

Transformation of Radiology Service in Artificial Intelligence Era

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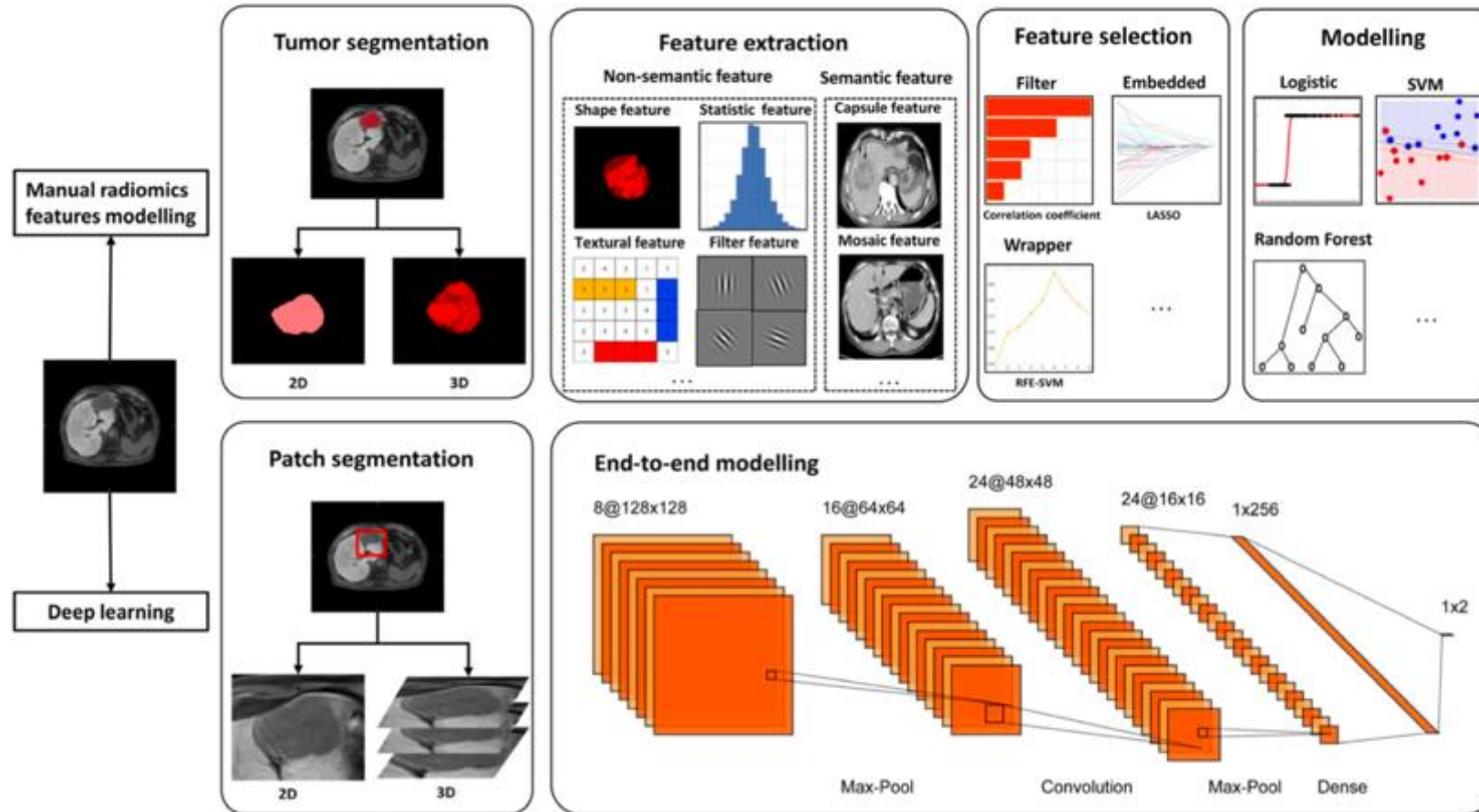
ROADMAP FOR MEDICAL IMAGING RESEARCH AND DEVELOPMENT

INTERAGENCY WORKING GROUP ON MEDICAL IMAGING

	Referral	Scan	Interpretation	Next Steps
Current Practice	Driven by professional habit, time pressure, defensive medicine, networks	Lengthy techniques or imaging series	Qualitative: much information is discarded	Further imaging or surgical consultation
Future Possibility	Driven by evidence-based criteria for appropriate use	Faster, high-value techniques with shorter targeted protocols	Quantitative assessments: analytical tools mine image data for more useful information	Reduced need for further imaging: more timely and precise diagnostics and treatment

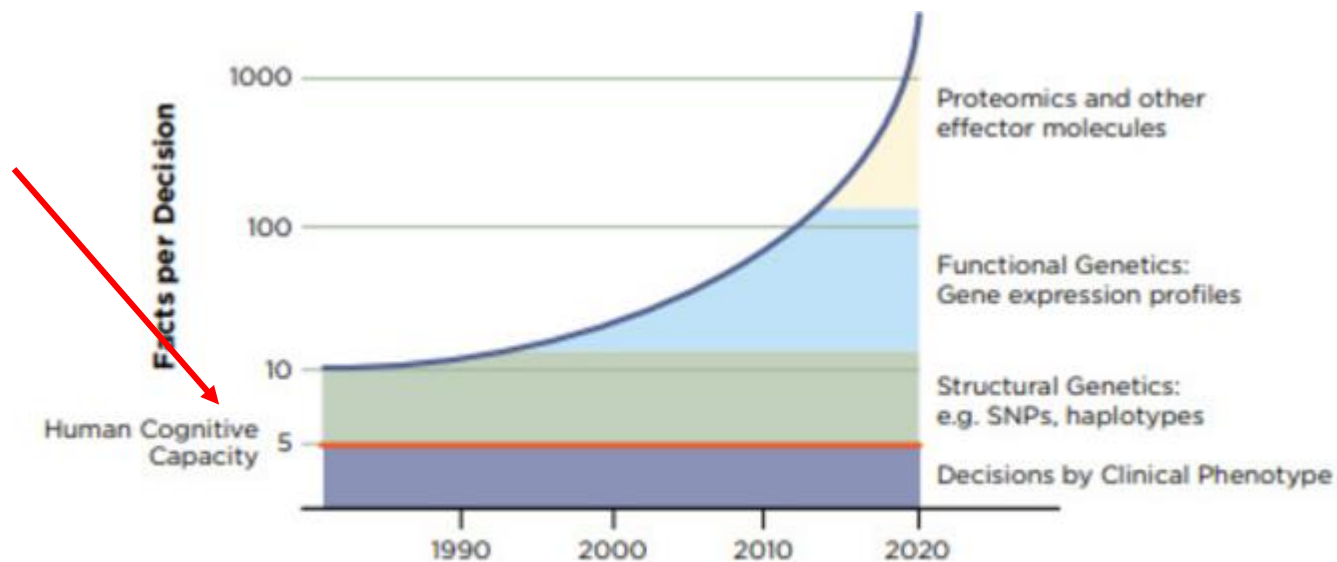
Figure 5. A New Paradigm in Medical Imaging

How to Extract New Knowledge Quantitative Imaging and Radiomics



Up To
174 Features

Human Cognitive Limit: 5 Facts Per Decision



William Stead, IOM Meeting, 8 October 2007. Growth in facts affecting provider decisions versus human cognitive capacity.

Data/Information Explosion

**Legacy Strategy: Specialization
Fragmented Service**

**Big Data Strategy: AI Analytics
Integrated Service**

Clinical Radiology Experience in CAD

Breast Cancer Screening

- In the US, Widely Used
- Mainly: Higher Reimbursement
- CAD: No Significant Benefit

Lung Cancer Screening

- CAD is Effective
- CAD improves Efficiency
- No additional Reimbursement
- Image Quality:
 - Variations in Image Quality
 - Preprocessing Needed

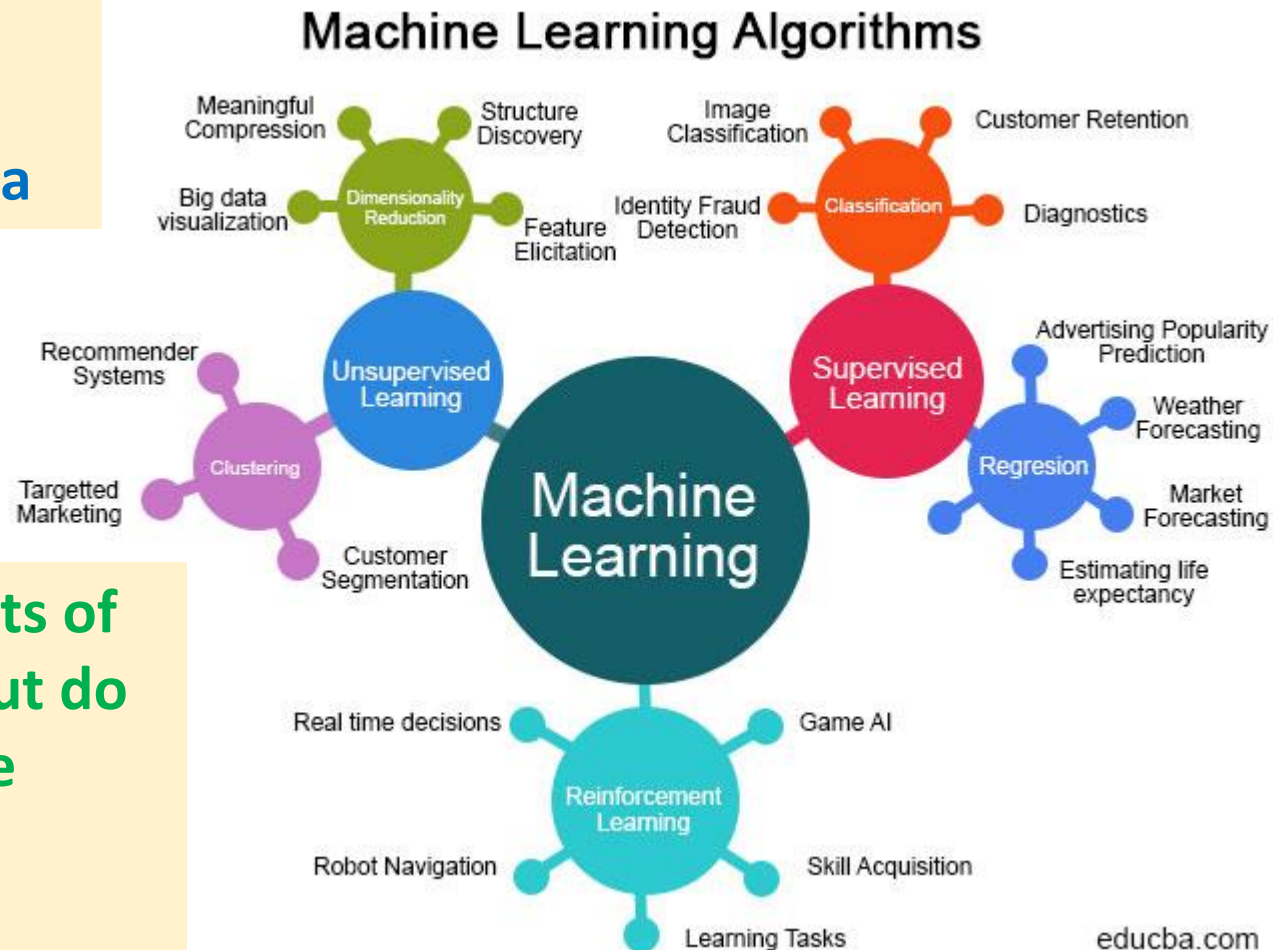
**Global Adoption of CAD in Radiology has been very slow.
Better Trajectory will be Needed.**

Google's Deployment in Thailand

- Detection of Diabetic Retinopathy Developed in 2016 – 3,049 patients
- Large Scale Prospective Study with 7,600 patients – 2018, 11 Clinics
- Evaluation Study Stopped:
 - Persistent Image Quality Problem
 - Workflow Challenges
- Success in Lab DID NOT Translate in Real Life Situation

3 Domains of ML/AI Tools for Various Applications

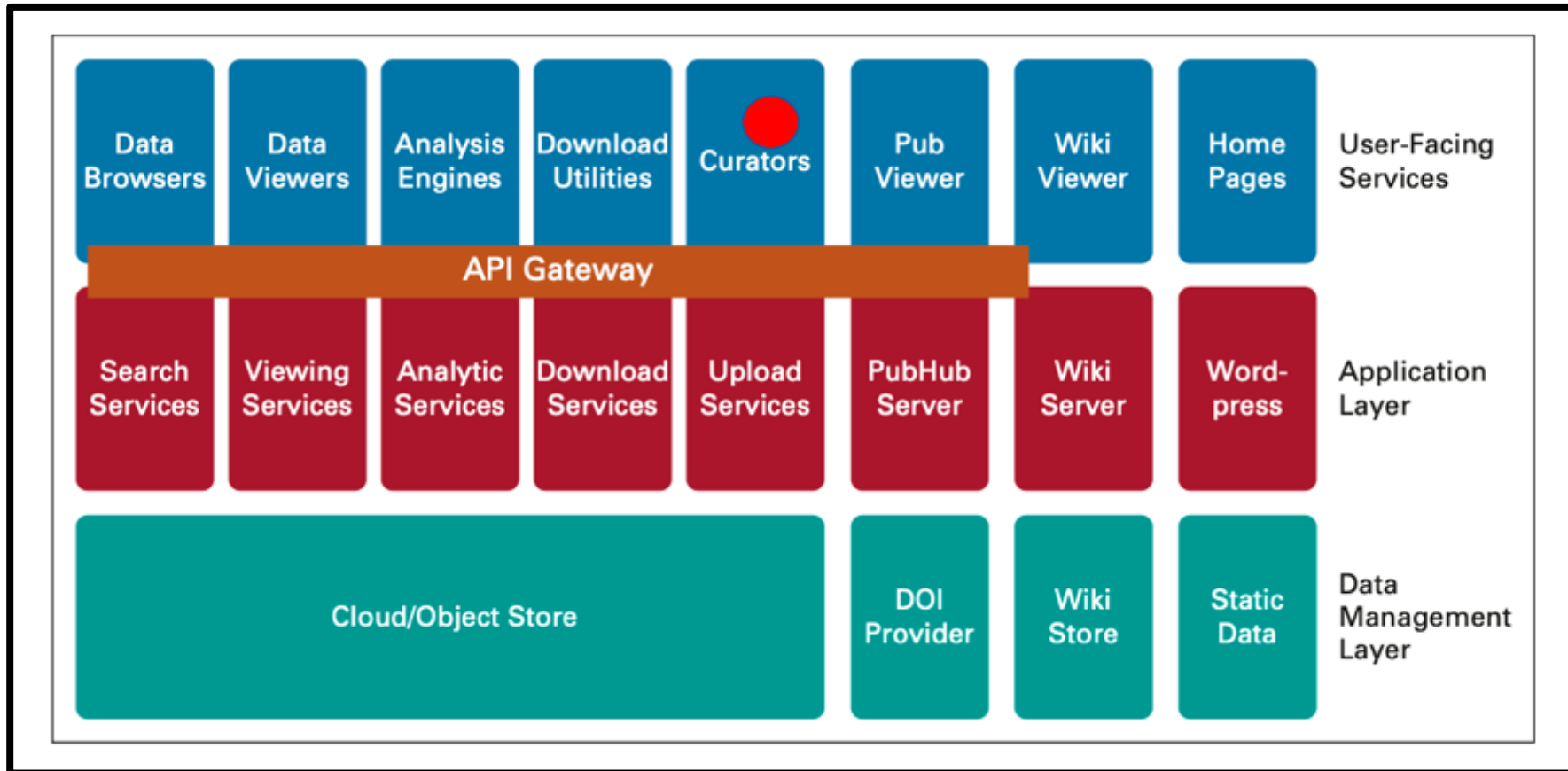
Ignores human reasoning
 And exclusively use large volumes of data



Accurately model human reasoning

Incorporate elements of human reasoning but do not require accurate modeling of human processes.

Big Data Platform for Sharing and Collaboration

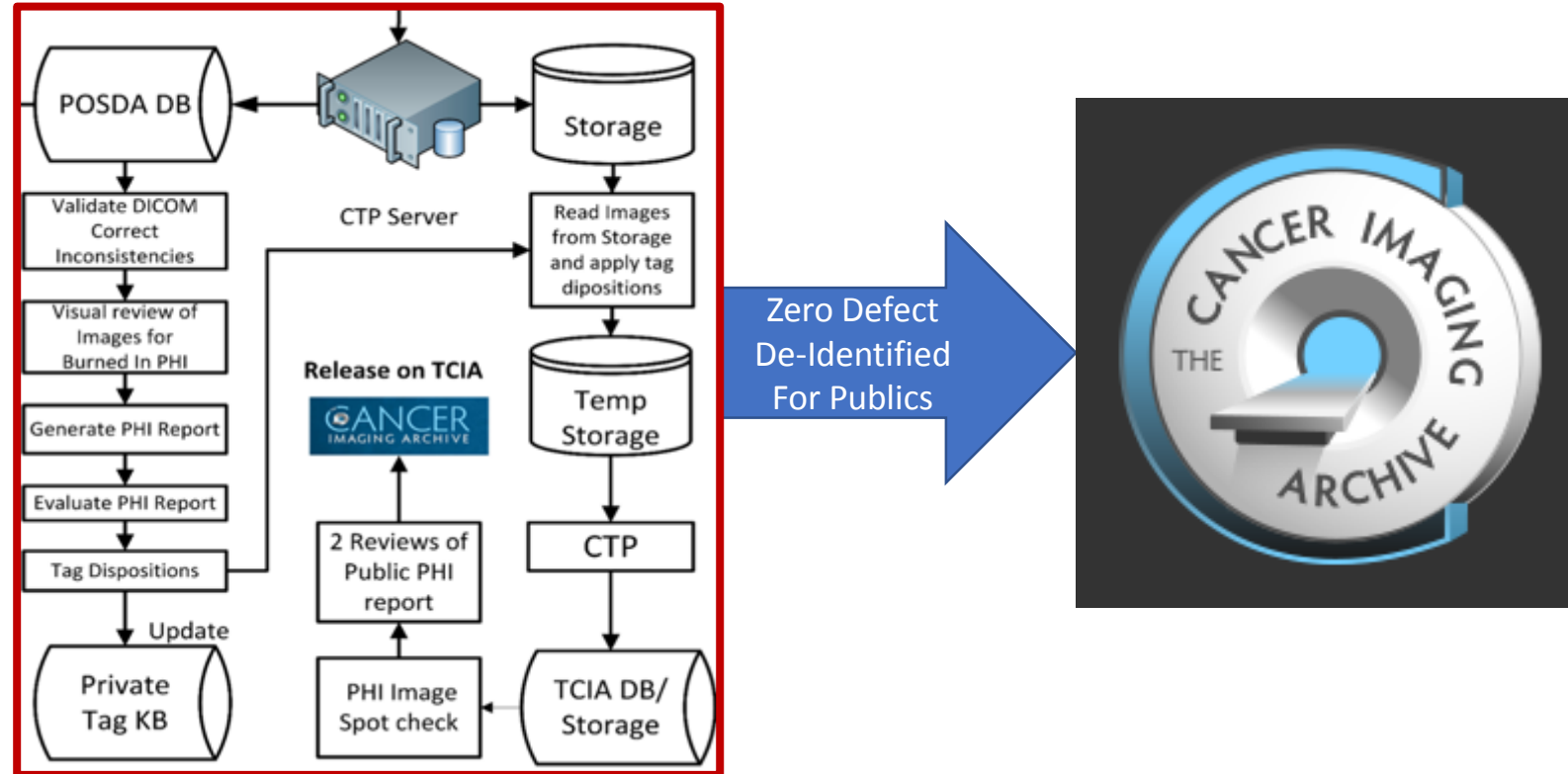
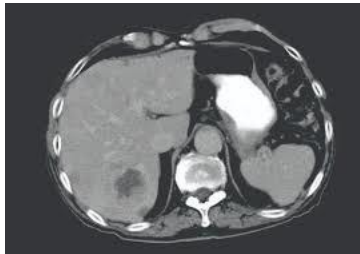
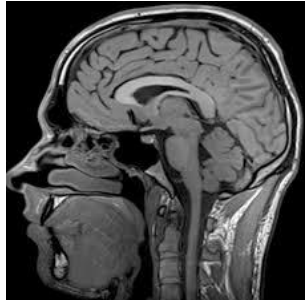


FAIR Principle

1. **F**indable
2. **A**ccessible
3. **I**nteroperable
4. **R**eusable

Curation Process

Remove PHI/PII and Preserve Scientific Info



Better Health Care

Better Knowledge

New Knowledge

New Process

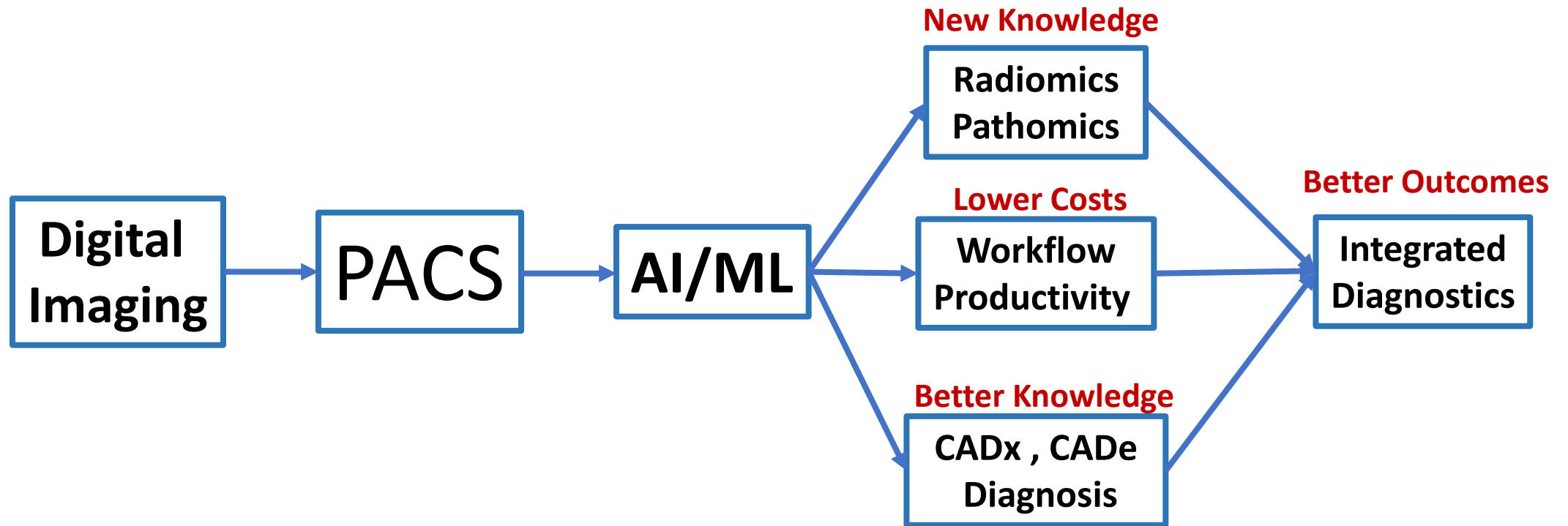
Artificial Intelligence

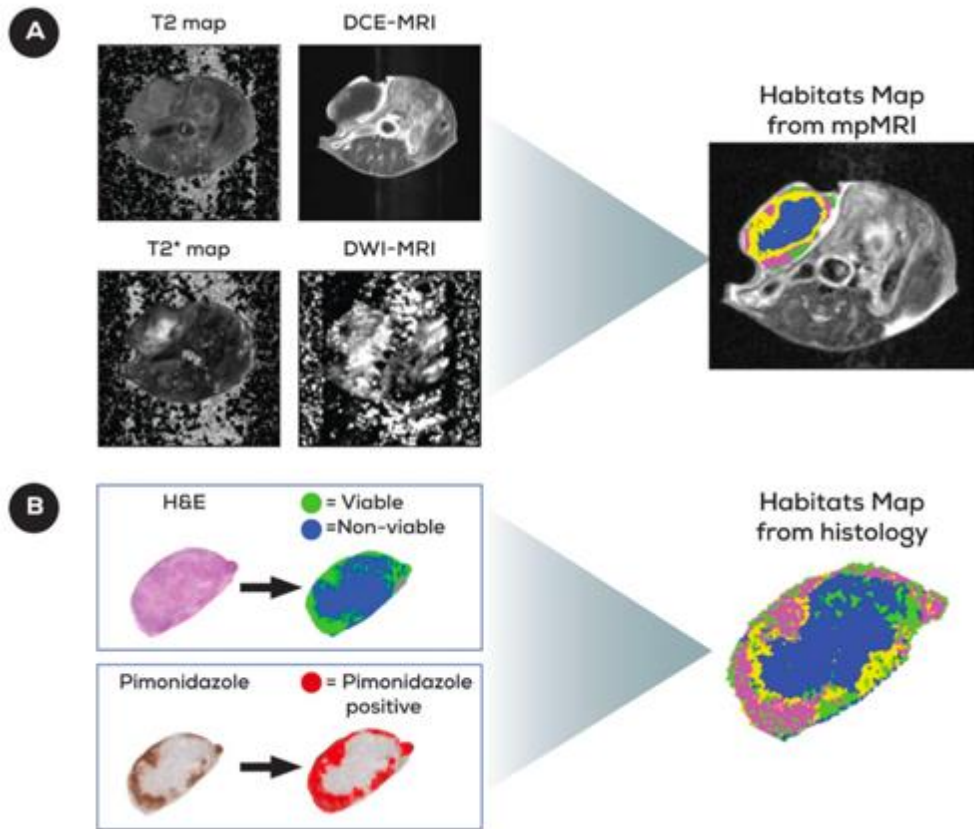
Machine Learning

Data Sharing, Standards, Analytics
Open Data and Open Collaboration



Digital Transformation and AI Trajectory





Integrated Diagnostics: The Computational Revolution Catalyzing Cross-disciplinary Practices in Radiology, Pathology, and Genomics¹

The silo metaphor is an adequate description of current practices in the diagnostic specialties. Radiologists are already running digital workflows for routine primary review (1,2), and there are a vast amount of clinical

UCLA PATHOLOGISTS, RADIOLOGISTS PRODUCE INTEGRATED DIAGNOSTIC LAB REPORTS

New service is making radiology and pathology news