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Single Day Event

The AI-DGI Model

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Introduction

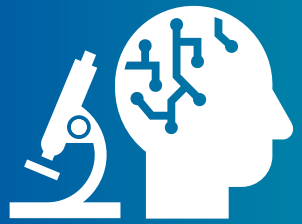
- Artificial Intelligence (AI) holds transformative potential in oncology. However, its clinical impact is limited by fragmented data, lack of standards, and ethical concerns.

- The AI-DGI framework addresses these challenges through a structured approach focusing on Data, Governance, and Implementation.

Challenges in AI-Driven Oncology

Data Silos and Lack of Standardization

Reproducibility Issues in AI Research



Ethical Concerns: Bias, Privacy, Explainability

Scalability Across Institutions and Populations

1. Data Silos and Lack of Standardization

Adopt Interoperability Standards
(e.g., HL7FHIR, DICOM, OMOP CDM)ii

Implement FAIR Principles
(Findable, Accessible, Interoperable, Reusable)

Create Federated Data Networks for secure cross-institutional sharing

2. Reproducibility Issues in AI Research

Promote Open Science:
Share code, models,
and datasets

Use Standardized Benchmarks
and Evaluation Metrics

Perform External Validation
across diverse populations

3. Ethical Concerns: Bias, Privacy, Explainability

01

Conduct Regular Bias Audits

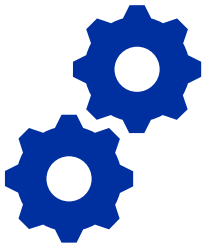
02

Apply Privacy-Preserving Techniques (e.g., federated learning, differential privacy)

03

Use Explainable AI tools (e.g., SHAP, LIME) to enhance trust

4. Scalability Across Institutions and Populations



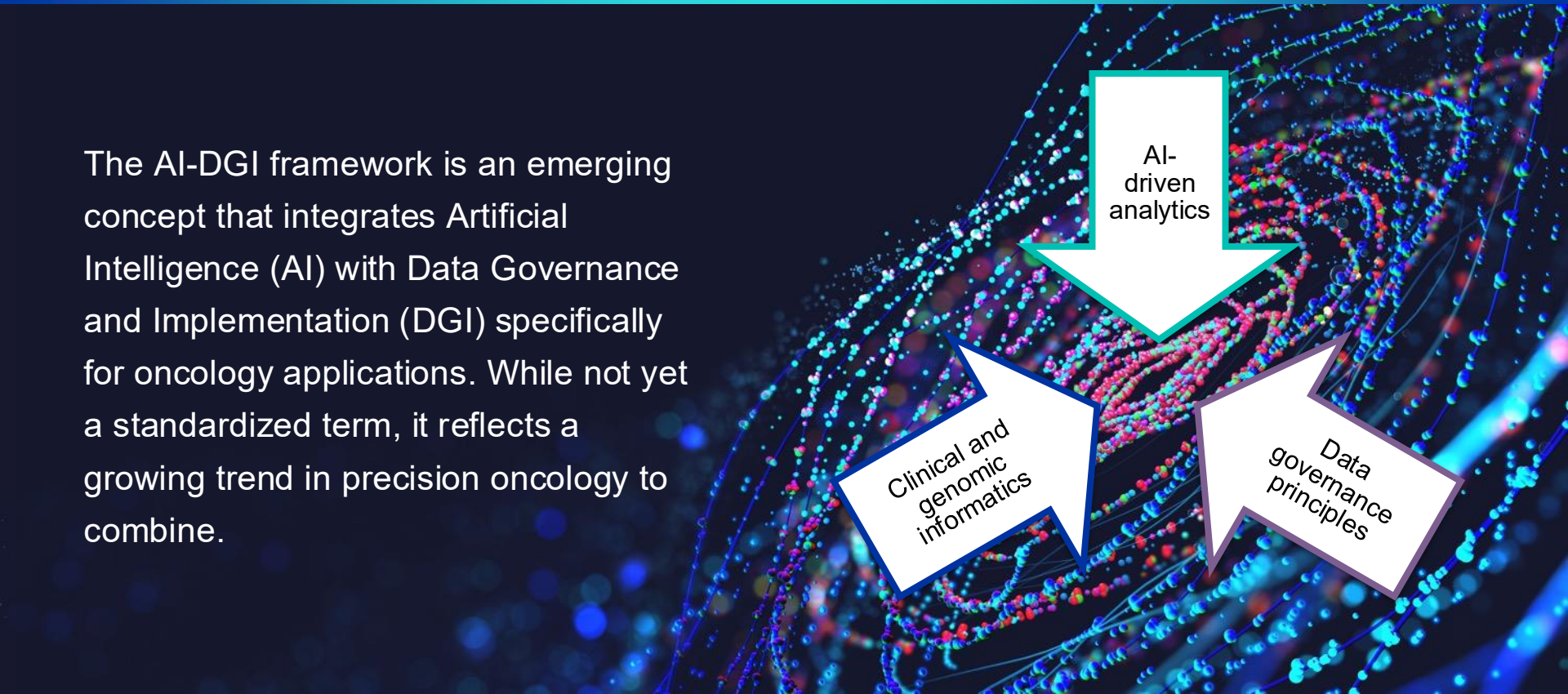
Design modular AI architectures for local adaptation

Use cloud-based platforms for scalable deployment

Foster cross-institutional collaborations for co-development

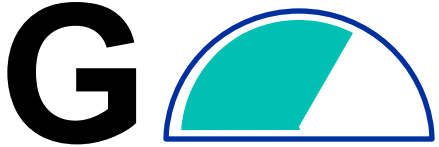
The AI-DGI Framework

The AI-DGI framework is an emerging concept that integrates Artificial Intelligence (AI) with Data Governance and Implementation (DGI) specifically for oncology applications. While not yet a standardized term, it reflects a growing trend in precision oncology to combine.

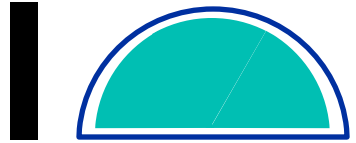


The AI-DGI Framework

Data:
Promotes interoperable, high-quality datasets using FAIR principles.

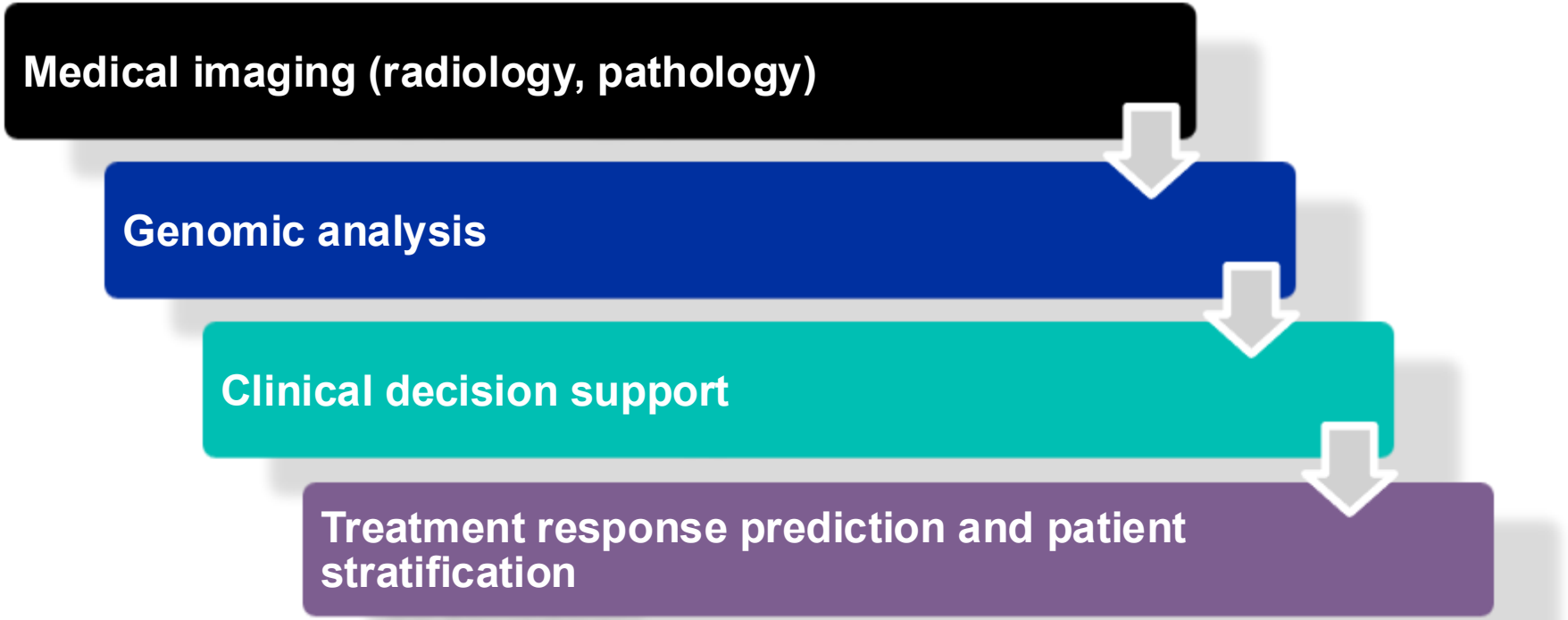


Governance:
Aligns AI development with ethical, legal, and regulatory standards.

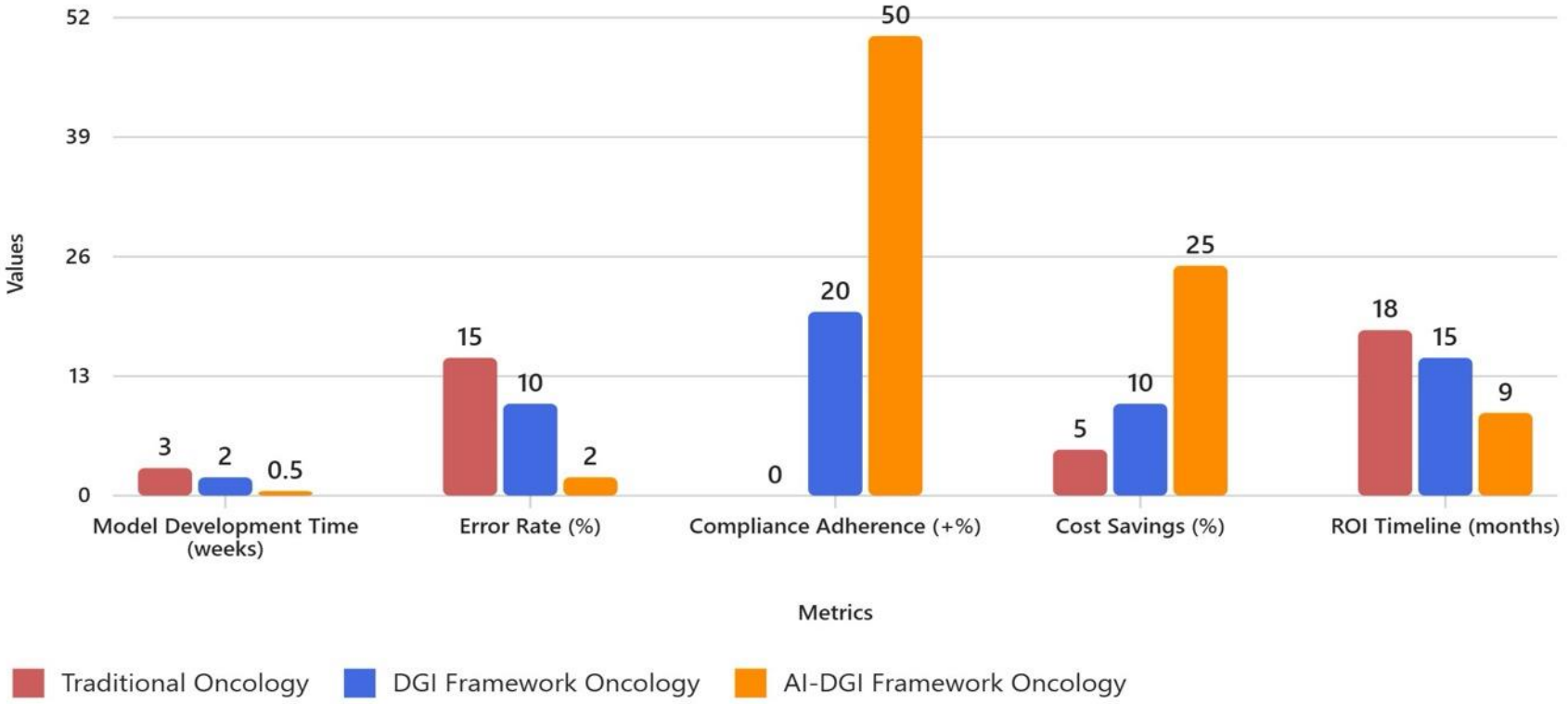


Implementation:
Supports real-world integration through secure, validated systems.

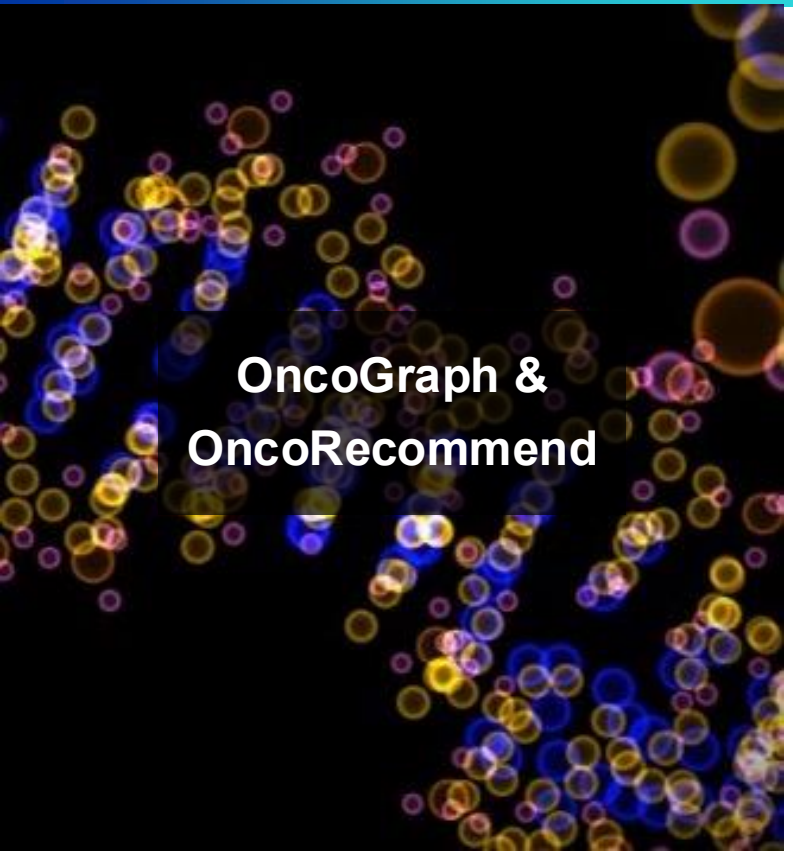
Application Domains



Comparison of Three generation



Real-World Applications



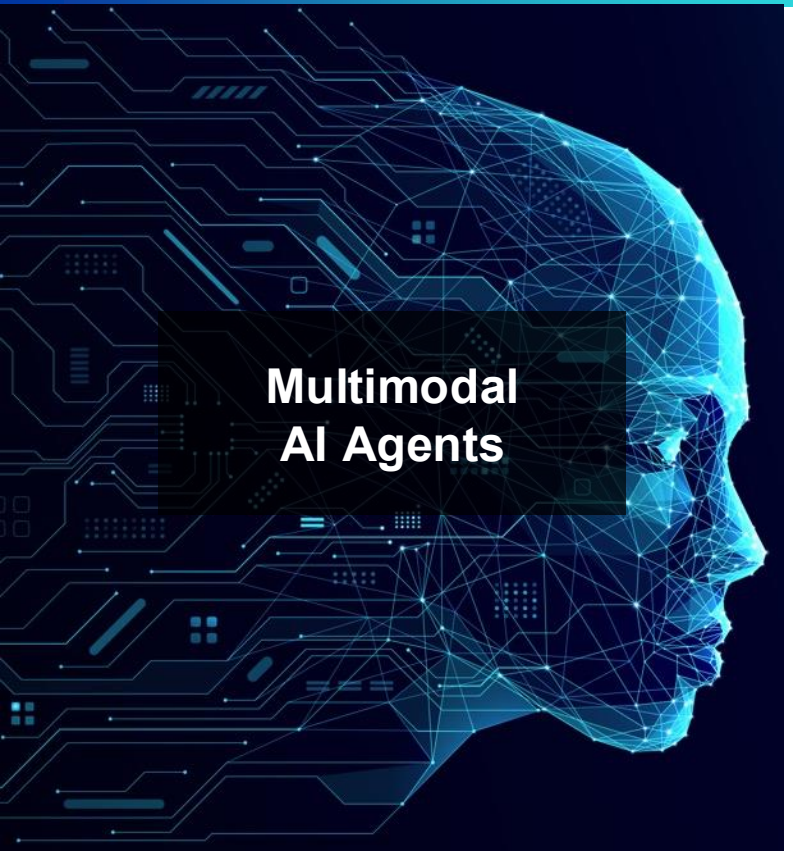
AI in Oncology Decision-Making
OncoGraph and OncoRecommend enhance clinical decisions using advanced AI and large language models.

Knowledge Graph Mapping
OncoGraph maps gene, drug, and disease relationships for molecular interaction understanding.

Personalized Treatment Matching
OncoRecommend matches patients to clinical trials and personalized treatments using structured data.

Precision Oncology Integration
Integrates genomics, health records, and guidelines to support precision oncology and better outcomes.

Real-World Applications



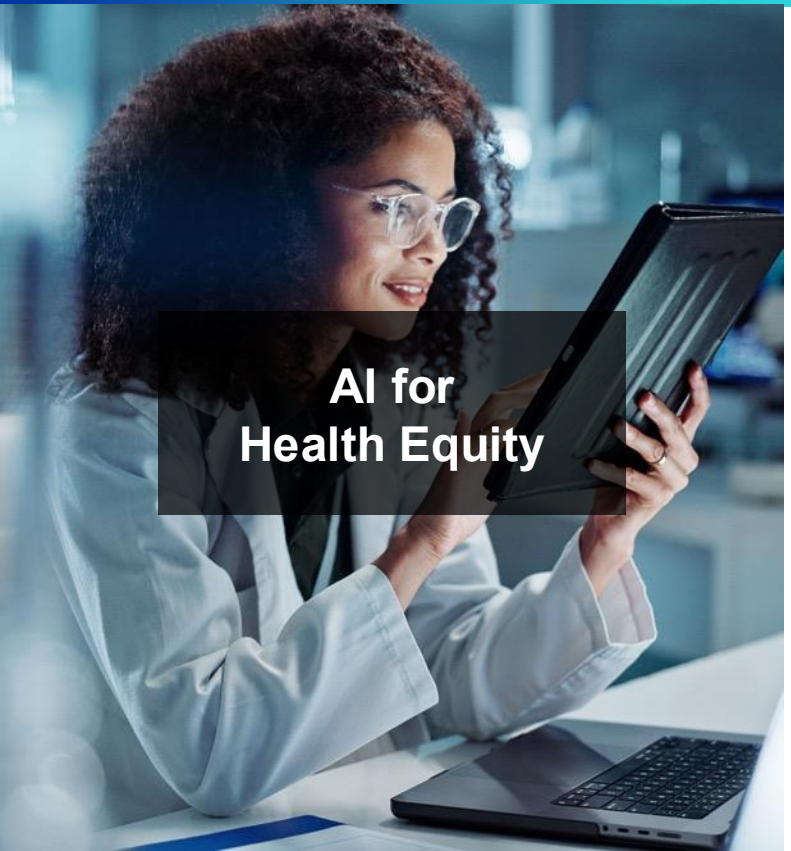
Integration of Data Modalities
Multimodal AI agents unify genomic, radiological, histopathological, and clinical data for analysis.

Autonomous Interpretation Tools
Tools like GPT-4 and MedSAM autonomously interpret diverse medical data sources effectively.

High-Accuracy Clinical Decisions
The agents deliver precise diagnoses, treatment plans, and prognoses based on synthesized data.

Mutation Detection with Vision Transformers
Vision transformers detect mutations like KRAS and BRAF using histopathology images.

Real-World Applications



Integrating Social Determinants
AI models incorporate socioeconomic, geographic, and demographic data to improve cancer care equity.

Targeting At-Risk Populations
AI identifies vulnerable groups to tailor cancer screening, diagnosis, and treatment interventions.

Remote Access Expansion
AI-driven geospatial analysis and telehealth extend oncology services to underserved remote areas.

Ensuring Fairness in AI
Mitigating training data bias and using fairness-aware algorithms create a just healthcare system.

Challenges Addressed

Data silos and lack of standardization:

Clinical, imaging, and genomic data are often stored in isolated systems with incompatible formats, hindering comprehensive analysis and robust AI model development.

Reproducibility issues in AI research:

Lack of transparency in model development and validation makes it difficult to replicate results across institutions, limiting trust and generalizability.

Ethical concerns around bias, privacy, and explainability:

AI may perpetuate biases, compromise patient privacy, and lack interpretability, raising fairness and accountability issues.

Scalability of AI solutions across institutions and populations:

AI tools may not generalize well due to differences in data and infrastructure, requiring adaptable models for broad deployment.

Vision for the Future

The AI-DGI framework bridges the gap between AI innovation and clinical utility.

It fosters a collaborative, interdisciplinary ecosystem that supports innovation while ensuring safety, equity, and improved patient outcomes.

Conclusion

AI Enhances Cancer Care

- AI leverages data, genomics, and imaging to enable accurate diagnoses and personalized cancer treatments.

Challenges and Solutions

- Data privacy, model interpretability, and workflow integration challenges are actively addressed by ongoing research.

Future Collaboration

- Collaboration among clinicians, researchers, and technologists is crucial to fully realize AI's potential in oncology.

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The Global Healthcare Data Science Community

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