

# Cancer-AI Consortium File

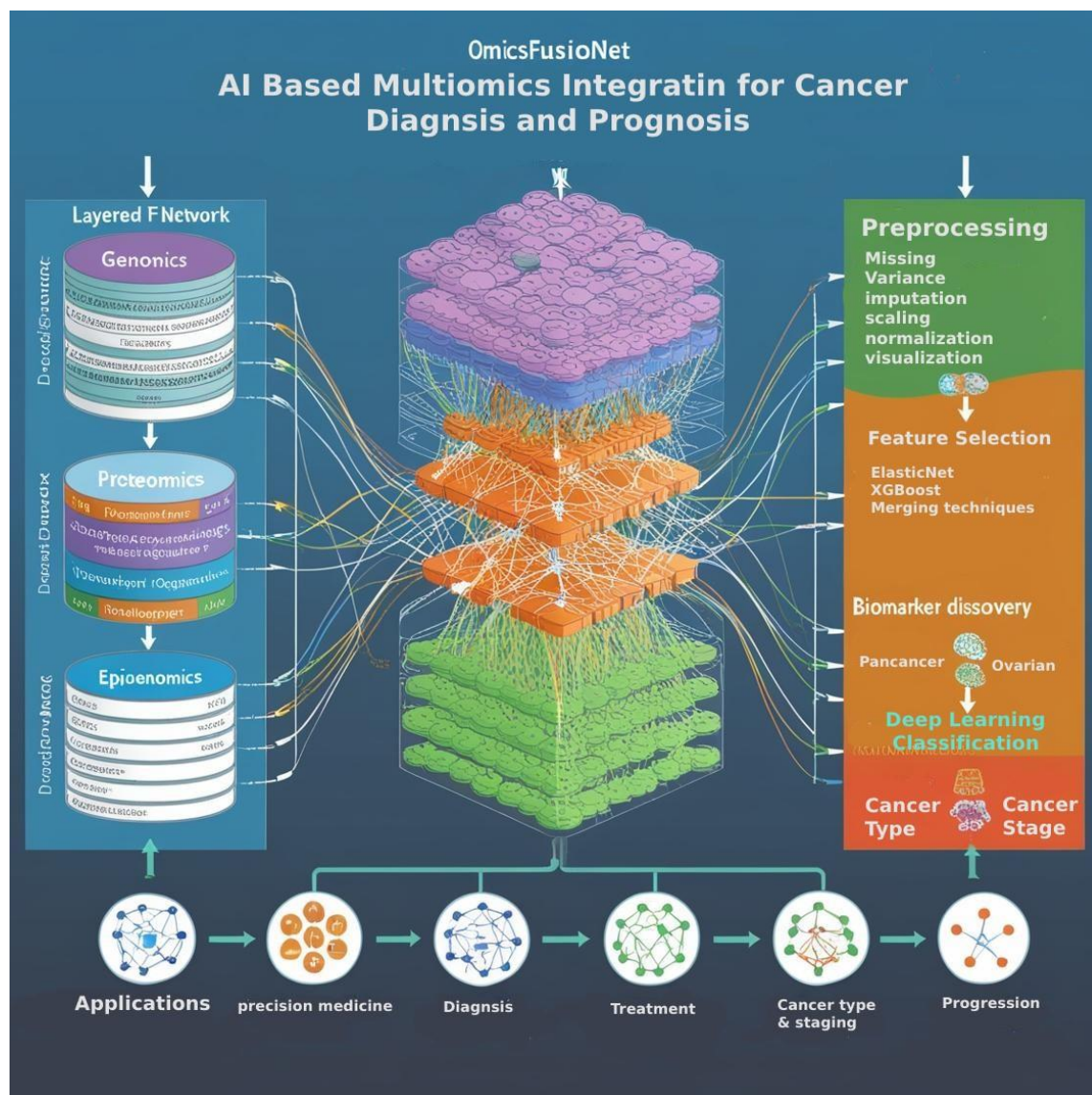
## AI-Driven Multi-Omics Platform for Early Detection & Precision Oncology

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## 1. Project Description

**Cancer-AI** is an integrative artificial intelligence platform designed to transform cancer diagnosis, subtype classification, and treatment decision-making through **multi-omics data fusion** and **predictive modeling**. The platform combines genomic, transcriptomic, epigenetic, and proteomic signals into one unified analytical engine capable of identifying early cancer signatures, robust biomarkers, and patient-specific therapeutic insights.

At the core of Cancer-AI is a **multi-stage machine learning and deep learning pipeline** that harmonizes heterogeneous biological datasets, extracts high-value features, and builds predictive models across **23 cancer types; focuses on 10 type at the first stage**. The system supports early-stage detection, progression risk prediction, and personalized treatment response forecasting, enabling clinicians and researchers to move beyond single-omics limitations toward a more comprehensive understanding of tumor biology.

The project includes:

- **OmicsFusionNet Framework:** A proprietary multi-omics integration technique that enhances signal quality and improves model stability across diverse cancer cohorts.
- **Feature Extraction & Biomarker Discovery:** Automated workflows for identifying disease-driving biomarkers and pathway-level signatures with high interpretability.
- **sDCFE Novel Statistical Framework + ML/DL Predictive Modeling:** Scalable classifiers and prognostic models validated across large international datasets, supporting both early detection and disease-stage prediction.
- **Clinical Decision Support Dashboard:** An interactive environment that provides clinicians with patient-level predictions, biomarker relevance scores, and treatment-oriented insights.
- **Case Studies:** Real-world validation on lung and ovarian cancer, demonstrating the ability of the platform to identify discriminative biomarkers and enhance diagnostic accuracy.

Cancer-AI aims to be deployed as a **clinical and research support tool** within hospitals, research centers, and personalized medicine programs. It enables faster analysis, more accurate predictions, and more efficient cancer research pipelines — ultimately contributing to improved patient outcomes and modern precision oncology strategies.

## 2. Vision & Mission

### VISION:

To revolutionize early cancer diagnosis and personalized treatment through interpretable AI that integrates multi-omics and clinical data—achieving significantly higher accuracy in cancer prediction and patient-specific decision-making.

**MISSION:**

To develop and clinically validate a scalable, explainable, secure AI platform that empowers hospitals, researchers, and biotech companies with actionable insights for diagnosis, prognosis, and therapy selection.

**3. Unmet Need**

Cancer remains the leading global cause of death, with more than 60% of patients diagnosed at late stages.

Healthcare systems lack integrated solutions connecting radiology, genomics, proteomics, and clinical workflows.

There is a strong unmet need for an affordable, accessible, clinically validated AI platform capable of supporting precision oncology and early detection across multiple cancer types.

**4. Cancer-AI Solution Overview**

The Cancer-AI platform provides:

- Multi-omics integration (transcriptomics, methylation, mutational data, proteomics)
- Radiomics feature extraction from CT/MRI
- Clinical metadata harmonization
- ML + DL predictive modeling across 23 cancer types
- Deep early-stage models for 10 cancers
- Case studies: Lung cancer & Ovarian cancer
- Survival, recurrence, treatment response prediction
- Web-based, secure clinical decision-support system

**5. Use Cases**

1. Early detection across 23 cancers
2. Early-stage prediction for 10 high-priority cancers
3. Personalized therapy selection
4. Recurrence and survival prediction
5. Biomarker discovery
6. Multi-omics feature interpretation for clinical teams

## 6. Scientific Innovation

- First unified platform combining radiomics + multi-omics + clinical signals
- Novel interpretable models (sDCFE, OmicsFusionNet)
- Multi-cancer early-stage modeling
- Strong real-world relevance via lung & ovarian cancer studies
- Scalable architecture aligned with IVDR/CE certification paths

## 7. Technical Architecture

1. Data ingestion & quality control
2. Multi-omics pipelines (RNA, methylation, mutations, proteomics)
3. Radiomics feature extraction
4. Feature fusion via sDCFE & OmicsFusionNet
5. ML + DL predictive modeling
6. Explainability: SHAP + biological relevance
7. Clinical dashboard for scoring & interpretation
8. API interoperability with hospital systems

## 8. Validation Strategy

- Retrospective validation across 23 cancer types
- Deep-stage validation for 10 cancers
- Lung & ovarian case studies
- External EU hospital datasets
- Prospective pilots
- Benchmarking against SOTA models
- Preparation for IVDR/CE compliance

## 9. Top 10 Target Cancer Types

1. Lung Cancer
2. Breast Cancer
3. Colorectal Cancer

4. Ovarian Cancer
5. Pancreatic Cancer
6. Prostate Cancer
7. Liver Cancer
8. Kidney Cancer
9. Gastric Cancer
10. Thyroid Cancer

#### **10. Desired Partner Profiles**

- Hospitals & oncology centers
- Research institutes (AI, genomics, radiomics)
- Biotech & pharma
- Cloud, cybersecurity & digital health SMEs
- International health networks

#### **11. Work Package Structure**

WP1 – Project Management

WP2 – Data Integration & Quality Control

WP3 – Multi-Omics & Radiomics Pipelines

WP4 – ML + DL Modeling & Platform Integration

WP5 – Validation & Clinical Evaluation

WP6 – Deployment & Interoperability

WP7 – Dissemination & Scaling

#### **12. Expected Impact**

##### **SCIENTIFIC:**

- Novel biomarkers & integrated signatures

##### **CLINICAL:**

- Early detection & improved therapy pathways

**ECONOMIC:**

- EU-MENA oncology innovation
- Commercialization potential
- Training & technology transfer

**13. Contact**

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