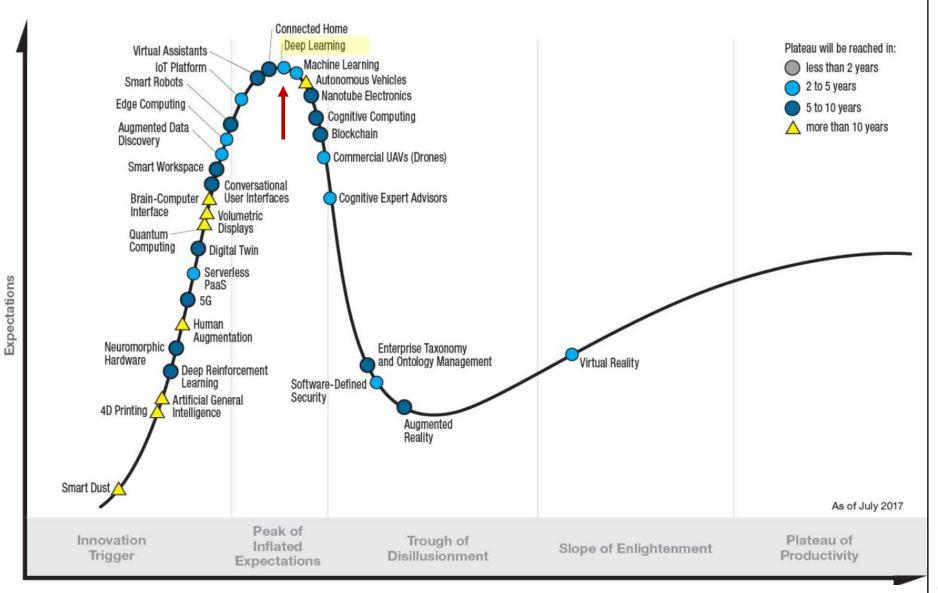


## Navigating the AI Landscape

Mike Tilkin, CIO and EVP Technology American College of Radiology August 3, 2024

acr.org

#### GARTNER HYPE CYCLE - 2017





"Let me start by just saying a few things that seem obvious.

I think if you work as a radiologist, you're like the coyote that's already over the edge of the cliff that hasn't yet looked down, so he doesn't yet realize there's no ground underneath him.

People should stop training radiologists now. It's just completely obvious that within 5 years deep learning is going to do better than radiologists, because it's going to be able to get a lot more experience.

Geoff Hinton 2016

#### **ACR Data Science Institute (est. 2017)**

ACR DSI Leadership



Bibb Allen Jr., MD, FACR

ACR DSI Chief Medical Officer



Keith J. Dreyer, DO, PhD, FACR

**ACR DSI Chief Science Officer** 



Laura Coombs, PhD

ACR Senior Director of Informatics



Mike Tilkin

ACR Executive Vice President and Chief Information Officer



Chris Treml

ACR DSI Director of Operations



Christoph Wald, MD PhD MBA FACR

ACR Informatics Commission Chair

#### **DSI Oversight Board**

- Christoph Wald
- Bibb Allen
- Keith Dreyer
- Amy Kotsenas
- Jackie Bello
- Jim Brink
- Howard Fleishon
- Geraldine McGinty
- Laura Coombs
- Mike Tilkin
- Etta Pisano
- Bill Thorwarth

#### **AI Panel Chairs**

- Abdominal | Luther B. Adair, II, MD, DABR, Las Vegas, NV
- Breast Imaging | Bhavika Patel, MD, Phoenix, AZ
- Breast Imaging | Robert Rosenberg, MD, FACR, FSBI, Albuquerque, NM
- Cardiac | Carlo De Cecco, MD, PhD, Atlanta, GA
- Interventional | Jeremy Durack, MD, MS, New York, NY
- Musculoskeletal | Jay W. Patti, MD, Charlotte, NC
- Neuroradiology | Alexander M. Norbash, MD, FACR, San Diego, CA
- Neuroradiology | Christopher T. Whitlow, MD, PhD, MHA, Winston-Salem, NC
- Neuroradiology | Sumit Niogi, MD, Phd, New York, NY
- Neuroradiology | John Tsiouris, MD, New York, NY
- Oncology | Reid F. Thompson, MD, PhD, Portland, OR
- Pediatric | Steven Blumer, MD, MBA, CPE, FAAP, Wilmington, DE
- Thoracic | Carol Wu, MD, Houston, TX
- Non-Interpretative | Alexander J. Towbin, MD, Cincinnati, OH
- Non-Interpretative | Adam B. Prater, MD, MPH, Atlanta, GA

#### **Senior Scientists**

Sheela Agarwal, MD, MBA, New York, NY
Tarik Alkasab, MD, Boston, MA
Katherine P. Andriole, PhD, Boston, MA
Bernardo Canedo Bizzo, MD, Boston, MA
Garry Choy, MD, Sunnyvale, CA
Curtiland Deville Jr., MD, Baltimore, MD
Adam E. Flanders, MD, Philadelphia, PA
J. Raymond Geis, MD, FACR, Fort Collins, CO
C. Matthew Hawkins, MD, Atlanta, GA
Jayashree Kalpathy-Cramer, PhD, Boston MA
Matthew P. Lungren, MD, MPH, Palo Alto, CA
Gregory N. Nicola, MD, Hackensack, NJ
Chris L. Sistrom, MD, MPH, PhD, Gainesville, FL
Neil Tenenholtz, PhD, Boston, MA

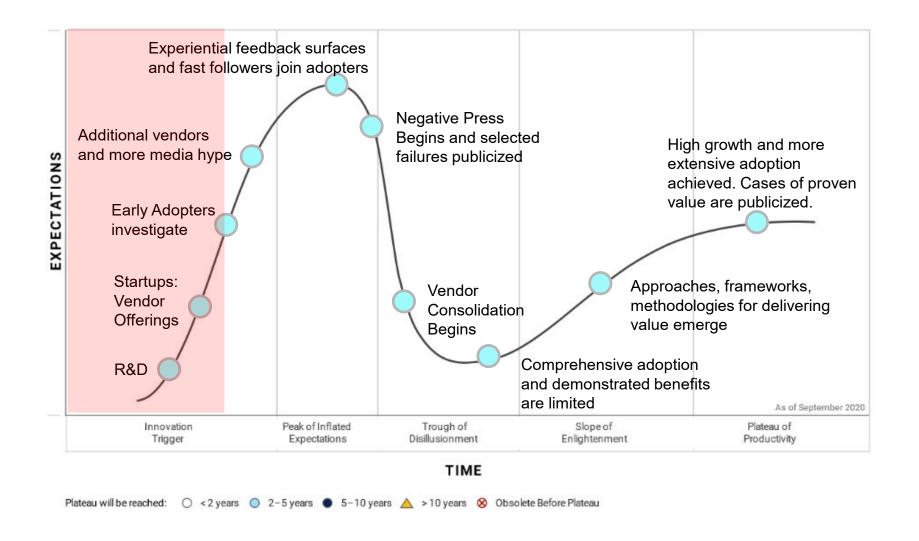


**American College** 

**Data Science Institute** 

of Radiology™

### Technology Diffusion and the Hype Cycle



 Identifying the gaps and Research Imperatives

#### **ARTICLE IN PRESS**

**ORIGINAL ARTICLE** 

A Road Map for Translational Research on Artificial Intelligence in Medical Imaging: From the 2018 National Institutes of Health/RSNA/ACR/The Academy Workshop

Bibb Allen Jr, MD<sup>a</sup>, Steven E. Seltzer, MD<sup>b,c</sup>, Curtis P. Langlotz, MD, PhD<sup>d</sup>, Keith P. Dreyer, DO, PhD<sup>e</sup>, Ronald M. Summers, MD, PhD<sup>f</sup>, Nicholas Petrick, PhD<sup>g</sup>, Danica Marinac-Dabic, MD, PhD, MMSC<sup>b</sup>, Marisa Cruz, MD<sup>i</sup>, Tarik K. Alkasab, MD, PhD<sup>e</sup>, Robert J. Hanisch, PhD<sup>j</sup>, Wendy J. Nilsen, PhD<sup>k</sup>, Judy Burleson, BSW, MHSA<sup>l</sup>, Kevin Lyman, BS<sup>m</sup>, Krishna Kandarpa, MD, PhD<sup>n</sup>

#### **Abstract**

Advances in machine learning in medical imaging are occurring at a rapid pace in research laboratories both at academic institutions and in industry. Important artificial intelligence (AI) tools for diagnostic imaging include algorithms for disease detection and classification, image optimization, radiation reduction, and workflow enhancement. Although advances in foundational research are occurring rapidly, translation to routine clinical practice has been slower. In August 2018, the National Institutes of Health assembled multiple relevant stakeholders at a public meeting to discuss the current state of knowledge, infrastructure gaps, and challenges to wider implementation. The conclusions of that meeting are summarized in two publications that identify and prioritize initiatives to accelerate foundational and

- Identifying the gaps and Research **Imperatives**
- Promoting Standards and Interoperability

#### ACR DSI Urges AI Standardization, Interoperability and Reportability at NIH Workshop

Share A Recommend Bookmark

American College of Radiology Data Science Institute™ (ACR DSI (22)) Chief Medical Officer Bibb Allen, MD, FACR, co-chaired the recent National Institute of Biomedical Imaging and Bioengineering (NIBIB) Workshop on Artificial Intelligence (AI) in Medical Imaging. Proceedings from the workshop will be published as a research roadmap for health care and scientific professionals.

ACR DSI presenters stressed the need for standardized AI use cases ₺ to not only ensure that the relevant clinical questions are answered, but to promote interoperability and reportability for ongoing quality improvement - including that:

- The AI market is dependent upon both the development of AI algorithms and integration with current digital solutions (PACS, reporting systems, etc.)
- . The DSI is working with various clinical experts, academic radiology departments and other radiology professional organizations to create standardized use cases for developing AI algorithms that will solve the most important clinical problems radiologists encounter
- . Compared to algorithms developed by industry developers or at single academic institutions, Al solutions that follow DSI Al use case standards will be able to be readily integrated into clinical practice



ACR DSI Chief Medical Officer Bibb Allen, MD, FACR

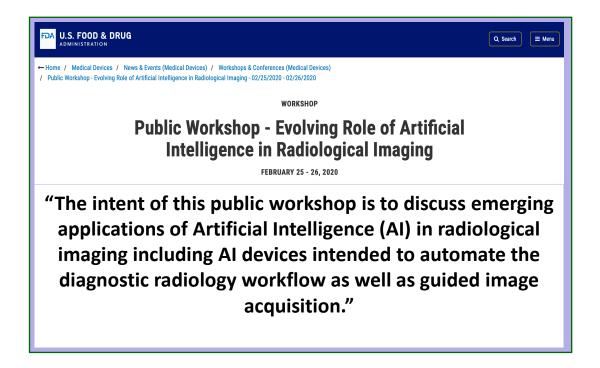


ACR DSI Chief Science Officer Keith Drever, DO. PhD. FACR

ACR DSI chief science officer Keith Dreyer, DO, PhD, FACR, specifically outlined the Lung-RADS® Assist: Advanced Radiology Guidance, Reporting and Monitoring use case that was recently chosen as a pilot project by the FDA-funded National Evaluation System for Health Technology Coordinating Center ™ (NESTcc). Dreyer outlined that the Lung-RADS® standardization provided a basis for this standardized use case that will:

- . Utilize existing ACR resources with data from multiple institutions to demonstrate the ability to validate algorithm performance prior to FDA clearance
- Facilitate interoperability between reporting and AI developers to generate standardized data in a real-world setting
- · Capture real-world data in a national registry to monitor the performance of AI algorithms in clinical practice and enable both facility-level and developer reporting to ensure the algorithm performs as expected in clinical practice

- Identifying the gaps and Research Imperatives
- Promoting Standards and Interoperability
- Working with Regulators on the Limits of Al (e.g., Autonomous Al)



- Identifying the gaps and Research Imperatives
- Promoting Standards and Interoperability
- Working with Regulators on the Limits of Al (e.g., Autonomous Al)
- Promoting ethics and the safe application of AI





## Ethics of Artificial Intelligence in Radiology: Summary of the Joint European and North American Multisociety Statement

J. Raymond Geis, MD<sup>a,b</sup>, Adrian P. Brady, MB, FFRRCSF, Carol C. Wu, MD<sup>d</sup>, Jack Spencer, PhD<sup>e</sup>, Erik Ranschaert, MD, PhD<sup>e</sup>, Jacob L. Jaremko, MD, PhD<sup>e</sup>, Steve G. Langer, PhD<sup>h</sup>, Andrea Borondy Kitts, MS, MPH<sup>e</sup>, Judy Birch, BEd<sup>e</sup>, William F. Shields, JD, LLM<sup>h</sup>, Robert van den Hoven van Genderen, PhD, MSc. LLM<sup>h</sup>, Elmar Kotter, MSc, MD, MB<sup>m</sup>, Judy Wawira Gichoya, MBChB, MS<sup>m,o</sup>, Tessa S. Cook, MD, PhD<sup>o</sup>, Matthew B. Morgan, MD, MS<sup>d</sup>, An Tang, MD, MSc<sup>e</sup>, Nabile M. Safalar, MD, MPH<sup>o</sup>, Marc Kohli, MD<sup>e</sup>

Credits awarded for this enduring activity are designated "SA-CME" by the American Board of Radiology (ABR) and qualify toward fulfilling requirements for Maintenance of Certification (MOC) Part II: Lifelong Learning and Self-assessment. To access the SA-CME activity visit https://cortex.acc.org/Presenters/CaseScript/CaseView?CDId=b171u+rAaBs%3d. SA-CME redit for this article expires October 2022.

#### **Abstract**

This is a condensed summary of an international multisociety statement on ethics of artificial intelligence (AI) in radiology produced by the ACR, European Society of Radiology, RSNA, Society for Imaging Informatics in Medicine, European Society of Medical Imaging Informatics, Canadian Association of Radiologists, and American Association of Physicists in Medicine. AI has great potential to increase efficiency and accuracy throughout radiology, but it also carries inherent pitfalls and biases. Widespread use of AI-based intelligent and autonomous systems in radiology can increase the risk of systemic errors with high consequence and highlights complex ethical and

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<sup>e</sup>MIT, Department of Linguistics and Philosophy, Cambridge, Massachusetts.

<sup>f</sup>Netherlands Cancer Institute, Amsterdam, the Netherlands.
<sup>g</sup>Department of Radiology and Diagnostic Imaging, University

 ${}^{\rm g}{\rm Department}$  of Radiology and Diagnostic Imaging, University of Alberta, Edmonton, Alberta, Canada.

<sup>h</sup>Radiology Department-Mayo Clinic, Rochester, Minnesota. <sup>i</sup>Lahey Hospital & Medical Center, Burlington, Massachusetts.

Pelvic Pain Support Network, Poole, UK.

<sup>k</sup>General Counsel, American College of Radiology, Reston, Virginia.

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<sup>n</sup>Department of Interventional Radiology, Oregon Health & Science University, Portland, Oregon.

<sup>o</sup>Department of Radiology and Imaging Sciences, Emory University, Atlanta, Georgia.

PDepartment of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania.

<sup>q</sup>Department of Radiology and Imaging Sciences, University of Utah, Salt Lake City, Utah.

<sup>r</sup>Centre de Recherche du Centre Hospitalier de L'Université de Montréal, Ouebec, Canada.

\*Department of Radiology and Biomedical Imaging, UCSF, San Francisco California.

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Dr. Jaremko reports support from MEDO Dx PTE Ltd, outside the submitted work; Andrea Borondy Kits MS, MPH is COO and investor, Prosumer Heath, Associate Editor JACR, pald faculty 2019 Medtronic Global Lung Health Summit. Dr. Morgan reports personal fees from Elsevier, outside the submitted work. Dr. Tang reports support from Fonds de Recherche du Québec (FRQS-ARQ 34939), duting the conduct of the study. Dr Kohli reports non-financial support from Society of Imaging Informatics in Medicine, during the conduct of the study; non-financial support from Radiological Society of North America, outside the submitted work. The other authors state that they have no conflict of interest related to the material discussed in this article.

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1546-1440/19 ■ https://doi.org/10.1016/j.jaez-2019.07028

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- Identifying the gaps and Research Imperatives
- Promoting Standards and Interoperability
- Working with Regulators on the Limits of Al (e.g., Autonomous Al)
- Promoting ethics and the safe application of AI
- Convening Experts and Educating

2018 Economics of Artificial Intelligence

2019 Data Access in Healthcare – Implications for the Artificial Intelligence Ecosystem

2020 Monitoring and Evaluating AI: Challenges and Practical Implications

2021 Al in Clinical Practice: Choosing the Right Tools for your Practice and

**Patients** 

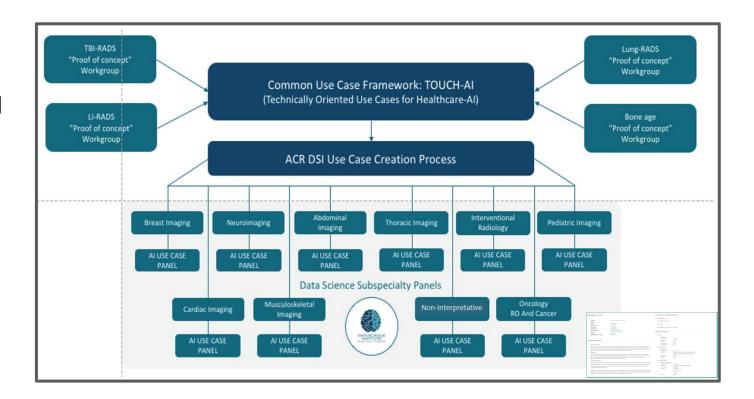
2022 Using Al in Clinical Practice: A Practical Guide for Radiologists

2023 Quantifying the Value of AI: Investment, Costs, Reimbursement and Benefits

2024 From Data to Diagnosis with Tested, Transparent, and Trustworthy Al



- Identifying the gaps and Research Imperatives
- Promoting Standards and Interoperability
- Working with Regulators on the Limits of Al (e.g., Autonomous Al)
- Promoting ethics and the safe application of AI
- Convening Experts and Educating
- Defining Use Cases (DEFINE-AI)



#### Sample Use Case

## R

#### Midline Shift

Purpose Detect and measure midline shift

Tag(s)

Panel Neuroradiology
Define-AI ID 18030001
Originator Sumit Niogi
Panel Chair Alex Norbash

Panel Reviewers Neuroradiology Panel
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Status Published
Related RadElement Sets RDES39 ☎

#### Clinical Implementation

#### Value Proposition

Midline shift is closely associated with intracranial pressure (ICP), leading to brain stem compression and eventual death if untreated. It is critical to manage ICP as quickly as possible. Identifying midline shift, especially early or subtle onset, can significantly improve patient outcomes. In emergency situations, it is not always a neuro-specialist taking the first look at the study. Automated midline shift measurement would provide value to nonspecialists, especially those who read images in emergency situations.

#### Context

#### Narrative(s)

A 27-year-old male pedestrian is struck by a motor vehicle. The patient is reported to have five minutes of loss of consciousness after the injury. At presentation to the ED, the patient does not remember the accident or how he arrived there. The patient has obvious left-frontal-scalp hematoma and swelling. Given physical exam findings and history of present illness, the ED physician references the ACR Appropriateness Guidelines for Traumatic Brain Injury and orders a noncontrast CT.

#### Workflow Description

The patient receives CT for head trauma. An algorithm receives the entire CT data set. If the algorithm can determine a result (the presence or absence of midline shift, distance of midline shift, and direction of shift), it is returned. A reliability metric, assessing the accuracy of the measurement, would also be helpful. If the midline shift is significant (larger than 5 mm), a modest alert should notify the user.

Additional considerations are as follows: The algorithm executes after the exam is verified on PACS. The algorithm optimally integrates on PACS and dictation or reporting software. The user is then able to automatically populate the report or manually input the results. An indicator image may save to PACS as part of the medical record.

#### Considerations for Dataset Development

Procedures(s): CT, Head

Sex at Birth: {Male, Female}

Age: [16,90]

Comorbidities: {Hematoma, tumor, abscess}

#### Data Set Considerations

#### **Technical Specifications**

#### Inputs

DICOM Study

 Procedure
 CT, Head

 Data Type
 DICOM

 Modality
 CT

 Body Region
 Head

 Anatomic Focus
 Brain

Technical and Integration
Considerations

#### Primary Outputs

Midline Shift

RadElement ID

Definition Measurement of midline shift at maximum (septum pellucidum) and at level of foramen of Monro.

RDE237 😂

Data Type Numeric
Value Set [0,10]
Units mm

#### Units Secondary Outputs

Units

Midline Shift Direction

RadElement ID

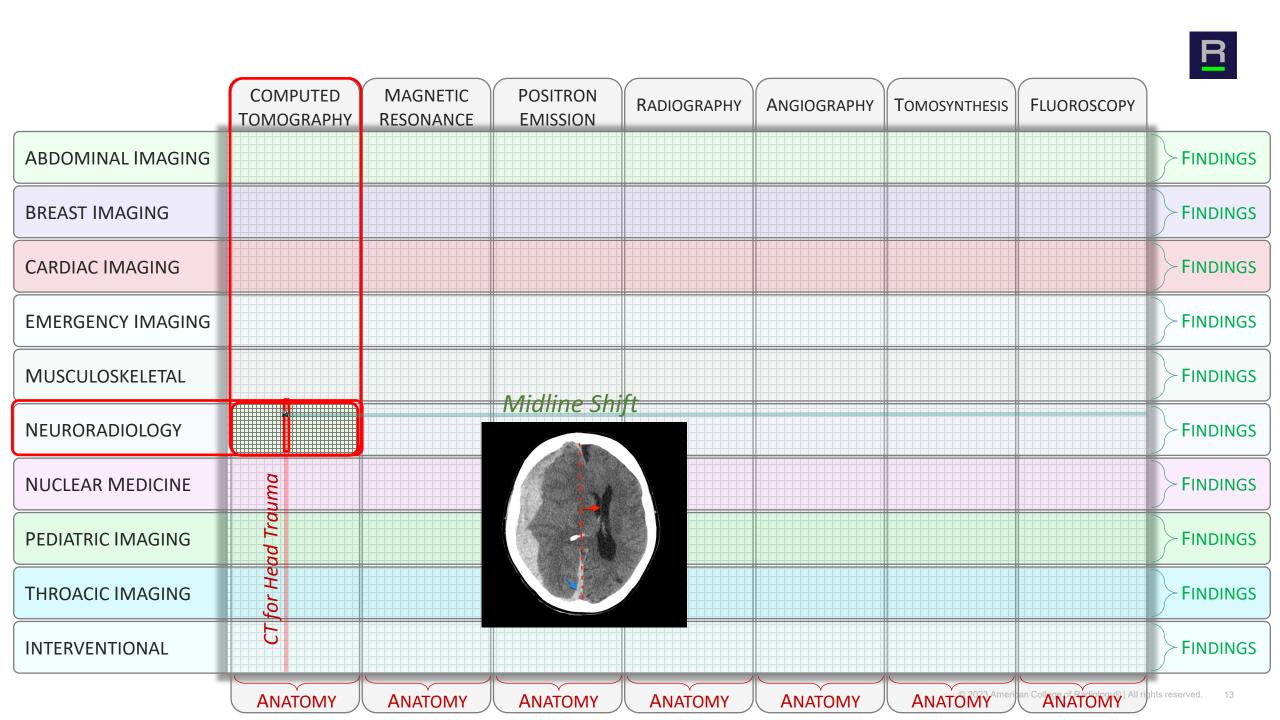
Definition The direction of midline shift, if present

RDE238 😂

Data Type Categorical
Value Set 0-Unknown

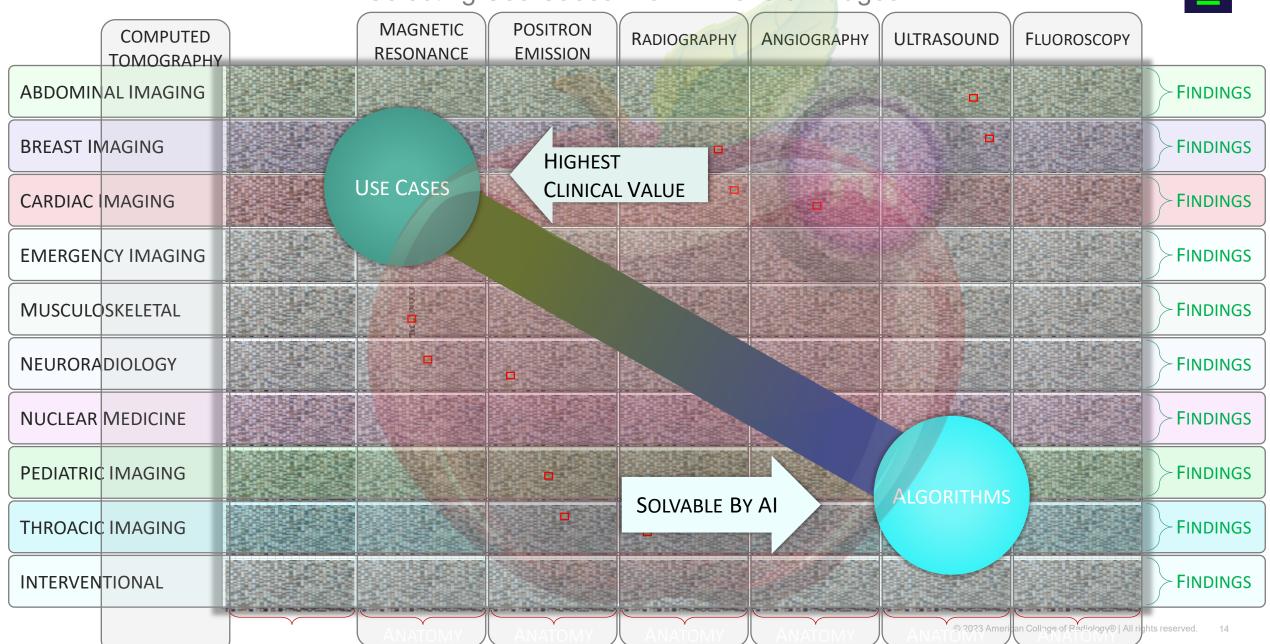
1-No midline shift

2-Left 3-Right N/A

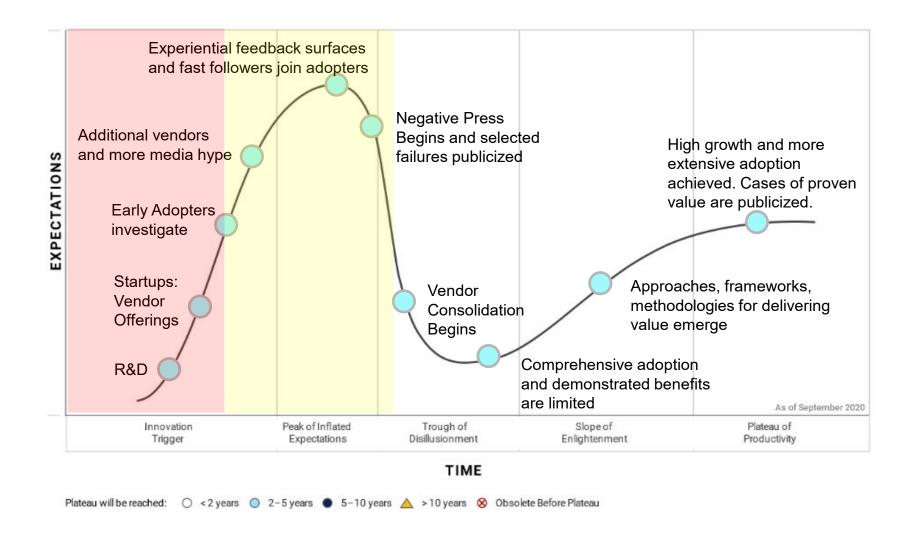


#### **Endless Opportunities For Al**

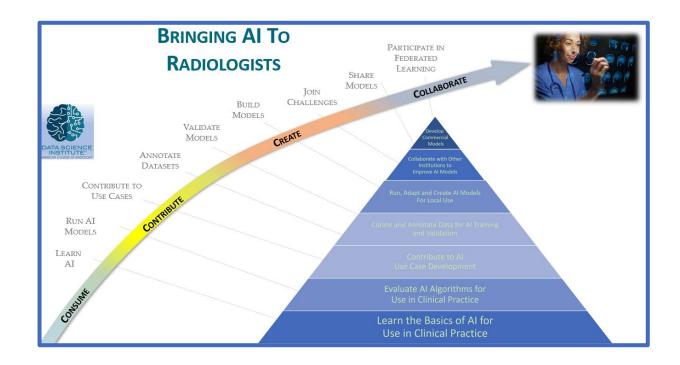
Selecting Use Cases From Billions of Images



### Technology Diffusion and the Hype Cycle

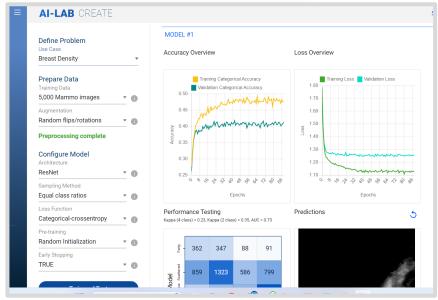


 Engagement and Literacy with a broad array of stakeholders

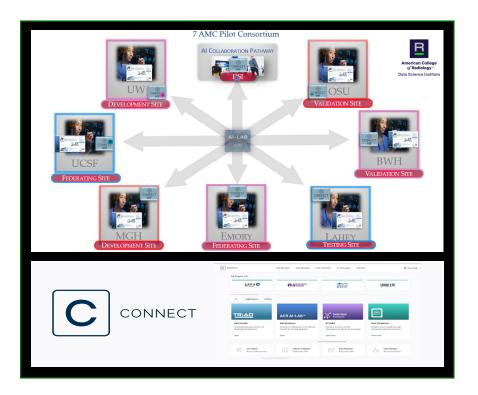


- Engagement and Literacy with a broad array of stakeholders
- Tools for Members to Engage (e.g., Al-Lab)

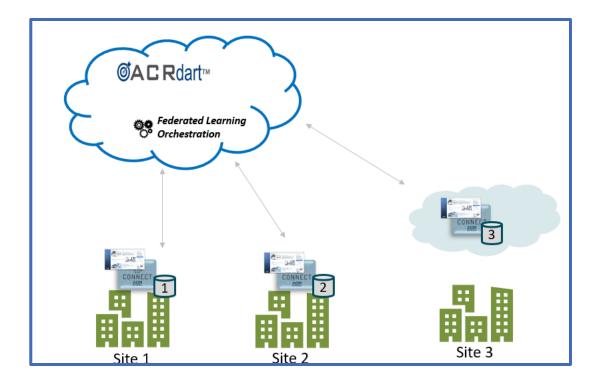




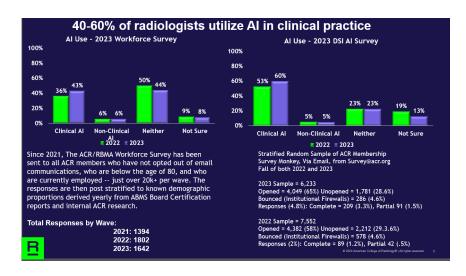
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- Distributed Validation



- Engagement and Literacy with a broad array of stakeholders
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- Distributed Validation
- Federated Learning



- Engagement and Literacy with a broad array of stakeholders
- Tools for Members to Engage (e.g., Al-Lab)
- Distributed Validation
- Federated Learning
- Understanding Usage and Current Practices





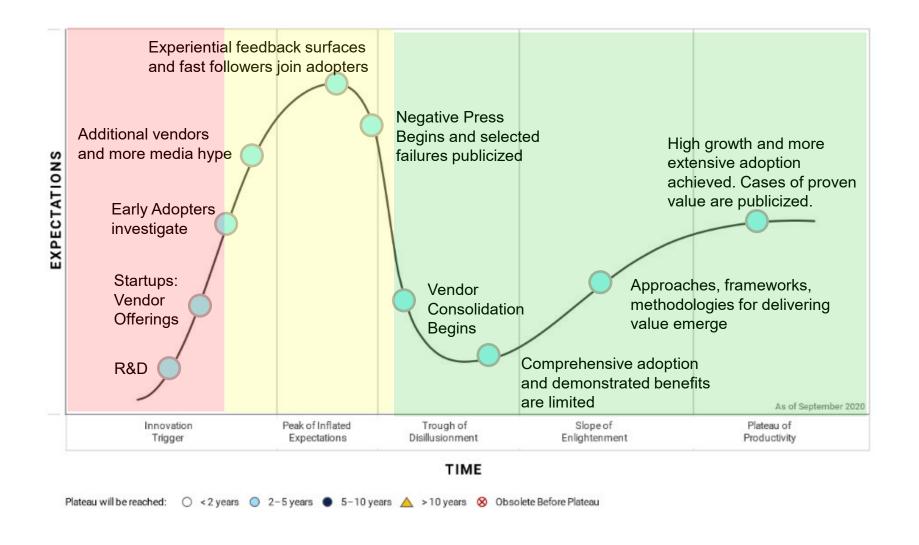
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- Federated Learning
- Understanding Usage and Current Practices
- Testing Efficacy in Real World Settings



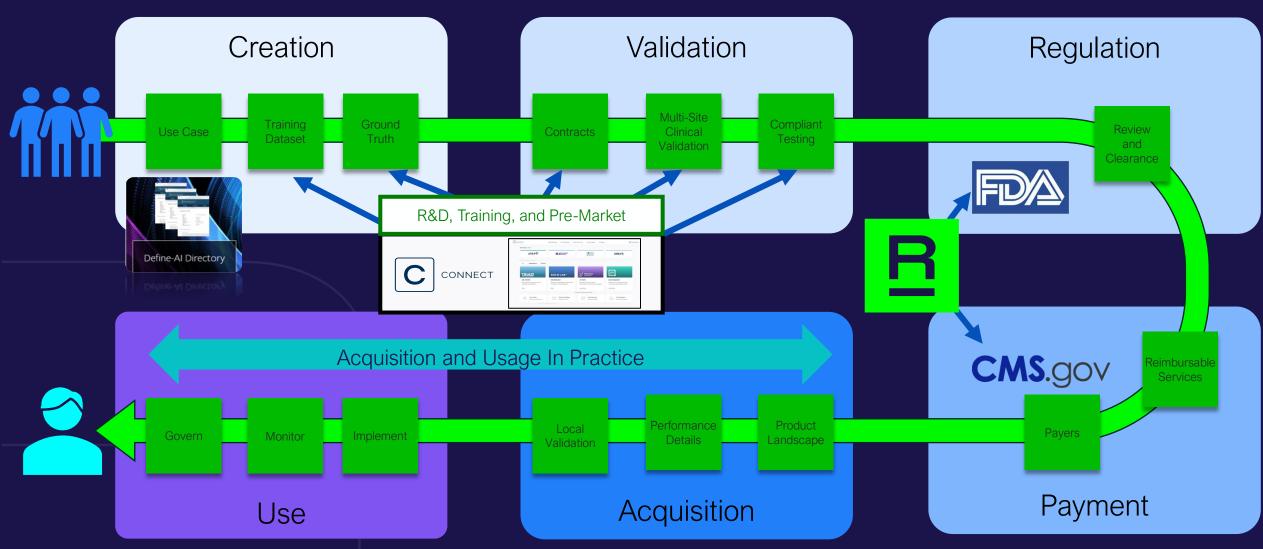
- Engagement and Literacy with a broad array of stakeholders
- Tools for Members to Engage (e.g., Al-Lab)
- Distributed Validation
- Federated Learning
- Understanding Usage and Current Practices
- Testing Efficacy in Real World Settings
- Facilitating the Discussion with Regulators, Payers, and Industry



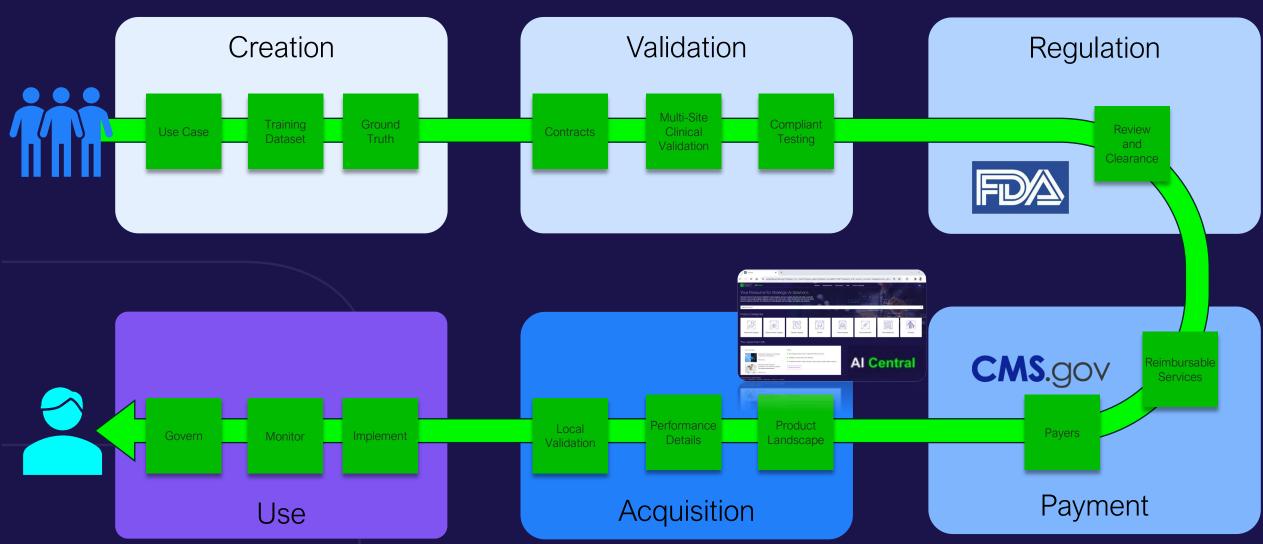
## Technology Diffusion and the Hype Cycle



# Al Life Cycle



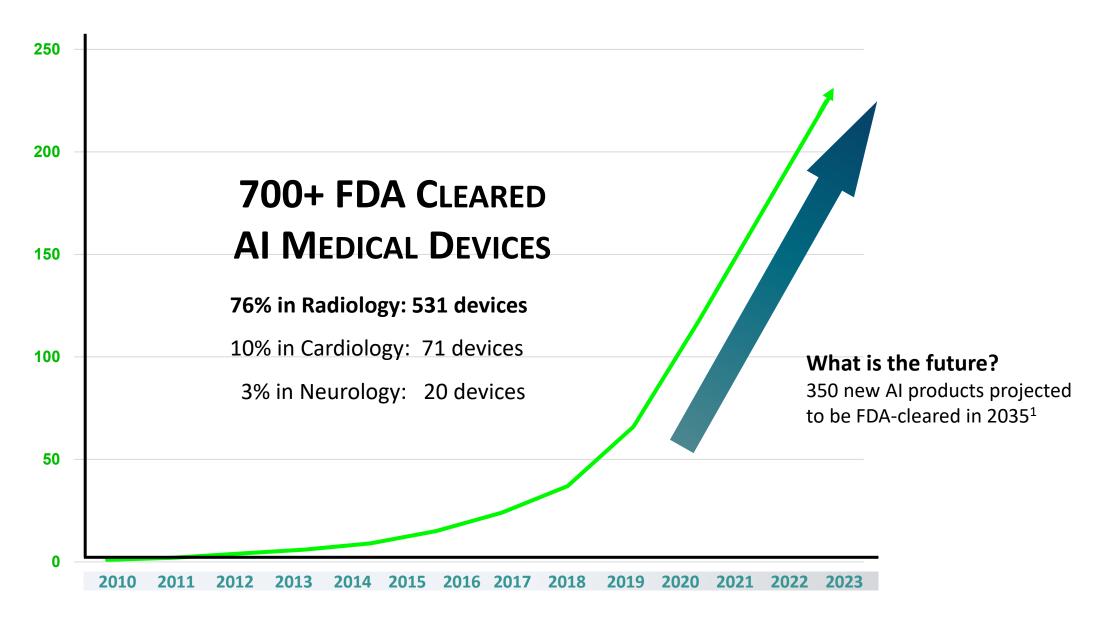
# Al Life Cycle





## **Understanding the Market**

#### Current Market for Al Cleared Devices



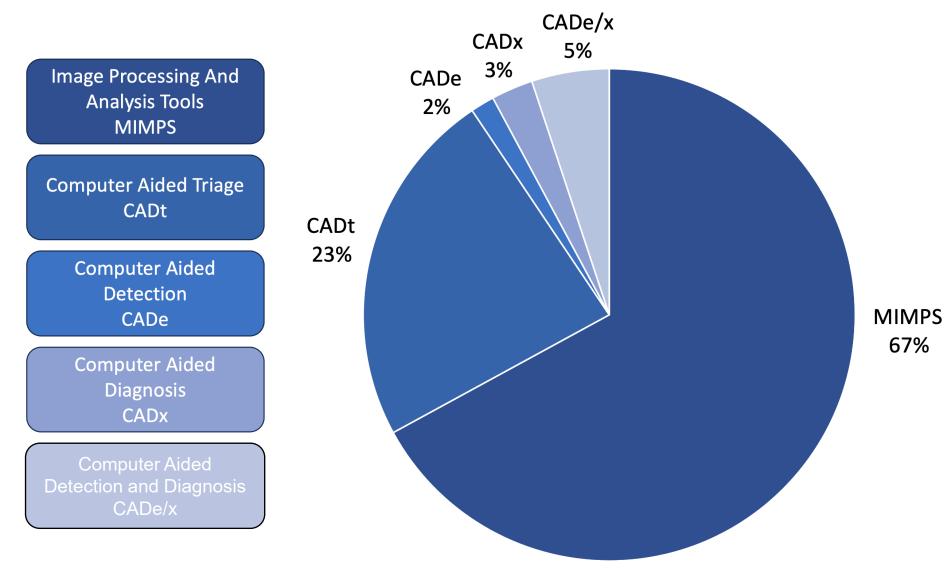
<sup>&</sup>lt;sup>1</sup>Projected Growth in FDA-Approved AI Products Given Venture Capital Funding. McNabb et al, JACR 2023. https://doi.org/10.1016/j.jacr.2023.08.03

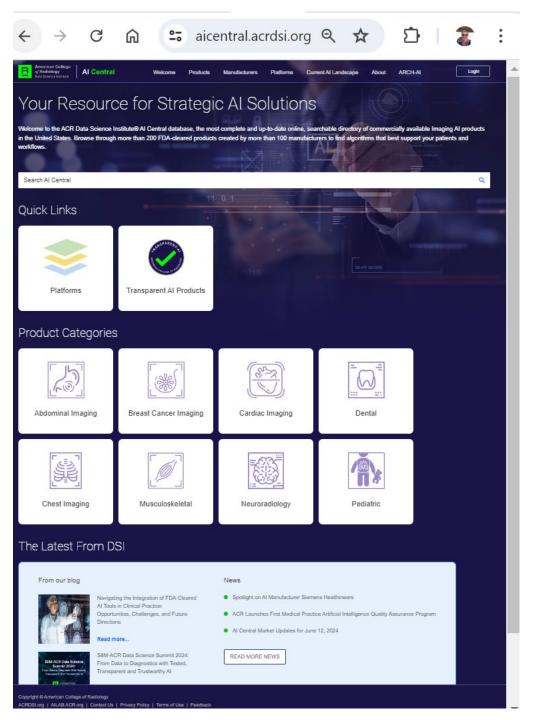
## FDA - Software As a Medical Device Categories

Table 3 FDA Intended Use Designations For Software As A Medical Device (SaMD)				
Intended Use Designation	Abbreviation	Intended Use	Code Of Federal Regulations (CFR) Citation	Pertinent Special Controls
Computer Aided Triage And Notification	CADt	Notification of potentially time sensitive findings	21CFR892.2080	Performance testing that demonstrates the device will provide effective triage without a requirement to improve reader performance
Computer Aided Detection	CADe	Direct clinician's attention to aid the identification of potential disease	21CFR892.2050 21CFR892.2070	Performance testing that demonstrates the device improves reader performance (MRMC* reader study)
Computer Aided Diagnosis	CADx	Concurrent/sequential use to aid the classification of lesions suspicious for cancer	21CFR892.2060	Performance testing that demonstrates the device improves reader performance (MRMC* reader study)
Computer Aided Detection And Diagnosis	CADe/x	Combined systems that both detect and provide a classification of potential disease	21CFR892.2090**	Performance testing that demonstrates the device improves reader performance (MRMC* reader study)
Medical Image Management And Processing System	MIMPS	Image processing and analysis tools	21CFR892.2050	Special controls include adherence to voluntary standards such as DICOM
Radiological Acquisition And Optimization Guidance	CADa/o	Aids the acquisition / optimization of radiological images / diagnostic signals	21CFR892.2100***	Special controls include clinical and non- clinical performance testing and documentation for personnel training

## Product Category Breakdown (318 Radiology SaMD Products)

#### Percentage Of AI/ML FDA Cleared AI Software Based On Intended Use Category

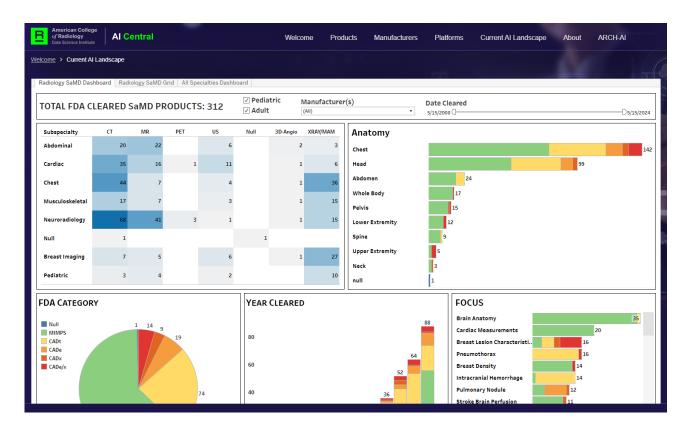






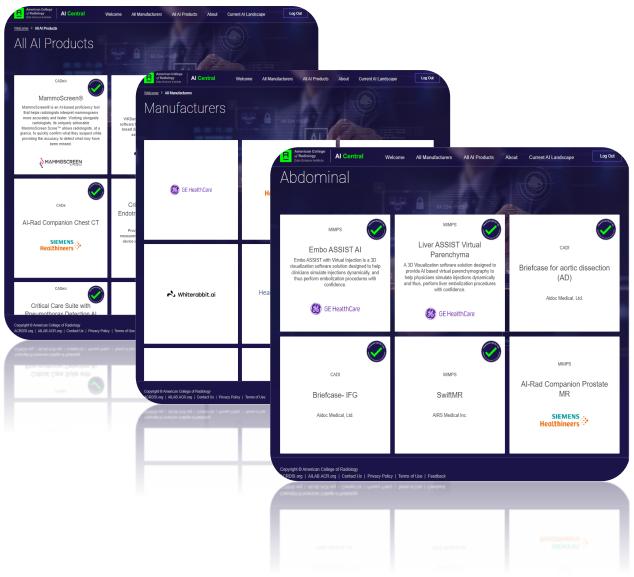


 Most complete view of the AI vendor landscape



R

- Most complete view of the AI vendor landscape
- 162 AI Companies
  - 30 Entered in 2023
  - Only 1/3 had booths at RSNA



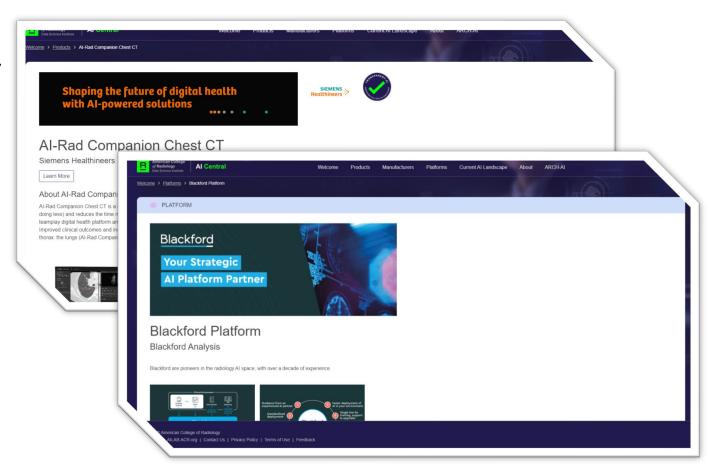


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- Al-Central Pro allows vendors to tell their detailed story

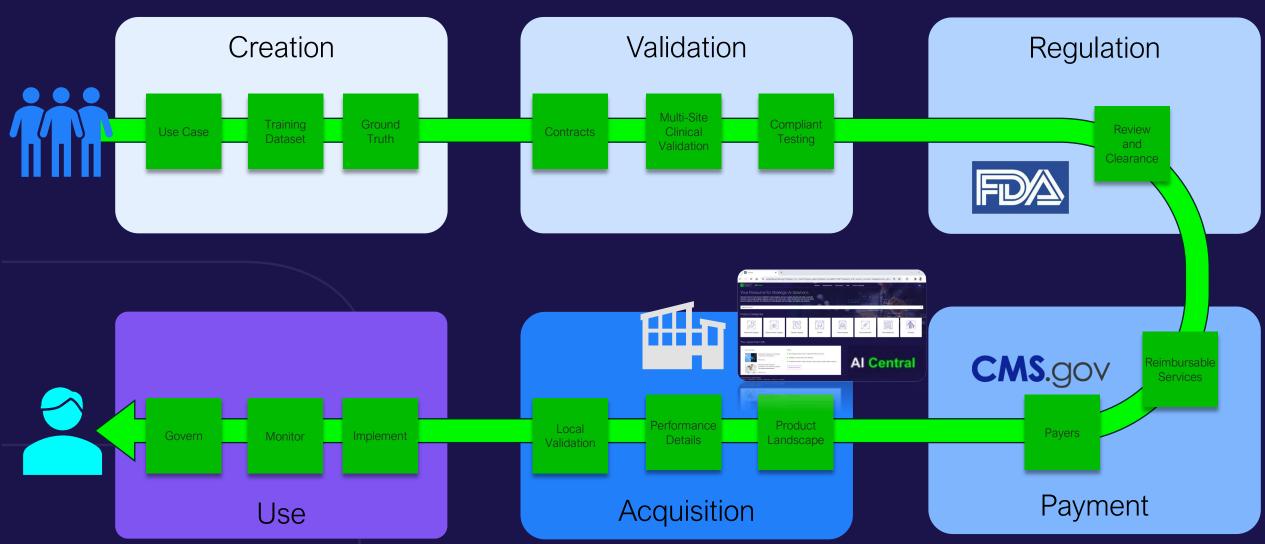




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- Al-Central Pro allows vendors to tell their detailed story
- Transparent-Al Creates a new standard for creating trust and transparency



# Al Life Cycle

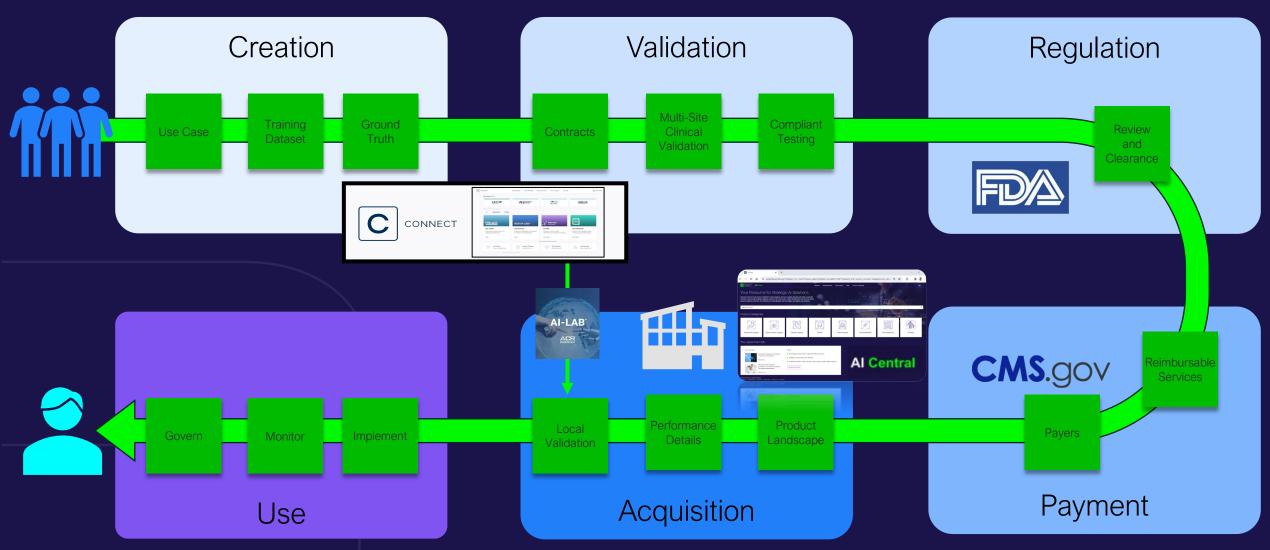


# Testing in a Controlled Environment

- Understand performance in:
  - Highly controlled settings
  - Under stress
- Understand model sensitivity and "failure modes"
- •ACR Life-Cycle Project includes formal Testing Labs
  - Stanford
  - Mayo



# Al Life Cycle





### Validating on Local Data

 Must Validate on Local Data due to variability from training data (e.g., patient demographics, equipment)





### Validating on Local Data

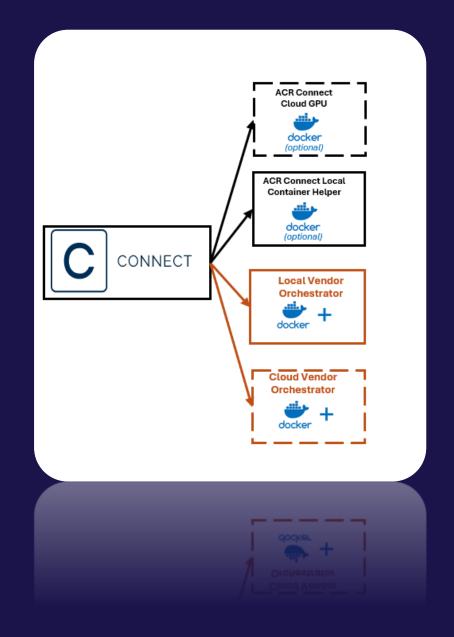
- Must Validate on Local Data due to variability from training data (e.g., patient demographics, equipment)
- ACR Life-Cycle Project includes multi-site validation through
  - A distributed computing model leveraging the ACRConnect and Al-Lab infrastructure





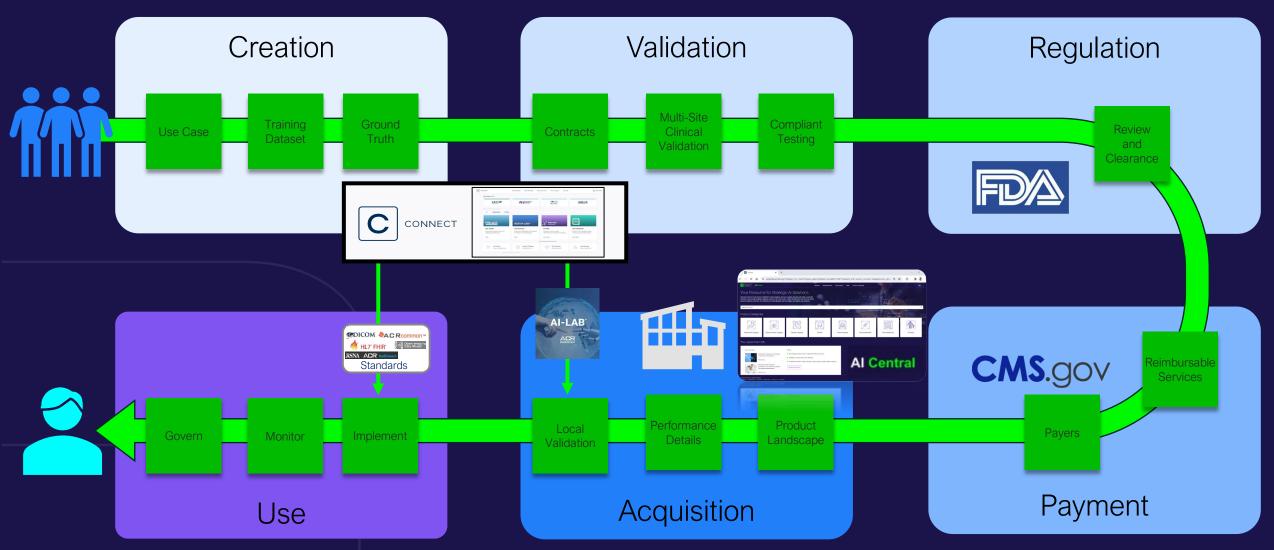
### Validating on Local Data

- Must Validate on Local Data due to variability from training data (e.g., patient demographics, equipment)
- ACR Life-Cycle Project includes multi-site validation through
  - A distributed computing model leveraging the ACRConnect and Al-Lab infrastructure
  - Flexible deployment strategies include onpremise, cloud, hybrid, and multi-vendor solutions





# Al Life Cycle

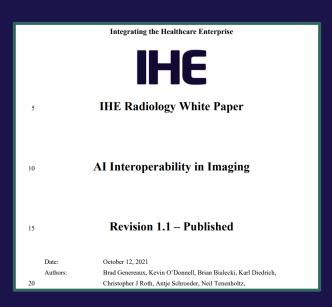




#### Standards and Interoperability

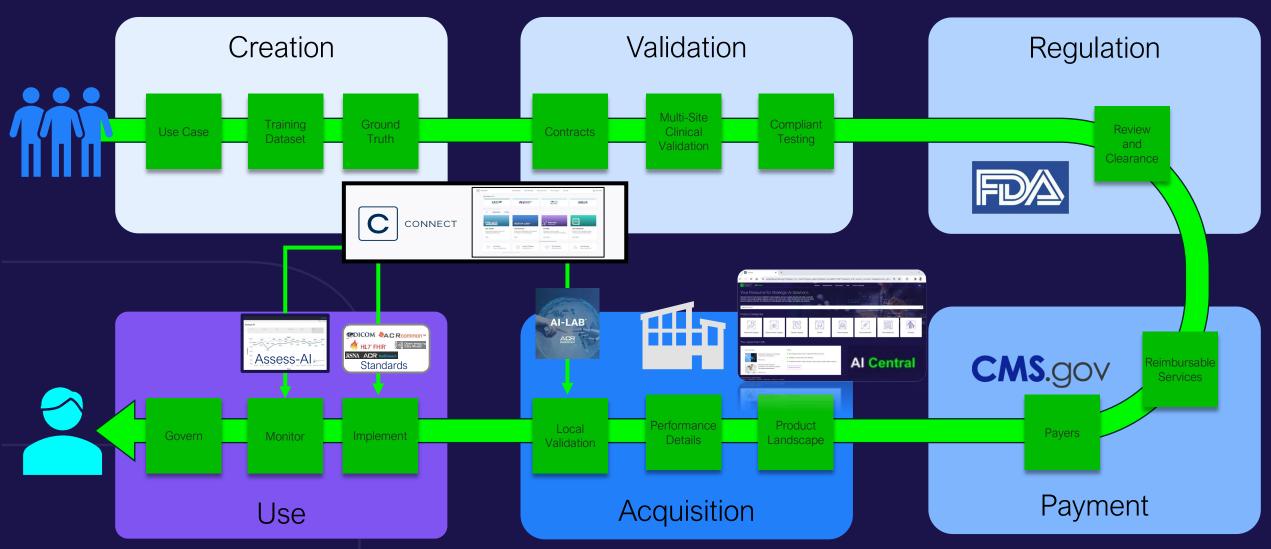
- Standards for AI integration within the Imaging workflow, culminating in an IHE profile and demonstration projects.
- Partnered with RSNA to create CDEs (Radelements) and Tarik Alkasab is leading the OIDM project
- Under Brian Bialecki's leadership, working with DICOM and HL7 to incorporate AI into the imaging workflow. Examples include FHIR resource updates to support the IHE Imaging Diagnostic Report and DICOM WG23 updates to support the DSI interface AI workflow API.

• Working with ONC, NIST, and other federal groups on standards for Al in imaging (e.g., USCDI)





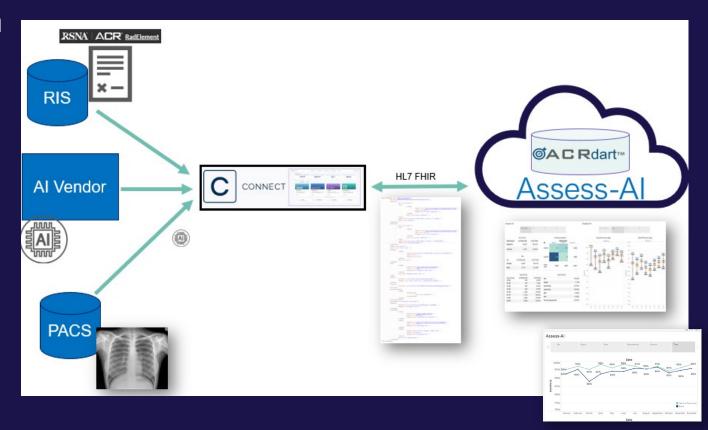
# Al Life Cycle





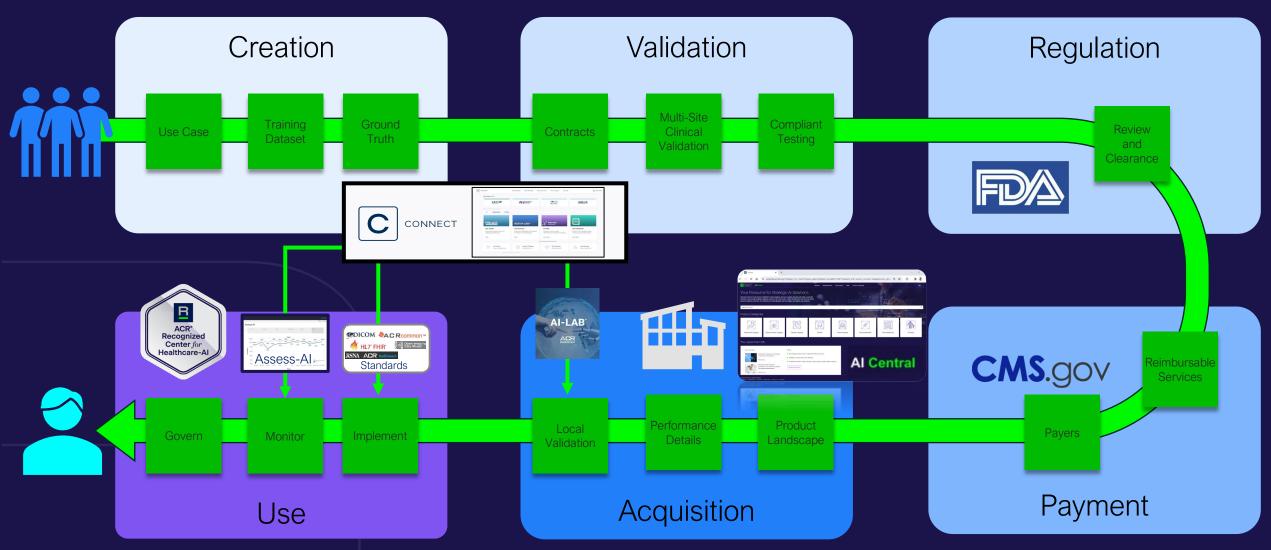
### Monitoring

- Monitor algorithm performance in clinical practice by capturing real world data during clinical use.
- Assess-Al combines specific information related to an algorithm's effectiveness reported by radiologists at the point of care and specific metadata related to the exam.





# Al Life Cycle







### Implementation Best Practices, Key Criteria, and *ARCH-AI*

#### What is ARCH-AI?

- National artificial intelligence quality assurance program for radiology facilities
- •Allows a facility to demonstrate that it is using artificial intelligence (AI) in diagnostic radiology safely and effectively in a clinical setting





### Methodology and Timeline

Q&S +DSI leadership draft criteria based on CoE and current best practices (Nov 2023)

Criteria are reviewed and edited by Informatics Commission (Dec 2023)

Advisory Committee established

(Feb 2024)

Potential pilot sites are identified from SERT, IC, Conferences (Feb-Mar 2024)

Pilot site kickoff meeting

(April 2024)

Pilot phase

(May/June 2024)

Launch of ARCH-AI

(June 2024)



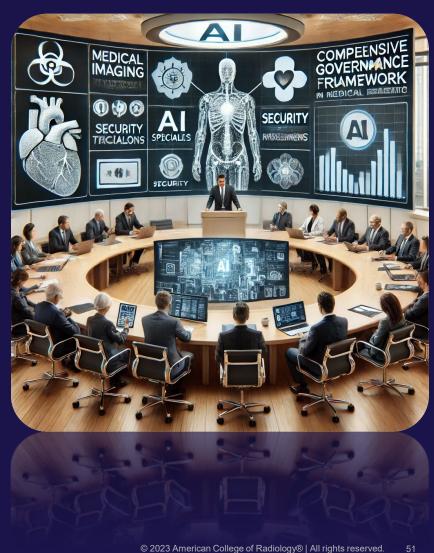
# Criteria

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#### Governance

- Establish an Al governance group to develop policies for evaluating, accepting, monitoring, and sunsetting models
  - Clinical champion (radiologist)
  - Technical lead
  - Administrative personnel
  - Data scientists
  - Informaticists
- Maintain a local inventory of clinically deployed model(s).
  - Model Version
  - Deployment Date
  - Instructions For Use
- Mandatory checkpoint with local Cybersecurity and/or Compliance teams before the deployment



### Model Selection

 Consulting with Al Central (or similar) for selecting Al models

Document the inclusion criteria or DICOM routing rules

Document the purpose of the Al model



```
def is_head_ct(dicom_file):
    """
    Check if the DICOM file is a head CT scan.
    """
    ds = pydicom.dcmread(dicom_file)
    if ds.Modality == "CT" and "HEAD" in ds.SeriesDescri
        return True
    return False
```

#### Midline Shift

Purpose Detect and measure midline shift Tag(s)

Panel Neuroradiology

Define-Al ID 18030001

Originator Sumit Niogi

Panel Chair Alex Norbash

Panel Reviewers Neuroradiology Panel

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Related RadFlement Set

Clinical Implementation

Midline shift is closely associated with intracranial pressure (ICP), leading to brain stem compression and eventual death if untreated. It is critical to manage ICP as quickly as possible. Identifying midline shift, especially early or subtle onset, can significantly improve patient outcomes. In emergency situations it is not always a neuro-specialist takine the first Jook at the study. Automated midline shift measuremen

would provide value to nonspecialists, especially those who read images in emergency situati

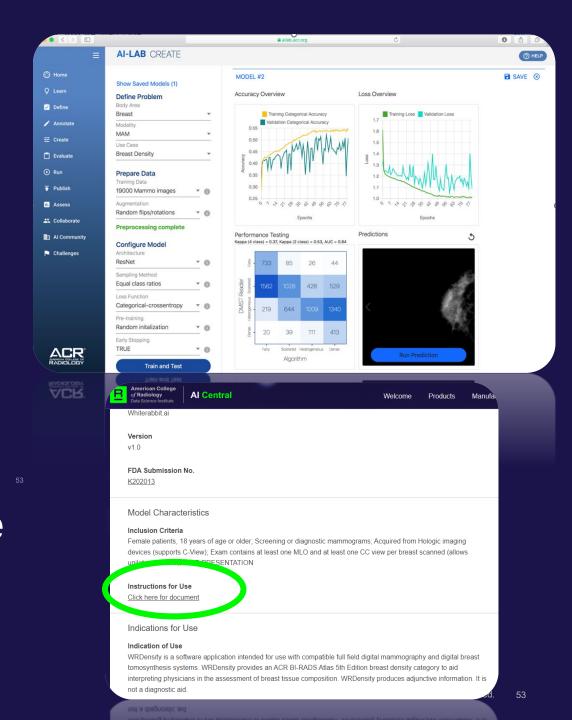


### Acceptance Testing

 Document process to assess model performance on local data

Document training procedures for users of the model

• Disseminate the Instructions for Use document to local users

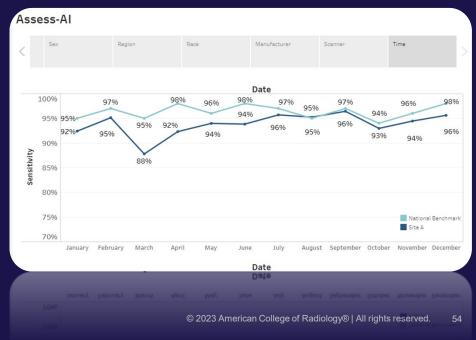


### Monitoring

 Have a mechanism to monitor model(s)

 Register to participate in ASSESS-Al for benchmarking of local performance







### Locally-developed Models

A person trained in developing Almodels

 Inventory includes the base dataset used in training, validation, and testing





### ARCH-Al Recognized Organizations

















Yale NewHaven **Health** 



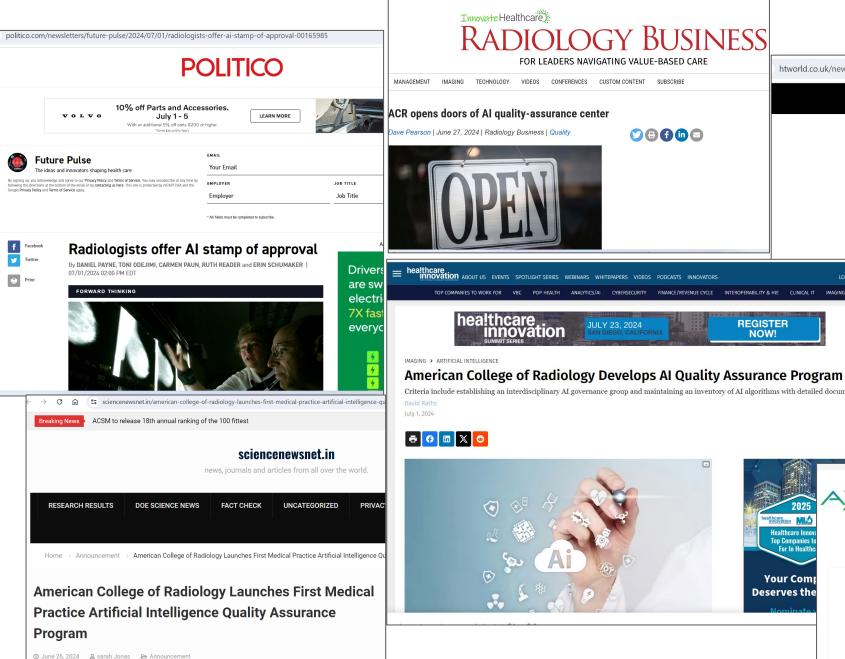








#### In the News....





TOP COMPANIES TO WORK FOR VBC POP HEALTH ANALYTICS/AI CYBERSECURITY FINANCE/REVENUE CYCLE

innovation

JULY 23, 2024





THE LEADING GLOBAL EVENT FOCUSED

SOLELY ON AI IN DRUG DISCOVERY

INTEROPERABILITY & HIE CLINICAL IT IMAGING

For In Healt

Your Comi

Deserves the

REGISTER

NOW!



CONVENTION

Amid growing concerns, and optimism, about Al's use in diagnostics, a new Al and radiology focused quality assurance programme has



**ACR LAUNCHES FIRST MEDICAL PRACTICE AI QUALITY ASSURANCE PROGRAM** 

Jun 27, 2024 | Associations, Machine Learning & Al | \*\*\*\*



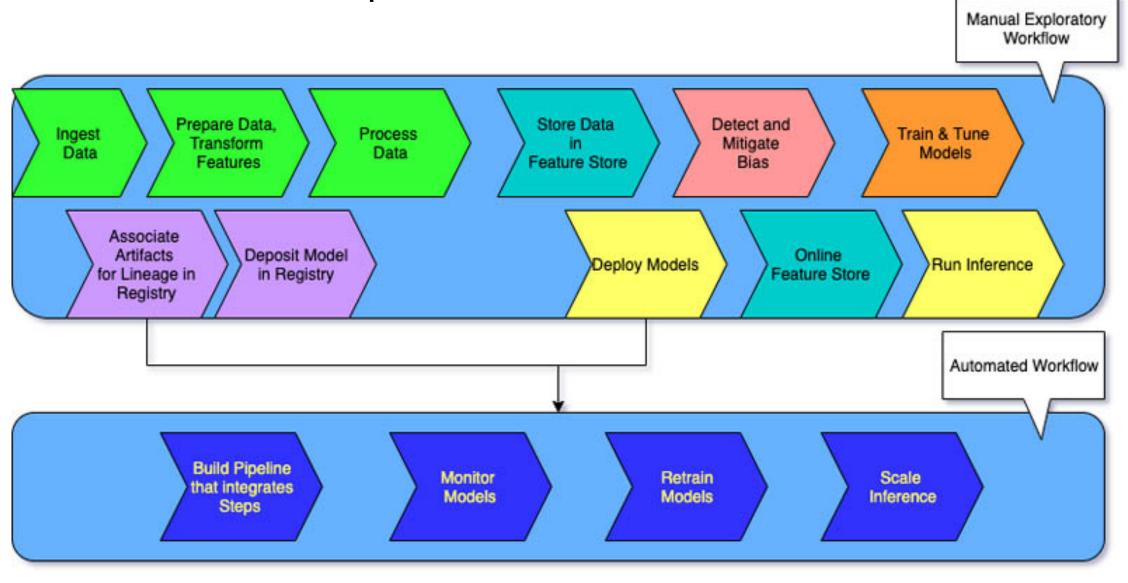
#### **Other Enterprise Considerations**

### Machine Learning Operations (MLOps)

- MLOps Practices that automate and scale the machine learning development, testing, and deployment life-cycle.
- Why Maximize repeatability, traceability, and reduce the costs associated with the manual steps involved in machine learning development and deployment.
- What are the key features:
  - -Version Control of ML Assets (e.g., code, features, data sets)
  - -Automate steps throughout the ML Lifecycle
  - -Continuous Integration and Deployment and Training
  - Model Governance and Monitoring

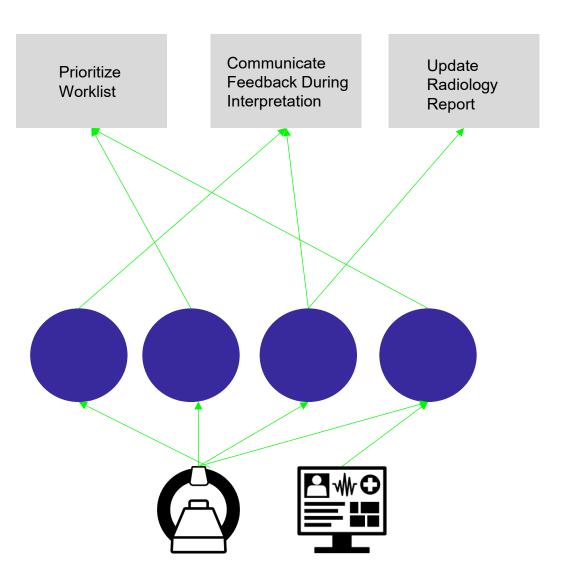


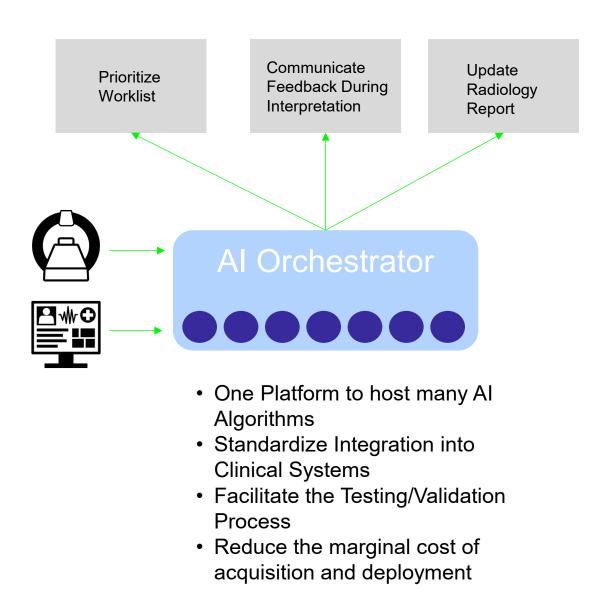
#### Manual vs. Automated Steps



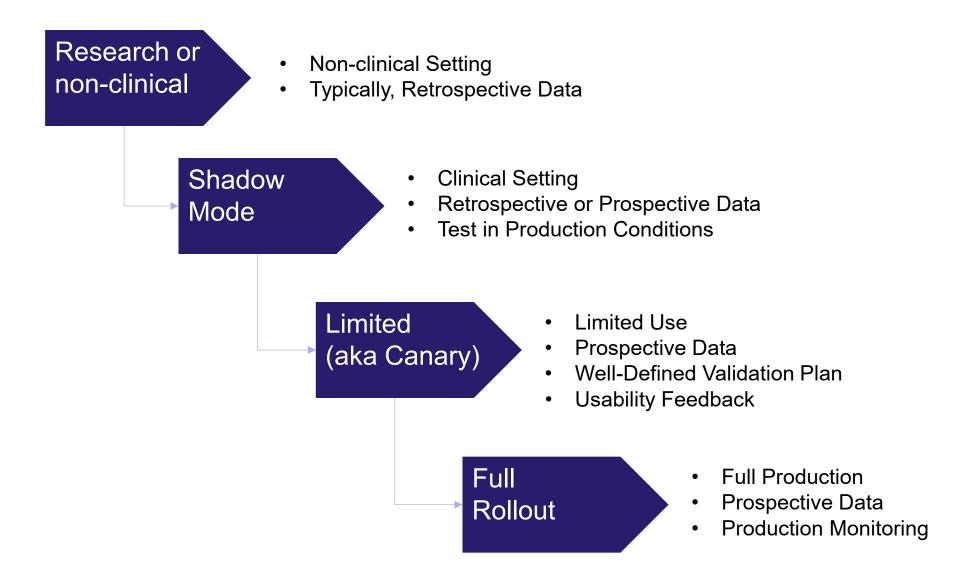
From AWS (https://aws.amazon.com/what-is/mlops/)

#### Platform / Orchestration Solutions





#### Typical Deployment Pathways



#### **Typical Deployment Pathways**

Research or non-clinical

- Non-clinical Setting
- Typically, Retrospective Data

Shadow Mode

- Clinical Setting
- Retrospective or Prospective Data
- Test in Production Conditions

Limited (aka Canary)

- Limited Use
- Prospective Data
- Well-Defined Validation Plan
- Usability Feedback

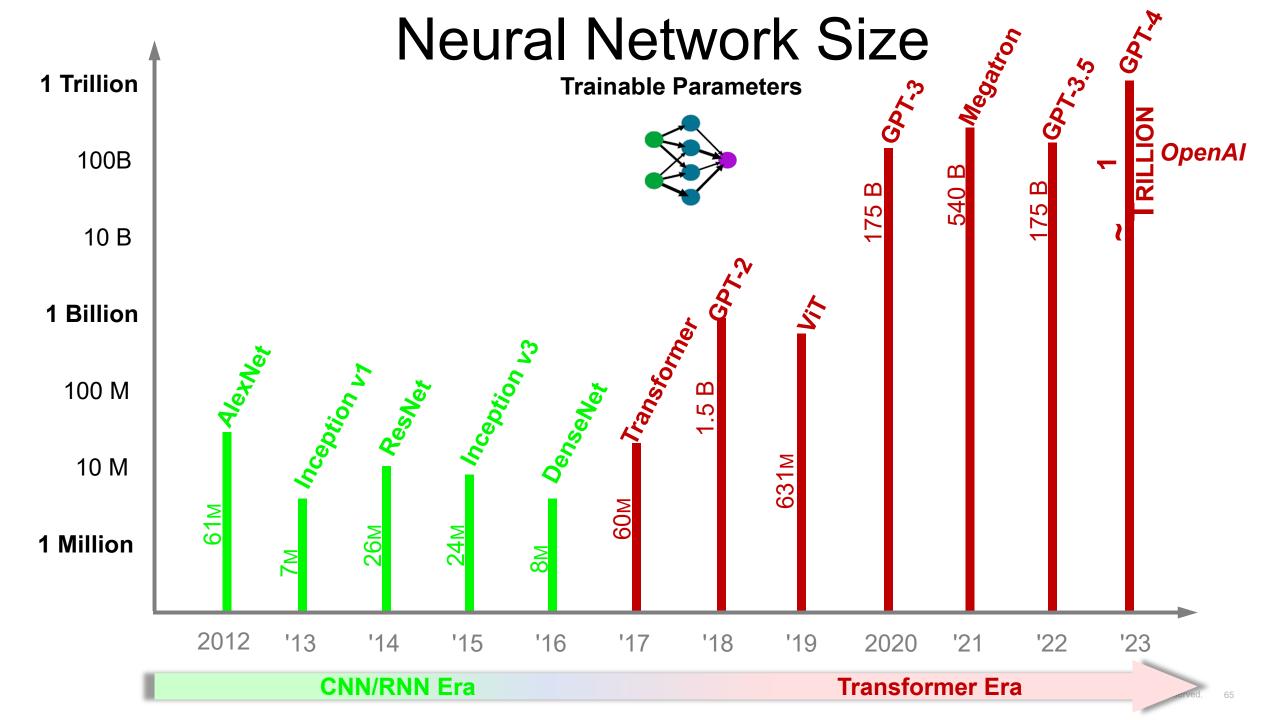
Full Rollout

- Full Production
- Prospective Data
- Production Monitoring





#### A Word About GenAl



#### Simple vs. Complex Tasks







	li I
General	VIEW DOCS
PREDICTED CONCEPT	PROBABILITY
dog	0.999
mammal	0.999
canine	0.997
pet	0.994
animal	0.987
one	0.985
portrait	0.983
no person	0.967
cute	0.957
domestic	0.950







General	VIEW DOCS
PREDICTED CONCEPT	PROBABILITY
dog	0.987
no person	0.984
mammal	0.981
one	0.962
pet	0.952
portrait	0.945
canine	0.937
people	0.926
family	0.896
sit	0.886
animal	0_870
two	

Focused.

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#### ChatGPT

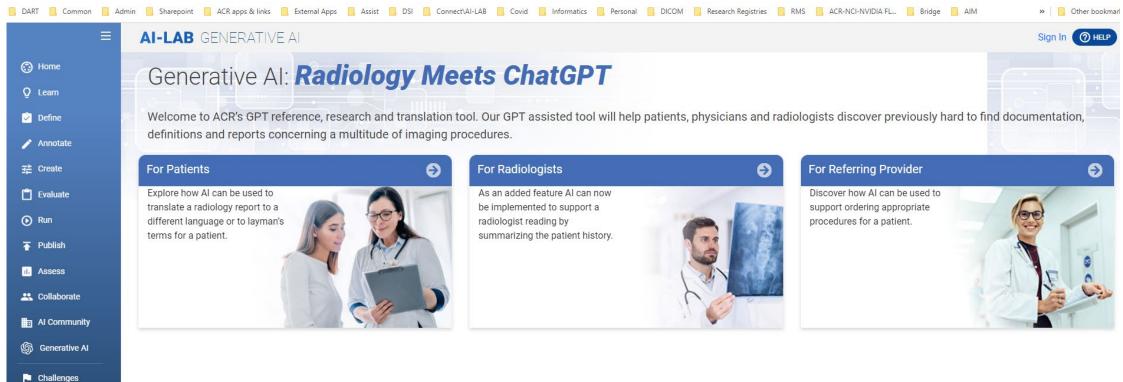
In the picture, there is a dog standing in front of a green chair. The chair's cushion appears to have been torn apart, with the stuffing scattered all around on the floor, suggesting that the dog may have destroyed it. The dog has a guilty or sheepish expression, which is commonly interpreted as a sign of knowing it did something wrong. The pillow from the chair is on the floor, undamaged, which might imply that it was removed before or after the cushion was torn apart.

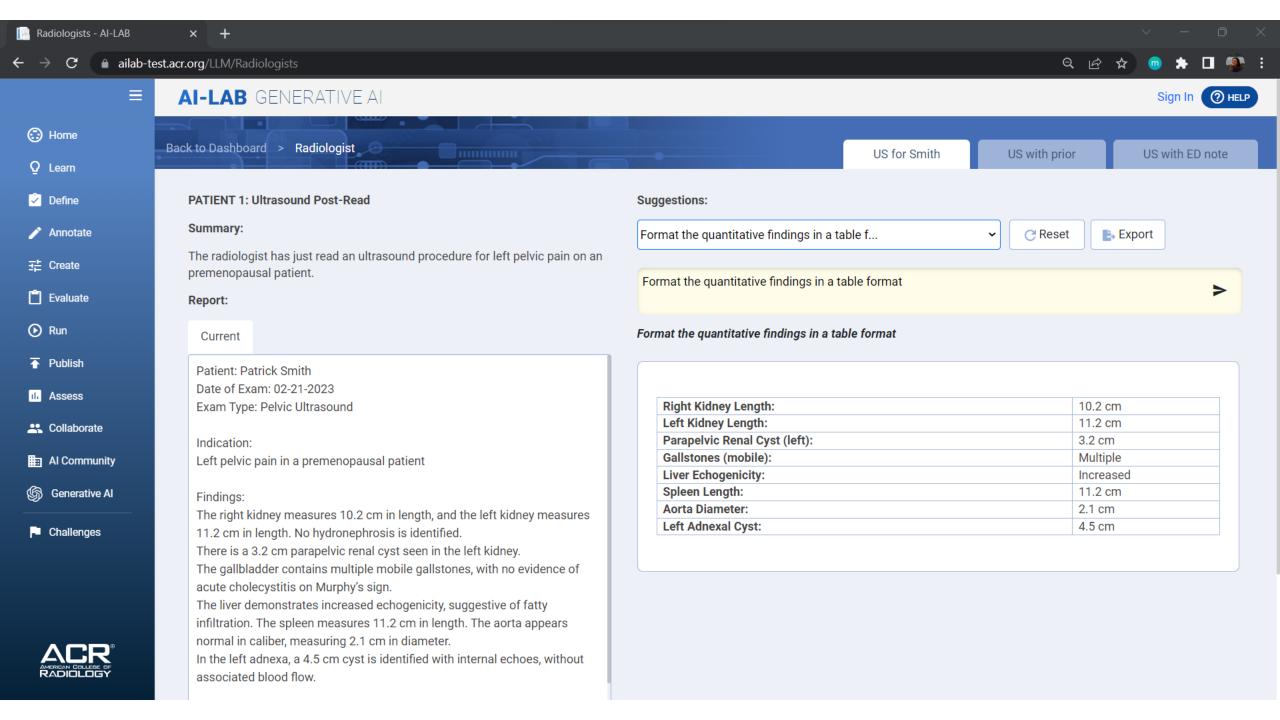
what is happening in this picture



In the picture, there is a dog standing in front of a green chair. The chair's cushion appears to have been torn apart, with the stuffing scattered all around on the floor, suggesting that the dog may have destroyed it. The dog has a guilty or sheepish expression, which is commonly interpreted as a sign of knowing it did something wrong. The pillow from the chair is on the floor, undamaged, which might imply that it was removed before or after the cushion was torn apart.

#### Example of an LLM Integration:







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