¹ R=Report, P=Prototype, D=Demonstrator, O=Other

² PU=Public, PP=Restricted to other programme participants (including the Commission Services), RE=Restricted to a group specified by the consortium (including the Commission Services), CO=Confidential, only for members of the consortium (including the Commission Services)

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1. INTRODUCTION

1.1 Background and Rationale

The NEWROAD project (Open Platform for European Networking and Repurposing of Oncological Assets and Drugs), emerges from the pressing need to address the challenges of therapy development, particularly in the realm of oncology. The project recognizes the existing gaps in developing novel therapies, especially for rare and pediatric cancers. Despite significant advancements in medical research, cancer remains a formidable global health challenge with many tumor types having poor prognoses and limited treatment options.

In response to these challenges, NEWROAD is conceived as a comprehensive solution. It is designed to bridge the gap between data-driven research, therapy development, and clinical practice by creating a collaborative ecosystem that fosters innovation, optimizes existing resources, and accelerates the journey from drug discovery to patient care.

1.2 Project Objectives

The objectives of the NEWROAD project are threefold:

1. **Development of the In Silico Drug Repurposing Platform:** The project aims to create a powerful, in silico drug repurposing platform that leverages Aul architecture combined with AI algorithms. This platform will enable the systematic exploration of existing drugs and compounds for new therapeutic applications, with an initial focus on oncology.
2. **Validation of the Computational Platform:** Validation is a crucial phase where in silico predictions are assessed in the real world. NEWROAD intends to validate the platform's predictions by conducting in vitro testing on selected human cancer cell lines and in vivo testing in animal models. These rigorous validations ensure the platform's reliability and accuracy.
3. **Integration of an Open Data Sharing Platform:** Beyond drug repurposing, NEWROAD is committed to creating an open platform for the sharing of clinical data (clinical data, pharmacological data, genomic data, drug response data, pathological data, etc.). This platform is envisioned as a hub for hospitals, research organizations, universities, and other entities to share valuable data efficiently. The objective is to establish a European-wide data-sharing ecosystem that facilitates research, development, and clinical practice in diverse fields, including oncology.

1.3 Significance of Drug Repurposing in Oncology

The significance of drug repurposing in the context of oncology cannot be overstated. Traditional drug development is an expensive and time-consuming process that often leads to high attrition rates. Moreover, most cancers are characterized by complex and

heterogeneous mutations, making the development of a single drug for all patients with a particular cancer type challenging. Personalized medicine emerges as a promising approach for cancer treatment, and drug repurposing plays a pivotal role in this paradigm.

Repurposing already FDA-approved drugs offers several advantages, including accelerated development timelines, reduced costs, and a higher likelihood of success in clinical trials. By exploring new applications for existing drugs, NEWROAD aims to bring innovative, cost-effective therapies to patients while minimizing the risks associated with traditional drug discovery.

2. METHODOLOGY

2.1 Development of the In Silico Drug Repurposing Platform

The cornerstone of the NEWROAD project lies in the creation of an advanced in silico drug repurposing platform. This platform is designed to revolutionize the process of identifying novel therapeutic applications for existing drugs, with an initial emphasis on oncology. At its core, the platform utilizes Augmented Intelligence (Aul) architecture, layered on top of state-of-the-art Artificial Intelligence (AI) algorithms. This dynamic combination of Aul and AI introduces a novel approach that integrates human expertise and intelligence into the decision-making process, ensuring a robust and collaborative environment.

Key features of the in silico drug repurposing platform include:

- **Semantic Analysis:** The platform employs semantic analysis to interpret and understand data within a contextual framework. This enhanced data interpretation contributes to the identification of subtle connections, thereby aiding in the discovery of potential drug candidates.
- **Data Integration and Sources:** Multiple data sources are integrated into the platform, encompassing a wide range of information from scientific literature, clinical databases, and pharmaceutical repositories. These diverse sources provide a comprehensive knowledge base for researchers.
- **User Interface and Accessibility:** The user-friendly interface ensures accessibility for researchers from various backgrounds. The platform is designed to simplify the in silico drug repurposing process, making it accessible to a wide range of experts.

2.2 Augmented Intelligence (Aul) and AI Algorithms

The innovative aspect of the NEWROAD project lies in the integration of Augmented Intelligence (Aul) with traditional AI algorithms. While AI is well-known for its data-driven decision-making capabilities, Aul enhances this approach by keeping human expertise in the loop. Aul actively encourages researcher collaboration and the exploration of scientific hypotheses by team members.

The core advantages of combining Aul with AI are:

- **Human Expertise Integration:** Aul allows human experts to actively participate in the research process. This collaboration leads to a more holistic understanding of the data, ensuring that multiple perspectives are considered.
- **Bias Mitigation:** By integrating multiple hypotheses into a unified knowledge graph, the platform addresses potential bias-related issues. This unified knowledge graph is continuously reviewed and analyzed in real-time by each team member, promoting well-informed decision-making.
- **Collaboration and Knowledge Sharing:** Aul actively encourages researcher collaboration, enabling team members to explore scientific hypotheses

collectively. This collaborative approach results in a more thorough evaluation of data and hypotheses.

2.3 Data Integration and Sources

The success of the NEWROAD project heavily relies on the integration of diverse data sources. The platform draws from a wide range of information, including scientific literature, clinical data, and pharmaceutical databases. These sources provide a rich and comprehensive knowledge base that forms the foundation for the drug repurposing process. Data sources encompass:

- **Scientific Literature:** The platform is integrated with Biovista Vizit, enabling users to access scientific literature seamlessly. This feature aids researchers in staying up to date with relevant studies, a critical aspect of drug repurposing.
- **Clinical Data:** Patient-centric data, encompassing demographic details, medical history, disease diagnoses, treatment plans, and outcomes, gathered from multiple healthcare facilities across the European Community.
- **Pharmacological Data:** Information concerning existing drugs, comprising chemical structures, mechanisms of action, and established indications. This data is sourced from pharmaceutical companies, regulatory agencies, and academic research.
- **Genomic Data:** Utilizing genomic information derived from DNA and RNA sequencing to gain valuable insights into the genetic foundations of cancer. We are actively exploring strategies to extract meaningful insights from this genomic data.
- **Drug Response Data:** Information on patient responses to specific drugs, encompassing details on drug efficacy and toxicity. This data is integrated with genomic data to identify potential drug candidates for repurposing.
- **Pathological Data:** Data associated with tissue samples and histopathological information, shedding light on the distinct characteristics of various cancer types and their response to drugs.
- **Electronic Health Records (EHRs):** EHRs serve as comprehensive repositories, housing extensive patient data, including treatment histories, laboratory results, and other clinical information.
- **Molecule and Protein Target Visualization:** The platform offers robust tools for visualizing molecules and protein targets. Researchers can explore the structural aspects of molecules and potential protein interactions, which inform their repurposing strategies.
- **Calculations:** Advanced computational capabilities, powered by SoftMining algorithms, enable users to perform crucial calculations vital for drug repurposing. These calculations include molecular docking, dynamics simulations, and toxicological assessments.
- **Semantic Analysis:** Enhanced data interpretation through semantic analysis aids in the identification of potential drug candidates and their contextual significance.

The integration of these diverse data sources empowers researchers to make data-driven, informed decisions in the drug repurposing journey.

2.4 Validation of the Computational Platform

Validation of the computational platform is an essential phase in the NEWROAD project. It ensures the reliability and accuracy of in silico predictions before moving to in vitro and in vivo testing. The validation process encompasses the following key steps:

- **In Silico Repurposing:** The computational platform performs in silico repurposing on a database of molecules, including those in clinical phases and already on the market. This initial phase focuses on tumor targets of high interest, particularly rare and pediatric cancers.
- **In Vitro Testing:** Compounds identified through in silico repurposing will undergo in vitro testing. This testing is performed using various human cancer cell lines, including U118 (glioma), A549 (lung cancer), and MIA PaCa (pancreatic cancer). In vitro testing aims to assess the efficacy of the identified compounds, primarily through the determination of IC50 values.
- **In Vivo Testing:** The most promising candidates from in vitro testing undergo in vivo testing in animal models, specifically in nude mice (xenografts). The primary criterion for evaluating the potency of these molecules is the measurement of tumor volumes.

The validation phase serves a dual purpose. It consolidates the efficiency of the computational platform while simultaneously offering the potential discovery of novel treatments for anticancer therapy. The rigorous testing process ensures that the platform's predictions are substantiated by empirical evidence, enhancing its credibility.

2.5 Integration of an Open Data Sharing Platform

One of the distinguishing aspects of the NEWROAD project is its commitment to the integration of an open data sharing platform. This platform serves as a hub for the collection, sharing, and reuse of various forms of data collected daily in clinical practice, research organizations, and academic institutions. The objectives of this data-sharing platform are multifold:

- **Facilitating Data Sharing:** The platform provides an accessible and efficient mechanism for entities in the European Community, including hospitals, research centers, universities, and more, to share their data. This data-sharing protocol encourages collaboration and accelerates scientific and medical advancements.
- **Promoting Interoperability:** The setup of this platform lays the foundation for the interoperability and reusability of data across different domains, including pharmaceuticals, clinical practice, eHealth, and basic research.
- **Encouraging Collaborative Research:** By sharing heterogeneous data, the platform opens numerous scenarios with high potential. It enables innovative progress in diverse sectors, such as in silico drug design, the development of

smart devices for monitoring and early diagnosis of neurological pathologies, and more.

- **Data Security and Privacy:** The platform is designed with the utmost consideration for data security, privacy, and intellectual property protection. Robust measures are in place to ensure that data shared through the platform remains secure and confidential.

The long-term vision of the platform is to provide benefits to all users, both in scientific and financial terms. This service could potentially extend to sharing data related to a wide range of fields, creating a collaborative environment that advances healthcare and research.

3. THE NEWROAD PLATFORM

The NEWROAD platform is the principal component of the project, serving as the innovative hub for in silico drug repurposing in oncology and data integration. This section provides a comprehensive overview of the platform, its functionalities, user interface, semantic analysis, collaborative features, and data security and privacy measures.

3.1 Platform Functionalities

The NEWROAD platform is a dynamic and multifaceted environment that offers a range of critical functionalities:

- **In Silico Drug Repurposing:** At its core, the platform facilitates in silico drug repurposing, allowing researchers to identify novel therapeutic applications for existing drugs. This process integrates advanced algorithms and data sources to make data-driven predictions.
- **Data Integration:** The platform integrates diverse data sources, including scientific literature, clinical data, pharmaceutical repositories, and more. This comprehensive data integration enhances the platform's knowledge base and supports informed decision-making.
- **Semantic Analysis:** Semantic analysis is a fundamental component of the platform. It enhances data interpretation and supports the recognition of conceptual relationships between genes, diseases, compounds, and other data points. This feature contributes to a deeper understanding of data significance.
- **Collaboration and Knowledge Sharing:** The platform actively encourages collaboration among researchers. It facilitates the exploration of scientific hypotheses by team members, promoting the generation of collective insights and collaborative research.
- **Data Security and Privacy:** Robust measures are in place to ensure the security and privacy of data shared through the platform. These security measures safeguard sensitive and confidential information.

3.2 User Interface and Accessibility

The user interface of the NEWROAD platform is designed to be accessible and user-friendly. Researchers from diverse backgrounds can navigate the platform with ease, fostering inclusivity and knowledge exchange. The user interface simplifies the in silico drug repurposing process, making it accessible to a wide range of experts.

3.3 Semantic Analysis in Data Interpretation

The platform leverages semantic analysis to enhance data interpretation and understanding. This feature allows the platform to interpret and understand data within a contextual framework, promoting a more comprehensive view of data. It aids in the

recognition of conceptual relationships between genes, diseases, compounds, and other data points, enabling deeper insights into data significance.

3.4 Collaborative Features

Collaboration is a core aspect of the NEWROAD platform. Its Augmented Intelligence (Aul) architecture actively encourages researchers to collaborate and explore scientific hypotheses collectively. The platform integrates multiple hypotheses into a unified knowledge graph, allowing for real-time review and analysis by each team member. This collaborative approach leads to well-informed decision-making and knowledge sharing.

3.5 Data Security and Privacy Measures

The NEWROAD platform prioritizes data security and privacy. As the platform integrates sensitive and confidential information, it implements robust measures to protect data. These measures ensure the confidentiality and security of patient data, research data, and other sensitive information shared within the platform.

4. TARGET SELECTION AND PATHWAYS

The selection of oncological targets and pathways is a crucial aspect of the NEWROAD project. This section provides an overview of the targeted cancer-related pathways and the process of identifying potential drug candidates.

4.1 Cancer Targets and Pathways

In the NEWROAD project, careful consideration has been given to identifying and targeting specific cancer-related pathways. The primary focus is on addressing orphan diseases and cancers with poor prognoses, such as glioma, pancreatic cancer, colorectal cancer, ovarian cancer, and cervical tumors. These cancers present significant challenges in terms of therapy development, often characterized by low 5-year survival rates and complex mutational profiles.

The project has selected highly relevant targets related to:

- **Pediatric Glioma:** Targeting pediatric glioma aims to address the urgent need for effective therapies in children diagnosed with brain tumors. The identification of novel drug candidates for pediatric glioma is a priority.
- **Solid Cancers:** Cancers like colorectal cancer, ovarian cancer, and cervical tumors are among those targeted. These cancers represent a considerable burden, and innovative treatments are essential.

Through thorough study and research, six highly relevant targets have been selected. Furthermore, pathways that can be targeted within these cancers have been identified.

4.2 Identification of Potential Drug Candidates

The NEWROAD project employs advanced algorithms and computational tools to identify potential drug candidates for the selected oncological targets and pathways. This process involves multiple stages:

- **Molecular Similarity:** The platform assesses the molecular similarity of existing drugs to the identified targets. This initial screening helps prioritize potential candidates based on their structural resemblance to known therapies.
- **Identification of Allosteric Sites:** The platform explores the potential allosteric sites in target proteins. Allosteric sites offer opportunities for modifying protein functions, making them significant targets for drug repurposing.
- **Affinity Prediction:** Predictive modeling is used to estimate the binding affinity of drugs to their target proteins. Higher affinities are indicative of better potential drug candidates.
- **ADMET Properties:** The platform assesses the Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) properties of potential drug candidates. This analysis is crucial for evaluating a drug's safety and effectiveness.

- **Chemical Stability:** The chemical stability of potential candidates is examined to ensure their viability in drug development and administration.
- **Lead Optimization:** Promising candidates are subject to lead optimization processes to enhance their effectiveness and safety.
- **Repurposing of Drugs:** The final selection of drug candidates is based on their suitability for repurposing. This means that existing FDA-approved drugs, which have already passed certain safety tests, are given preference for further development.

The selection process ensures that only the most promising drug candidates move forward for in vitro and in vivo testing, contributing to the acceleration of new therapeutic options for these challenging cancers.

5. INTEGRATION OF AN OPEN DATA SHARING PLATFORM

The NEWROAD project recognizes the vital role of an open data sharing platform in advancing healthcare research. This section delves into the significance of data sharing in healthcare, the goals and objectives of the European Open Platform, and the protocols for data collection, structuring, and sharing.

5.1 The Need for Data Sharing in Healthcare

Data sharing in healthcare is imperative for several reasons:

- **Scientific Advancement:** Sharing clinical and biomedical data fosters scientific progress by making valuable information available to researchers and clinicians.
- **Collaborative Research:** Data sharing encourages collaboration among healthcare professionals, researchers, and institutions. This collaboration enhances the collective understanding of diseases and therapeutic strategies.
- **Accelerated Drug Development:** By sharing data related to drug repurposing and therapeutic research, the development of new treatments is accelerated.
- **Improved Patient Care:** Access to comprehensive patient data enables healthcare providers to make more informed decisions, leading to improved patient care and outcomes.
- **Resource Optimization:** Efficient data sharing minimizes duplication of efforts and optimizes resource allocation, ensuring that data is leveraged to its full potential.

5.2 European Open Platform: Goals and Objectives

The European Open Platform in the context of the NEWROAD project has defined clear goals and objectives:

- **Data Collection:** The platform serves as a central hub for collecting diverse data sources from clinical practice, research, and industry. These sources include patient records, research data, electronic health records (EHRs), and more.
- **Data Structuring:** Collected data undergo structuring and harmonization to align with a common framework. This process facilitates data integration and analysis.
- **Data Sharing:** The platform actively promotes data sharing, offering an environment where hospitals, research centers, universities, and other entities can share their data efficiently.
- **Scientific, Financial, and IP Returns:** Participants in data sharing can expect scientific, financial, and intellectual property (IP) returns, ensuring that collaboration is mutually beneficial.

- **Interoperability:** The platform aims to lay the foundations for interoperability in healthcare data. This extends beyond oncology and encompasses various areas, including drug development, electronic medical records, and eHealth.

The European Open Platform within the NEWROAD project is a forward-looking initiative that is expected to have a profound impact on healthcare research and data utilization.

5.3 Data Collection, Structuring, and Sharing Protocols

Data collection, structuring, and sharing are critical aspects of the European Open Platform. The protocols in place are designed to ensure efficiency and effectiveness:

- **Data Collection:** Data collection protocols encompass the identification of relevant data sources, including EHRs, clinical records, research databases, and industry data. These sources are identified based on their potential to contribute to healthcare research.
- **Data Structuring:** Data are structured and harmonized to ensure compatibility and consistency. Data structuring protocols facilitate the integration of heterogeneous data sources.
- **Data Sharing:** The sharing of data is regulated by defined protocols, ensuring that data is shared securely and responsibly. These protocols outline data access, governance, and quality assurance processes.

The NEWROAD project is committed to establishing a robust framework for data collection, structuring, and sharing, paving the way for innovative advancements in healthcare research.

6. CHALLENGES AND FUTURE DIRECTIONS

The NEWROAD project, while making considerable progress, is bound to face several challenges. This section addresses project challenges and their mitigation, collaboration initiatives, and outlines future prospects and directions.

6.1 Project Challenges and Mitigation

The NEWROAD project has navigated various challenges, including but not limited to:

- **Data Integration Complexity:** The integration of diverse data sources, while enriching the platform, presented challenges in terms of harmonization and compatibility. To mitigate this, data structuring protocols and advanced algorithms will be employed to streamline data integration.
- **Ethical and Regulatory Compliance:** Handling patient data and sensitive information required careful adherence to ethical and regulatory guidelines. The project has taken measures to ensure data privacy and security, working in compliance with legal and ethical standards.
- **Interoperability:** Achieving interoperability in data sharing and analysis across various healthcare domains and systems is a prominent challenge. The project is continually working to enhance interoperability mechanisms.
- **Collaboration Barriers:** Effective collaboration between healthcare institutions, research centers, and industry partners can be challenging due to differing workflows and practices. The Consortium is actively working to establish collaborative mechanisms and shared knowledge graphs to bridge these gaps.

Mitigation strategies have been and will be implemented to address these challenges, ensuring that the project remains on course for success.

6.2 Collaboration Initiatives

The NEWROAD project places a strong emphasis on collaboration. Initiatives to foster collaboration include:

- **Digital4Cancer Workshops:** These workshops, organized by the European Union, serve as a platform for finding the right collaborations and defining effective integration with the platform. They bring together healthcare experts, researchers, and data providers to share insights and drive collaborative efforts.
- **Inter- and Intra-Research Group Collaboration:** The project encourages collaboration through the exchange of knowledge graphs, technical reports, etc. These documents, hosted on a shared platform, facilitate collaborative research within and between research groups.

Collaboration is central to the NEWROAD project's success, and ongoing initiatives aim to strengthen partnerships and knowledge sharing.

6.3 Future Prospects and Expansions

The NEWROAD project envisions a future filled with opportunities and expansions:

- **Wider Therapeutic Targets:** The platform's adaptability allows it to extend beyond oncology to target a broader range of diseases. Future prospects include the identification of novel therapies for various medical conditions.
- **Data-Driven Healthcare:** The project contributes to the evolution of data-driven healthcare, where comprehensive data integration and analysis become standard practice, leading to more personalized and effective treatments.
- **International Collaboration:** The project aims to expand its collaborations internationally, fostering global initiatives in healthcare research and data sharing.
- **Innovative Progress:** With ongoing research and development, the NEWROAD project is set to introduce innovative progress in data analysis, drug repurposing, and knowledge sharing.

7. DISSEMINATION AND COMMUNICATION

Dissemination and communication are essential components of the NEWROAD project, ensuring that the project's results and impact are effectively shared with the European community. The NEWROAD project has successfully launched its project website (<https://new-road.eu/>), serving as a central hub for project updates, resources, and collaboration opportunities. This section delves into the Dissemination and Communication Plan, progress monitoring and indicators, as well as outreach and impact.

7.1 Dissemination and Communication Plan

The NEWROAD project has developed a comprehensive Dissemination and Communication Plan to optimize the communication activities and maximize their impact. This plan encompasses various channels for sharing project results, avoiding misuses, improvisation, and enhancing the optimization of resources. The plan includes periodic reports, scientific publications, organization of workshop, seminars, and training sessions, and all activities related to project dissemination.

7.2 Progress Monitoring and Indicators

To ensure that project goals are being met and that dissemination efforts are effective, specific indicators are monitored. These indicators include:

- **Periodic Reports:** The content and quality of periodic reports are assessed to track the project's progress and align it with its objectives.
- **Scientific Publications:** The impact and reach of scientific publications are considered indicators of the project's influence on the scientific community.
- **Participation of International Experts:** The diversity and expertise of international experts participating in project activities are monitored to gauge the project's global reach.
- **Overall Participation in the Work of the Platform:** Increased participation in the platform reflects growing interest and collaboration within the European community.

The project's effectiveness in disseminating information and engaging stakeholders is measured through these indicators.

7.3 Outreach and Impact

The NEWROAD project has a significant outreach and impact on the European community and beyond:

- **Scientific Advancements:** By sharing research findings and facilitating data-driven healthcare, the project contributes to scientific advancements in drug repurposing and therapy development.

- **Collaboration Initiatives:** The project's collaboration initiatives foster partnerships and knowledge sharing among healthcare professionals, researchers, and data providers.
- **EU Initiatives:** The project's international reach lays the foundation for Europe-wide healthcare research initiatives, promoting the exchange of knowledge and expertise.
- **Innovative Progress:** The NEWROAD project is positioned to introduce innovative progress in data analysis, drug repurposing, and knowledge sharing, leading to advancements in healthcare.

The project's outreach and impact extend beyond research and into the broader healthcare community, emphasizing the importance of data-driven, collaborative healthcare research.

8. CONCLUSION

NEWROAD, an ambitious endeavor supported by EU funding, has made significant strides in the field of healthcare research, with a primary focus on drug repurposing and data-driven therapy development. This section provides a conclusion to the proceedings, highlighting project achievements, implications for cancer research, and future developments and collaboration.

8.1 Project Achievements

The NEWROAD project has achieved several significant milestones:

- **Development of an Innovative Platform:** The project is successfully developing an open, collaborative platform that combines Artificial Intelligence and Augmented Intelligence to facilitate drug repurposing and data-driven healthcare research.
- **Integration of Diverse Data Sources:** The platform will efficiently integrate diverse data sources, including clinical records, electronic health records, research data, and industry information, enabling comprehensive analysis.
- **Collaboration Initiatives:** The project is actively fostering collaboration among healthcare professionals, researchers, and data providers, promoting knowledge sharing and teamwork.
- **Data-Driven Healthcare:** The NEWROAD project is contributing to the evolution of data-driven healthcare, where data integration and analysis become integral to improving patient care and developing novel therapies.

8.2 Implications for Cancer Research

The implications of the NEWROAD project for cancer research are profound:

- **Targeted Therapy Development:** The project's platform allows for the targeted development of therapies for rare and pediatric cancers, addressing the urgent need for treatments in these areas.
- **Accelerated Drug Repurposing:** The in-silico approach to drug repurposing, validated by real data in cells and animal models, accelerates the development of new anticancer drugs.
- **Increased Interest in Orphan Cancers:** By repurposing already FDA-approved drugs, even for orphan cancers, the project stimulates interest in the development of treatments for less common cancers.

8.3 Future Developments and Collaboration

The NEWROAD project is poised for a future filled with opportunities and growth:

- **Expanding Therapeutic Targets:** The platform's adaptability allows it to extend its focus beyond oncology, targeting a broader range of diseases and medical conditions.

- **International Collaboration:** The project aims to expand its collaborations internationally, fostering global initiatives in healthcare research and data sharing.
- **Innovative Progress:** Ongoing research and development efforts within the project promise to introduce innovative advancements in data analysis, drug repurposing, and knowledge sharing.

Collaboration remains central to the project's success, and the exchange of knowledge and expertise within the European community and beyond is a priority for future developments. NEWROAD represents a unique approach to healthcare research, highlighting the importance of collaboration and data-driven solutions in addressing healthcare challenges. The project's accomplishments and potential offer hope for progress in medical science, better patient care, and opportunities for international healthcare research collaborations.