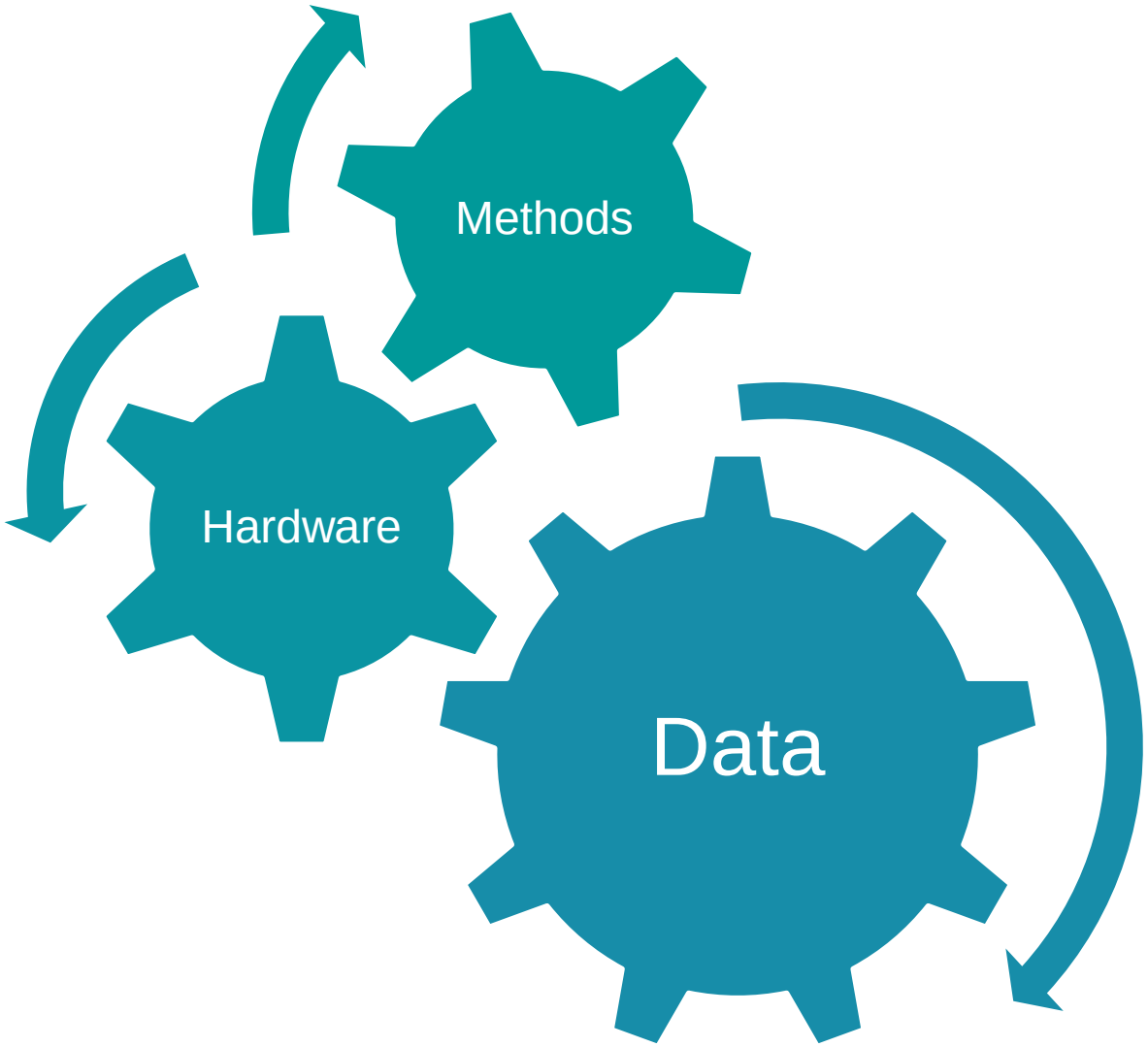
NCI Artificial Intelligence Funding Opportunities and Resources

Juli Klemm
Emily Greenspan
Jennifer Couch
Roxanne Jensen

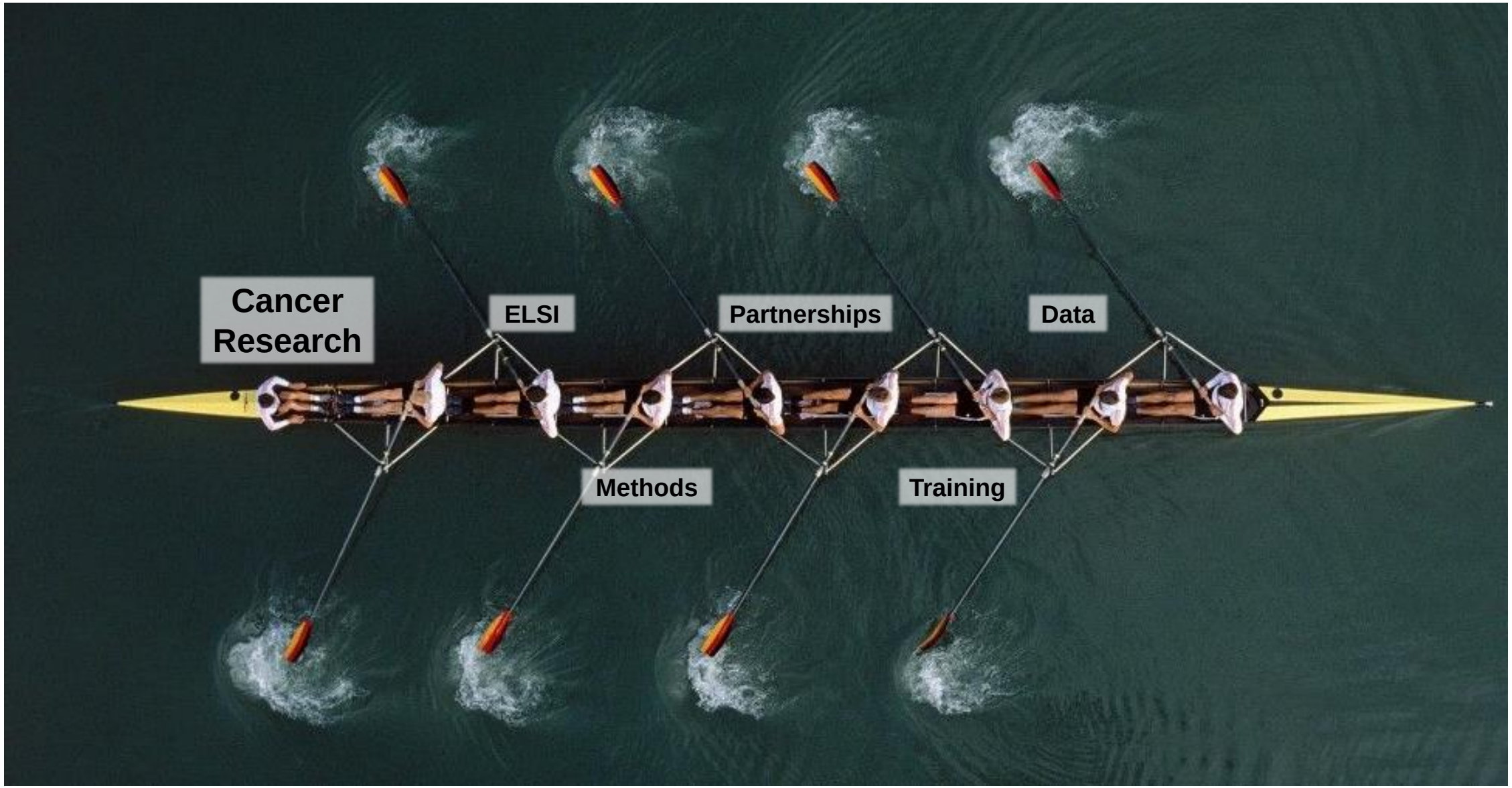
NIH NATIONAL CANCER INSTITUTE

AACR Meet the Experts
April, 2024

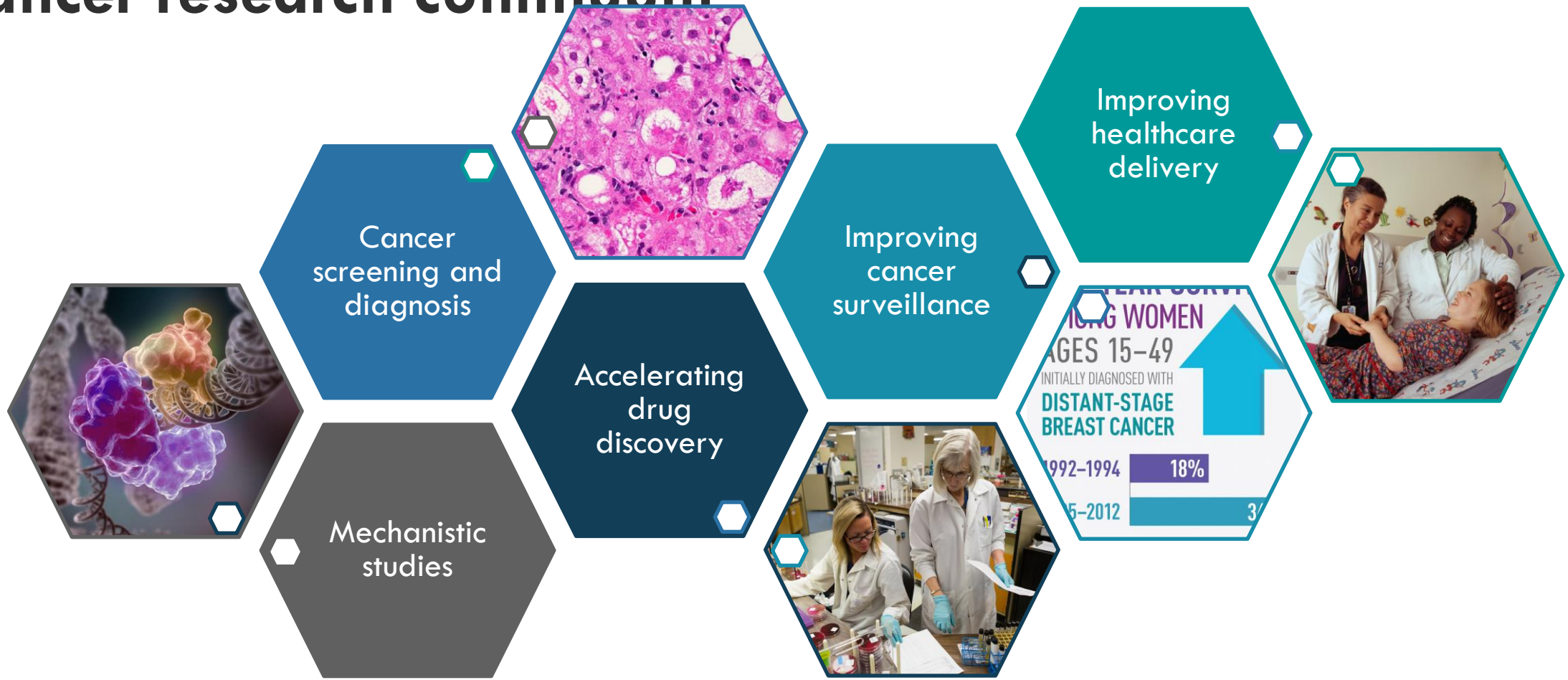
Recent advances have led to promising new applications of AI to cancer research



The pace of research is unprecedented


Cancer Research
ELSI
Partnerships
Data
Methods
Training

Artificial intelligence across the cancer research continuum



Funding Opportunities: AI in Cancer Research

NCI funds and supports extramural research to advance the use of AI in cancer research. Find out more about funding opportunities and other ways to engage in advancing AI for cancer research.

AI research is funded through a wide variety of grant and contract programs across NCI, where the majority of cancer research is supported through broad-based, investigator-initiated grant opportunities. The following programs have a strong emphasis on AI:

- Informatics Technology for Cancer Research (ITCR)
- Cancer Systems Biology Consortium (CSBC)
- Small Business Innovation Research (SBIR)
- Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science (SCH)

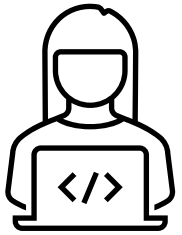
Specific open Funding Opportunities and Requests for Information are listed in the table below.

Notices of Funding Opportunities and Requests for Information

Title	Announcement Number	Opening Date	Expiration Date	Activity Code
Notice of Special Interest (NOSI): Administrative Supplements to Support the Development of Digital Twins in Radiation Oncology (DTRO)	NOT-CA-24-015	Dec 8, 2023	Mar 21, 2024	R00, R01, R21, R35, R37, U01, P01, P30, P50, U19, U24, or U54

https://www.cancer.gov/research/resources/ai-cancer-research/funding

Informatics Technology for Cancer Research (ITCR)



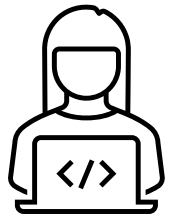
Goal: Promote research-driven informatics technology across the development lifecycle to address priority needs in cancer research.

Special Requirements: The development team must demonstrate how they will work with cancer researchers to ensure the tool/technology meets their needs. All software must be open source and AI models shared with model cards. Focus on tool sharing and dissemination.

Active Funding Opportunities:

Innovative methods and algorithms (R21)	RFA-CA-24-016
Early-stage tool development (U01)	RFA-CA-24-017
Advanced tool development (U24)	RFA-CA-24-018
Sustainment of highly-used tools (U24)	RFA-CA-24-019

ITCR support for AI Research

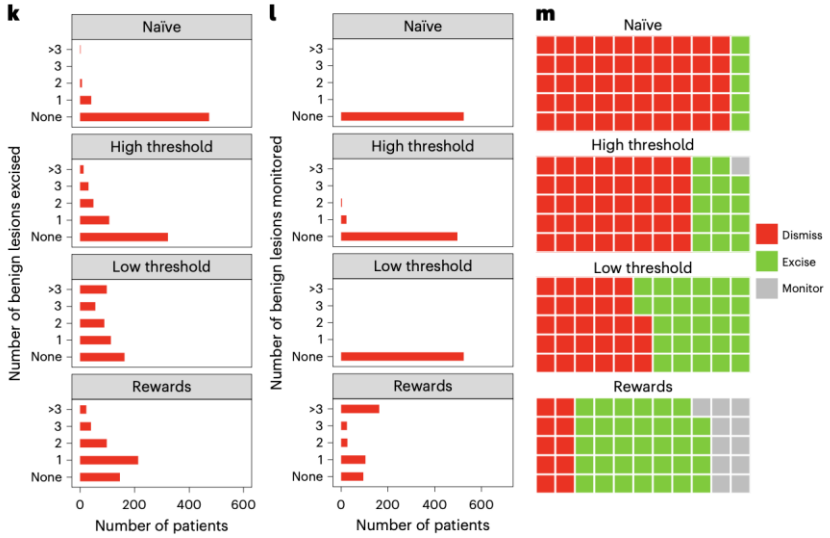


Brief Communication

https://doi.org/10.1038/s41591-023-02475-5

A reinforcement learning model for AI-based decision support in skin cancer

Veronica Rotemberg
MSKCC

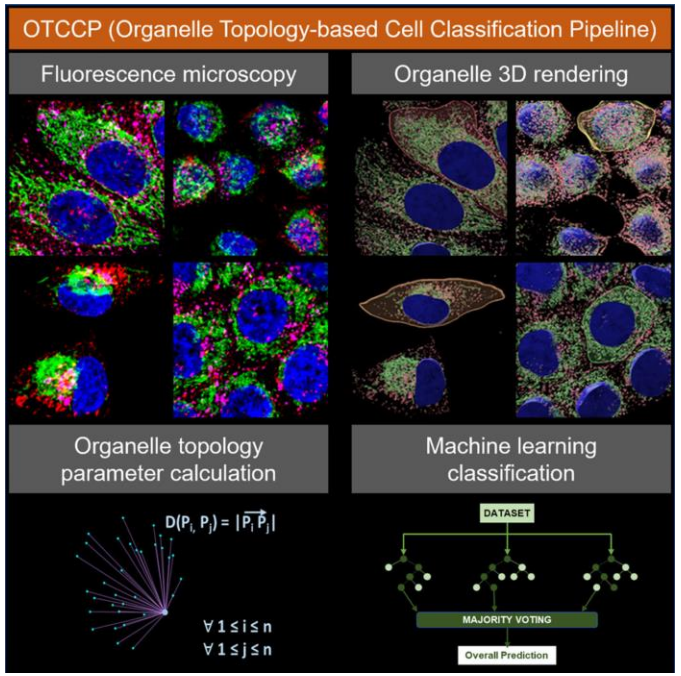


Amgan et al., Nature Communications, 2023

Volume 26, Issue 7, 21 July 2023, 107229

Article

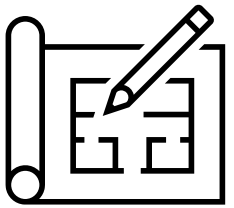
Spatial topology of organelle is a new breast cancer cell classifier



Margarida Barroso
Albany Medical College

Wang et al., iScience, 2023

Bioengineering Research Grants (BRG)



Goal: Promote collaborations between biomedical researchers and those in the quantitative and physical sciences to apply a multidisciplinary, bioengineering approach to solve biomedical problems.

Special Requirements: Innovation is broadly defined as the development of new tools or integration of existing components into new combinations to deliver new capabilities or impact.

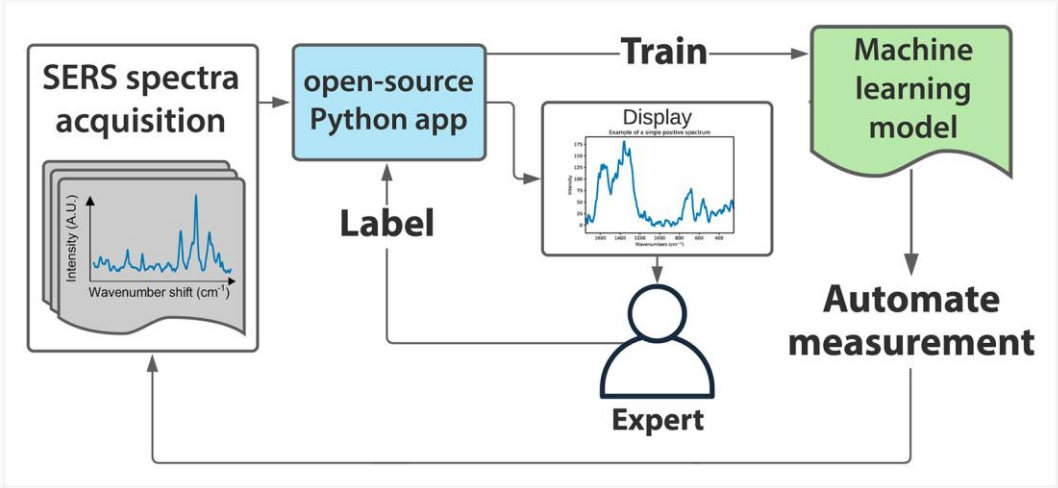
Active Funding Opportunities:

Test feasibility of new capabilities (R21)	PAR-22-090 & PAR-22-091
Develop, apply, or accelerate adoption of a bioengineering approach, tool, or method (R01)	PAR-22-242 & PAR-22-243

BRG support for AI Research

Machine Learning-Assisted Sampling of Surfance-Enhanced Raman Scattering (SERS) Substrates Improve Data Collection Efficiency

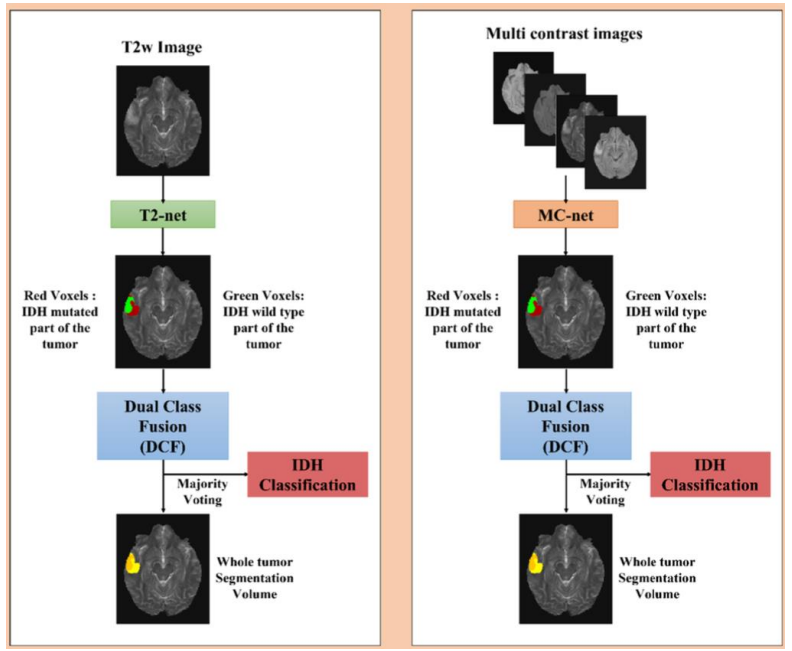
Randy Carney
UC Davis



Rojalin et al., Applied Spectroscopy, 2021

Article

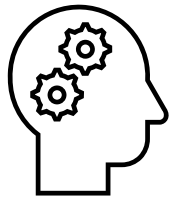
MRI-Based Deep Learning Method for Classification of IDH Mutation Status



Joseph Maldjian
UT Soutwestern

Yonananda et al., Bioengineering, 2023

NSF-NIH Smart Health Program



Goal: Support interdisciplinary teams to develop high-risk, high-reward advances to intelligently collect, sense, connect, analyze, and interpret data from individuals, devices, and systems to enable discovery and improve health.

Special Requirements: Proposals must make fundamental contributions to two or more disciplines such as computer science, engineering, social, behavioral, biomedical, cognitive, and/or economic sciences.

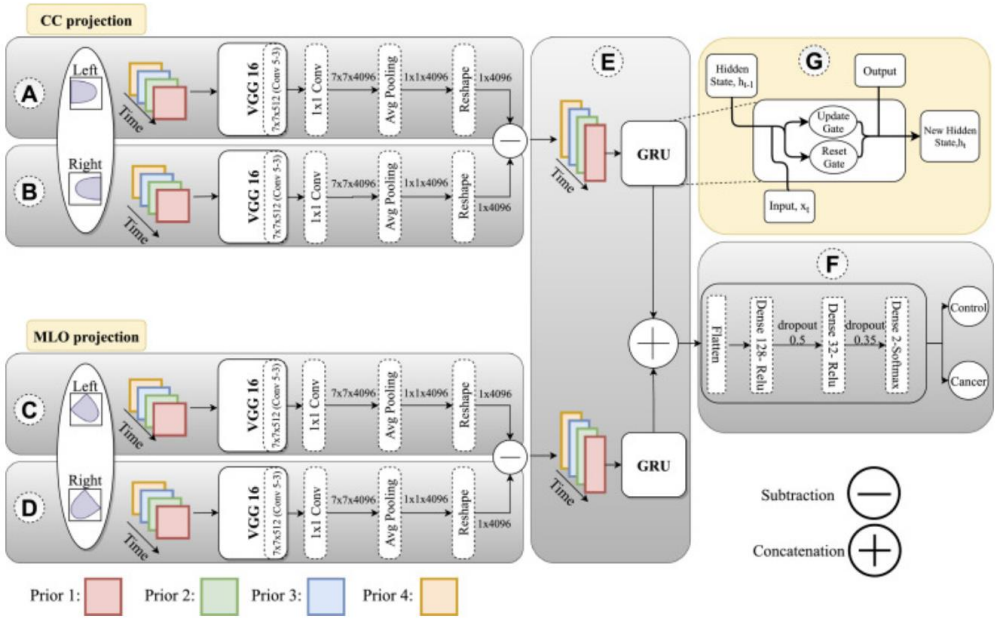
Active Funding Opportunities:

Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science	NOT-OD-21-011

Leverage Clinical Knowledge to Augment Deep Learning Analysis of Breast Images

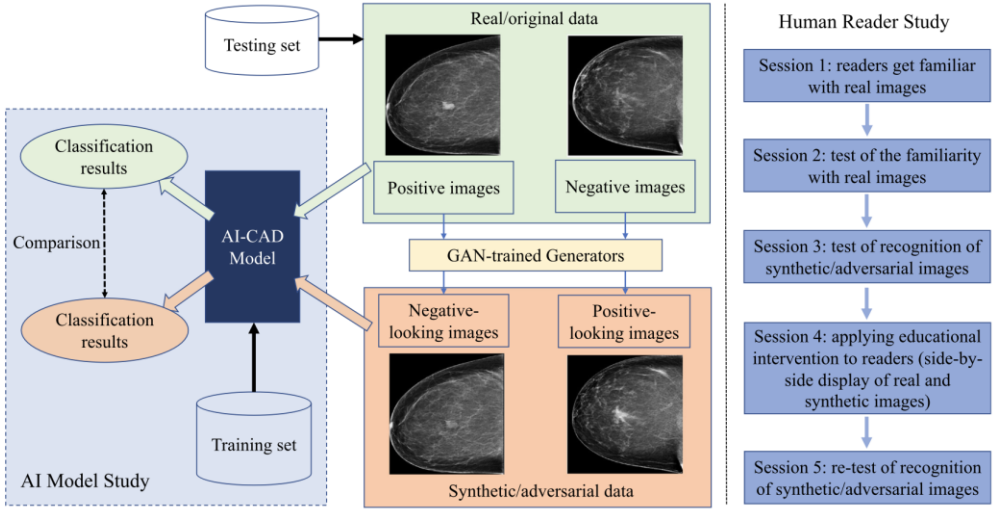
Shandong Wu
University of Pittsburg

Deep learning of longitudinal mammogram examinations for breast cancer risk prediction



Dadsetan et al., Pattern Recognit, 2022

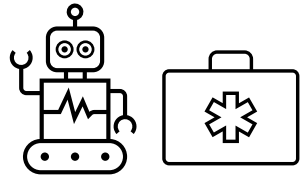
A machine and human reader study on AI diagnosis model safety under attacks of adversarial images



GANs-generated fake images lead to 69% mis-diagnosis for breast cancer

Zhou et al., Nature Communications, 2021

Digital Health and Artificial Intelligence



Goal: Support the addition of new measurement modalities to evaluate existing and recently developed digital health and AI tools such as sensor technologies, smartphone apps, software as a medical device, and AI/ML algorithms.

Special Requirements: Studies should apply rigorous research methods to evaluate the analytical and/or clinical validity of any proposed digital health and AI/ML applications including the use of gold-standard comparators.

Active Funding Opportunity:

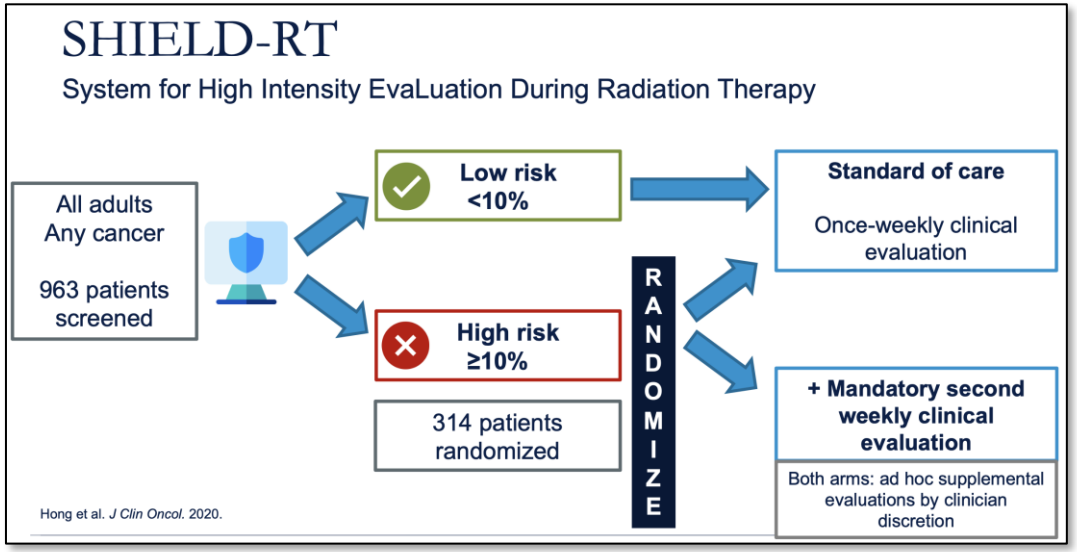
Validation of Digital Health and AI/ML tools for Improved Assessment in Biomedical and Behavioral Health (R01)	NOT-CA-24-031

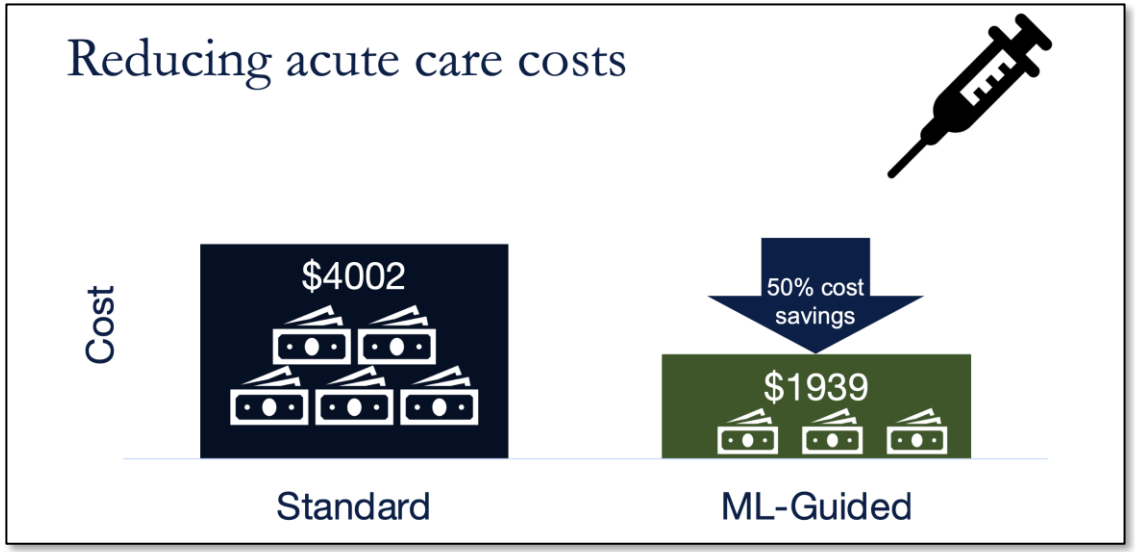
Multi-institutional validation of a multi-modal machine learning algorithm to predict and reduce acute care during cancer therapy

Julian Hong
UCSF

ORIGINAL ARTICLE

Health Care Cost Reductions with Machine Learning–Directed Evaluations during Radiation Therapy — An Economic Analysis of a Randomized Controlled Study





Images from J. Hong

Natesan et al., NEJM AI, 2024

Academic-Industry Partnerships for Technology Translation (AIP)

Goal: Support for partnerships between academic and industrial organizations to accelerate the transition of a technology, method, device, or system from a demonstration of possibility to a status useful in a chosen setting.

Special Requirements: Team must include at least one academic investigator and one investigator from an industrial organization among key team members. Innovation is defined as the likelihood to deliver a new capacity to end users.

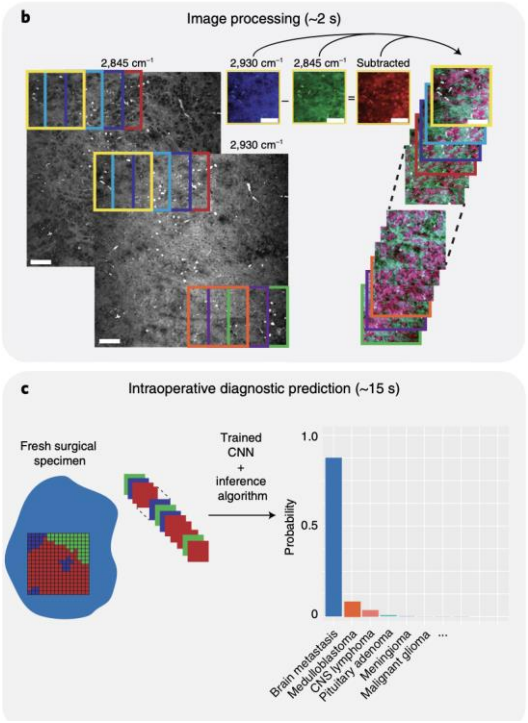
Active Funding Opportunities:

For cancer diagnosis and treatment (R01)	PAR-21-166 & PAR-21-206
For in vivo imaging systems (R01)	PAR-23-259
Bioengineering partnerships w/industry (U01)	PAR-22-123

Clinical Translation of Stimulated Raman Histology

Daniel Orringer
NYU Langone Health

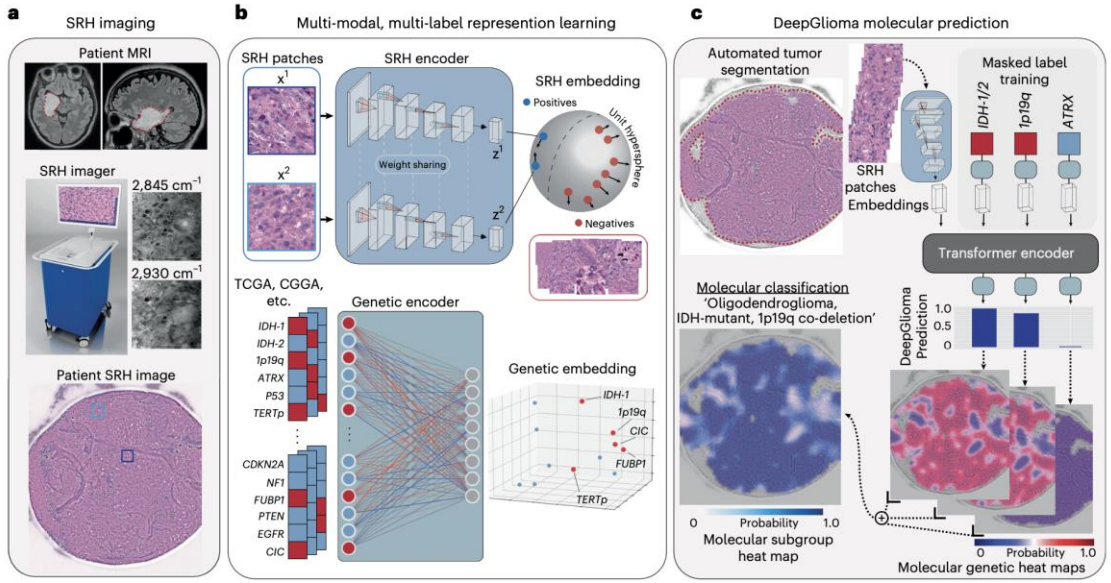
Near real-time intraoperative brain tumor diagnosis using stimulated Raman histology and deep neural networks



Hollon et al., Nature Medicine, 2020

Brief Communication
https://doi.org/10.1038/s41591-023-02252-4

Artificial-intelligence-based molecular classification of diffuse gliomas using rapid, label-free optical imaging



Hollon et al., Nature Medicine, 2023

Mar 26, 2024 11:00 AM ET
Title: *Machine Learning in Cancer Care Delivery: Moving from Model Validation to Clinical Workflow*
Moderator: Leah L. Zullig, PhD, MPH, Duke University
Panelists: William Lotter, PhD, Dana Farber Cancer Center; Julian Hong, MD, MS, UC San Francisco

May 28, 2024 11:00 AM ET
Title: *Machine Learning in Cancer Care Delivery: Implementation and Sustainability*
Moderator: Roxanne Jensen, PhD, NCI
Panelists: Tina Hernandez-Boussard, PhD, MPH, Stanford; Katharine Rendle, PhD, MPH, UPenn

Register at:
https://events.cancer.gov/nci/cancer-ai-conversations/registration

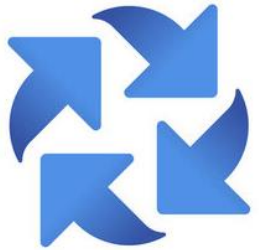
Resources and Tools: AI in Cancer Research

https://www.cancer.gov/research/resources/ai-cancer-research/resources-tools

Improving FAIRness of Computational Resources for Cancer Research

Goals

- **Re-use:** develop working examples, documentation, and tutorials to allow investigators to adopt resources in their own research
- **Verification:** resources are independently reviewed and curated with metadata, source code, and relevant information
- **Sustainability:** resources are containerized, openly accessible in a central location, and regularly updated

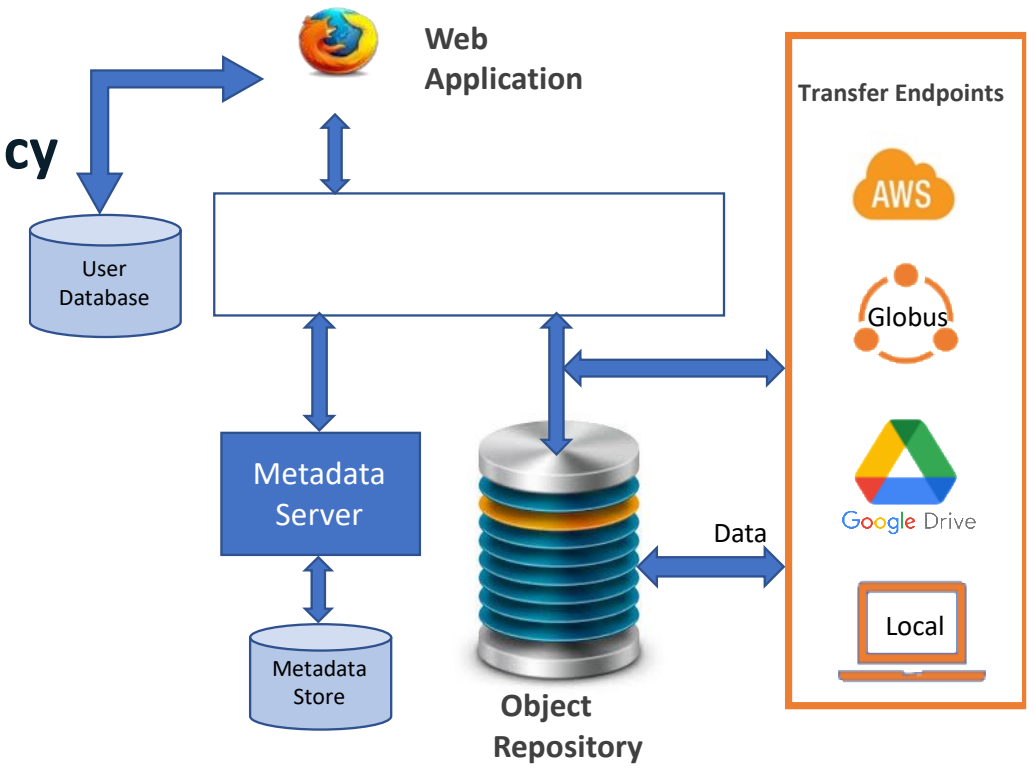


Predictive Oncology Models and Data Clearinghouse (MoDaC)

Fostering Transparency and Reusability

National Cancer Institute (NCI) & Department of Energy (DOE) Collaboration

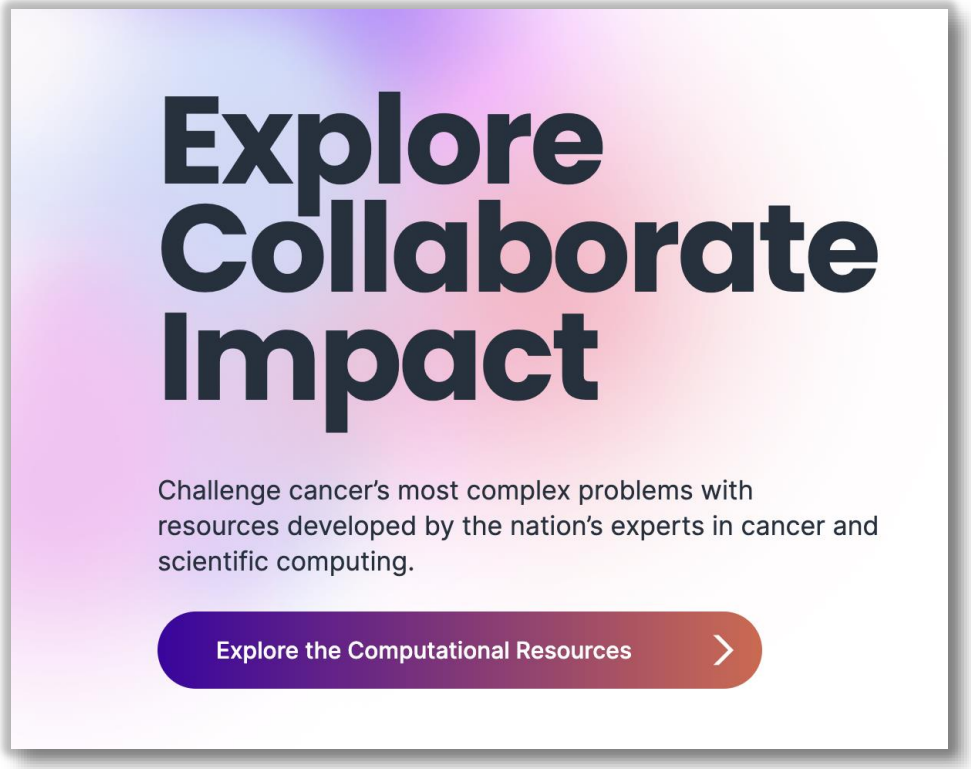
- Build **confidence and trust** in models
  - Data and models together
- Support **repeatability, reproducibility and transparency**
- Foster adoption of **FAIR principles for models**
- Encourage **portability** and **use of standards**
- Assure **stable versions** of models and datasets to reference
- Require **registration** for upload and download
  - Tracking and accountability
- Maintain **simplicity, flexibility, and future focus**



modac.cancer.gov

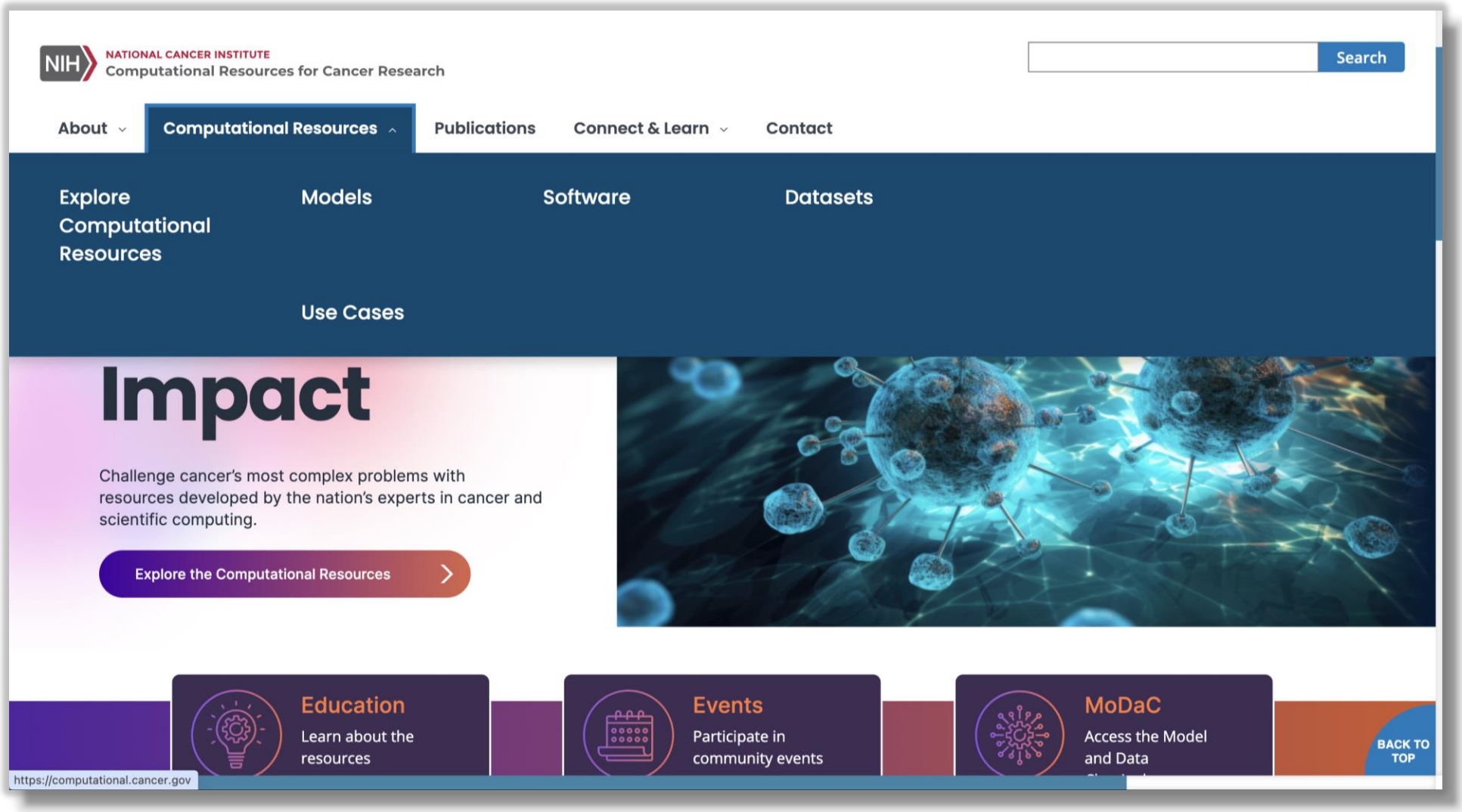
Computational Resources for Cancer Research Portal

- **Current challenges**
  - **Where:** Difficult to find the right resource for a specific need
  - **Who:** Researchers work in complementary yet siloed fields
  - **How:** Emerging AI and computational resources
- **Phase I Goals: Engage the community and provide a single starting point**
  - Co-location and easy access to the NCI-DOE computational resources
    - Searchable with filters; integrated with MoDaC
  - Educational resources
  - Feedback and discussion mechanisms: generate interest in connecting with the community

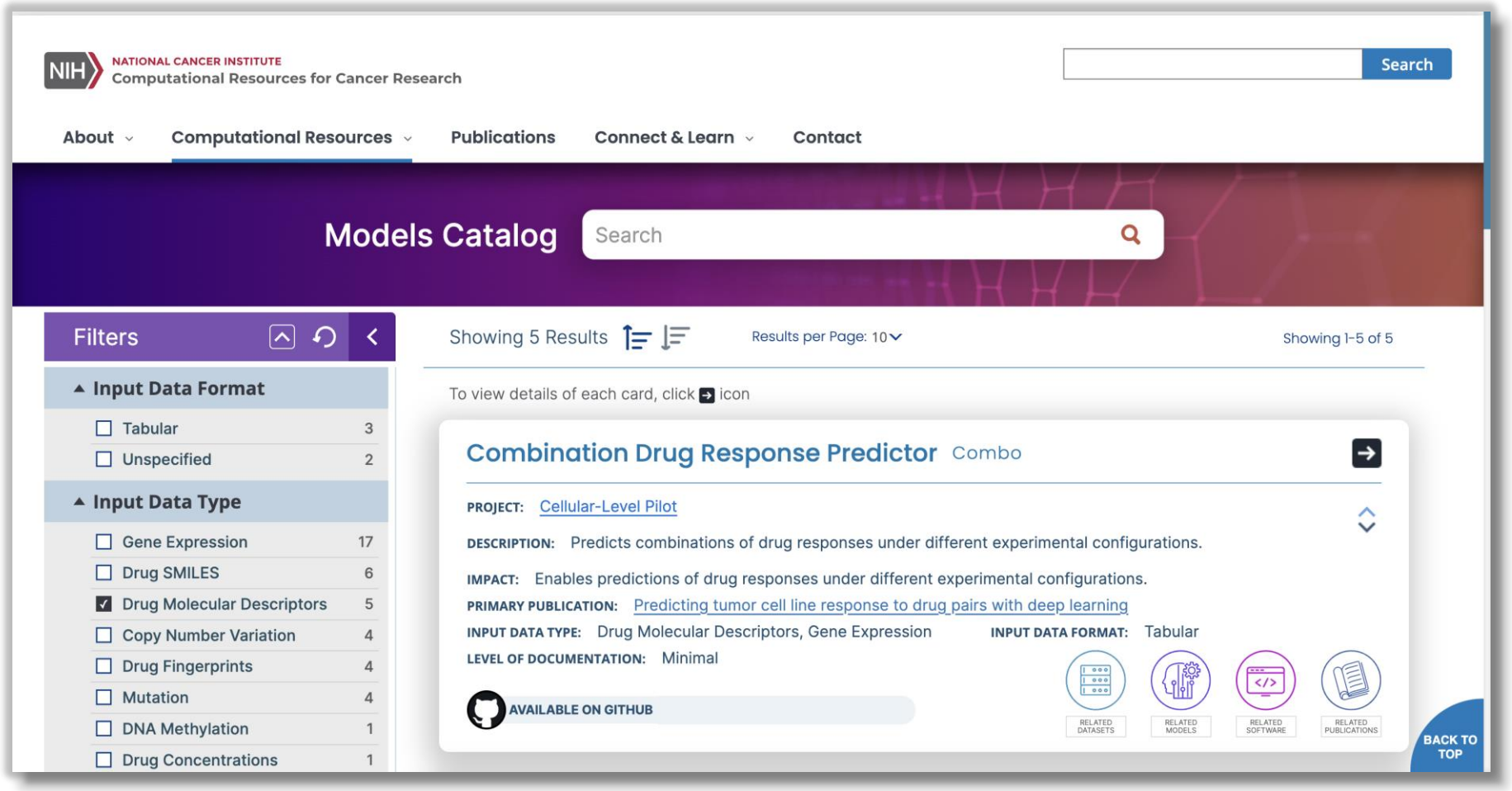


Visit us at computational.cancer.gov!

COMPUTATIONAL CANCER PORTAL – RESOURCE CATEGORIES



COMPUTATIONAL CANCER RESOURCE - MODELS CATALOG



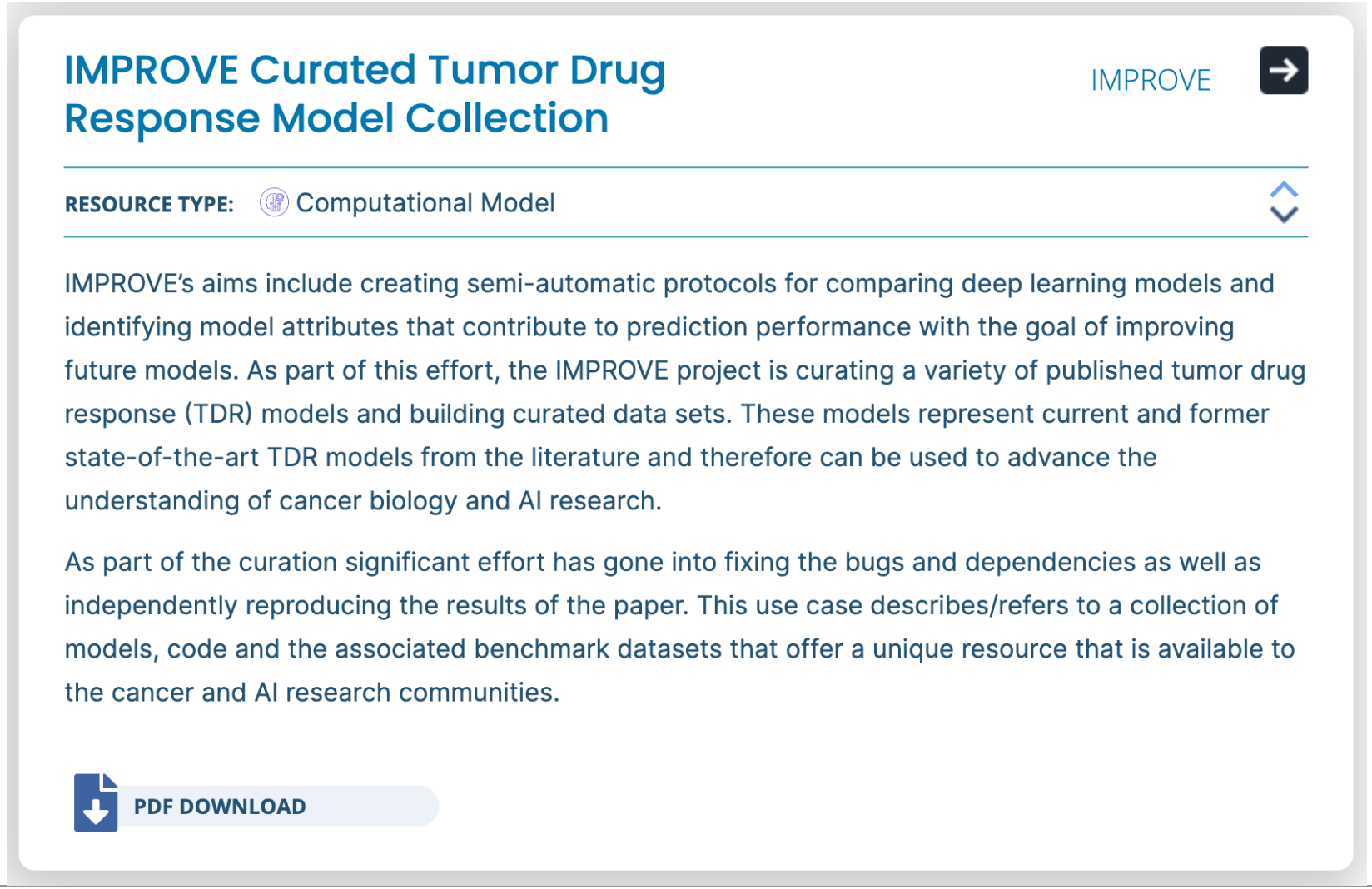
AI models containerized and curated, with metadata and source code

Includes description, publication, links to download site, and expanded detail

Filterable by criteria

Integrates modac.cancer.go

COMPUTATIONAL CANCER PortAL – USE CASE EXAMPLES



IMPROVE Curated Tumor Drug Response Model Collection

IMPROVE

RESOURCE TYPE: Computational Model

IMPROVE's aims include creating semi-automatic protocols for comparing deep learning models and identifying model attributes that contribute to prediction performance with the goal of improving future models. As part of this effort, the IMPROVE project is curating a variety of published tumor drug response (TDR) models and building curated data sets. These models represent current and former state-of-the-art TDR models from the literature and therefore can be used to advance the understanding of cancer biology and AI research.

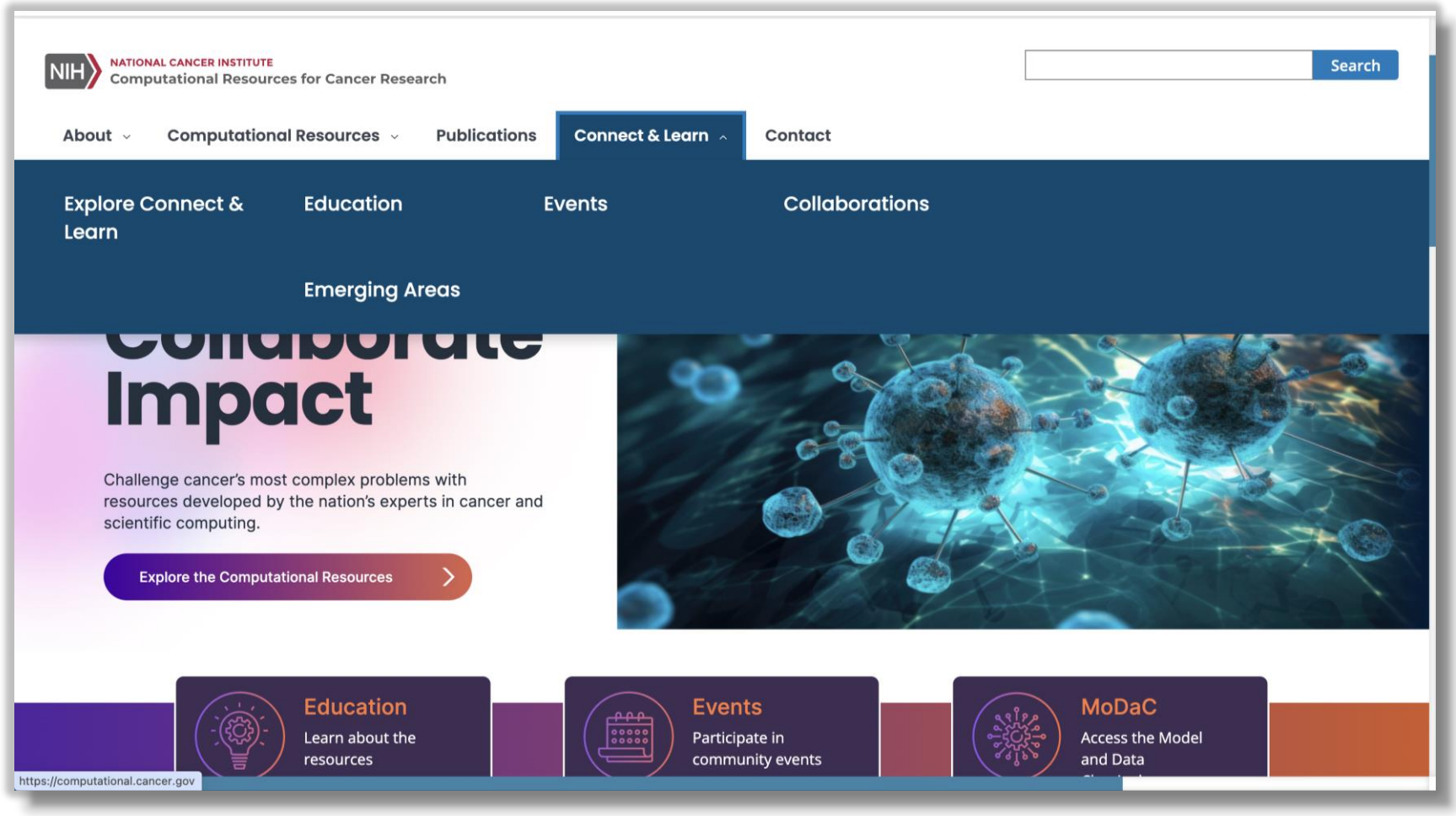
As part of the curation significant effort has gone into fixing the bugs and dependencies as well as independently reproducing the results of the paper. This use case describes/refers to a collection of models, code and the associated benchmark datasets that offer a unique resource that is available to the cancer and AI research communities.

PDF DOWNLOAD

Real world examples for employing computational resources included in the portal

Suggested by external Working Groups to enhance use and adoption

COMPUTATIONAL CANCER PORTAL – ENGAGEMENT AREAS



Computational Cancer Connect & Learn

- **New collaborations**
  - Trans-disciplinary collaborations using portal resources
  - Connect with potential collaborators (*coming soon*)
- **New community resource contributions**
- **Community input**
  - Computational cancer portal user group
  - Site feedback
- **Upcoming workshops and events**
- **Educational Materials**
  - Seminars, tutorials, workshops organized filterable by experience level
- **Emerging areas**
  - Biomedical digital twin
  - Predictive radiation oncology

Sign-up to receive updates and provide feedback!

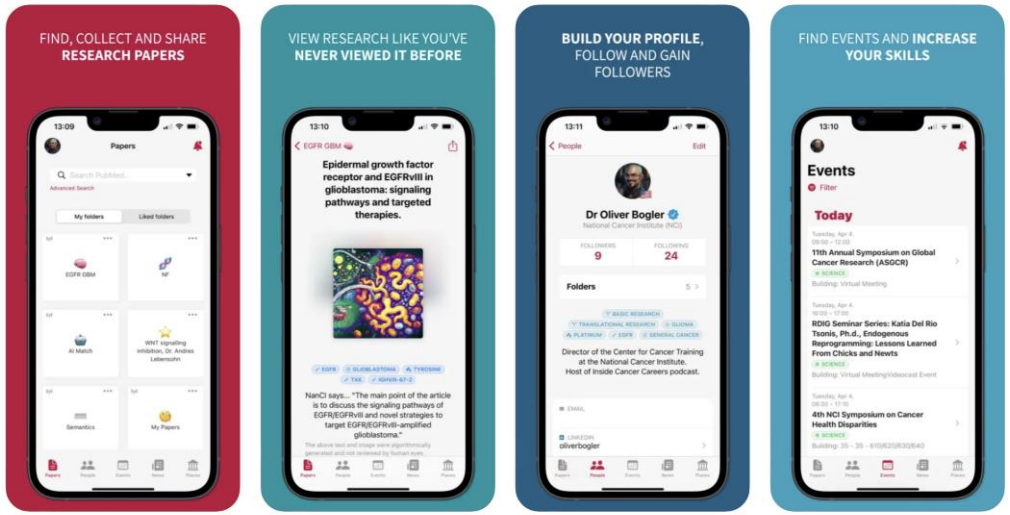
NanCI by NCI:

AI-driven mobile app providing tools for managing the literature & connecting via shared interests

- Managing the literature - **Papers**
  - Recommendations:
    - Bookmark papers on a theme into a folder to get AI recommendations
    - Navigate the author & citation network to explore literature
    - Follow authors to get preprint alerts
  - New ways of interacting with the literature:
    - AI-driven ’chat with papers’

NanCI

connecting scientists



https://www.cancer.gov/grants-training/training/nanci-app

Artificial Intelligence (AI) in Cancer Research

Recent advances in Artificial Intelligence (AI) have converged to rapidly accelerate activity across the cancer research spectrum. AI can create new models of care, as well as advance our knowledge of cancer biology, in an ever-expanding world of technology.

Contact the NCI AI Working Group

Email the NCI Artificial Intelligence Working Group at CancerAI@mail.nih.gov.

NCI supports many projects and activities, including funding opportunities and engaging the cancer research and AI communities to help realize the promise of AI in cancer research and care. Extramural researchers are encouraged to check out NCI funding opportunities and resources, as well as the latest seminars and workshops.

Funding Opportunities: AI in Cancer Research

NCI funds and supports extramural research to advance the use of AI in cancer research. Find out more about funding opportunities and other ways to engage in advancing AI for cancer research.

Events: AI in Cancer Research

Discover upcoming and past seminars and workshops organized by NCI on AI in cancer research.

Resources and Tools: AI in Cancer Research

Access a wide-ranging collection of NCI-supported resources and tools specific to artificial intelligence, machine learning, and deep learning.

Research Highlights: AI in Cancer Research

Discover highlights of research conducted or funded by NCI to advance the use of AI to increase our knowledge of cancer and to improve clinical decision making and cancer care.

https://www.cancer.gov/research/resources/ai-cancer-research

NATIONAL CANCER INSTITUTE

www.cancer.gov

www.cancer.gov/espanol