How to become an AI-ready hospital?

Kickstarting your data-driven and medical AI projects

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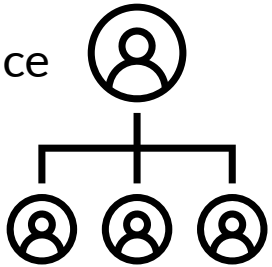
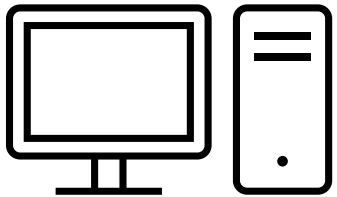
What are the key bottlenecks?

Key bottlenecks in digital data infrastructure

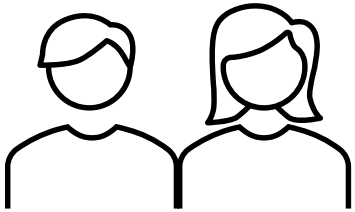
Governance





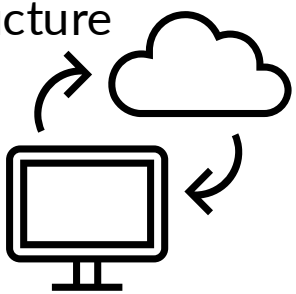
Data tools

Awareness & Buy-in

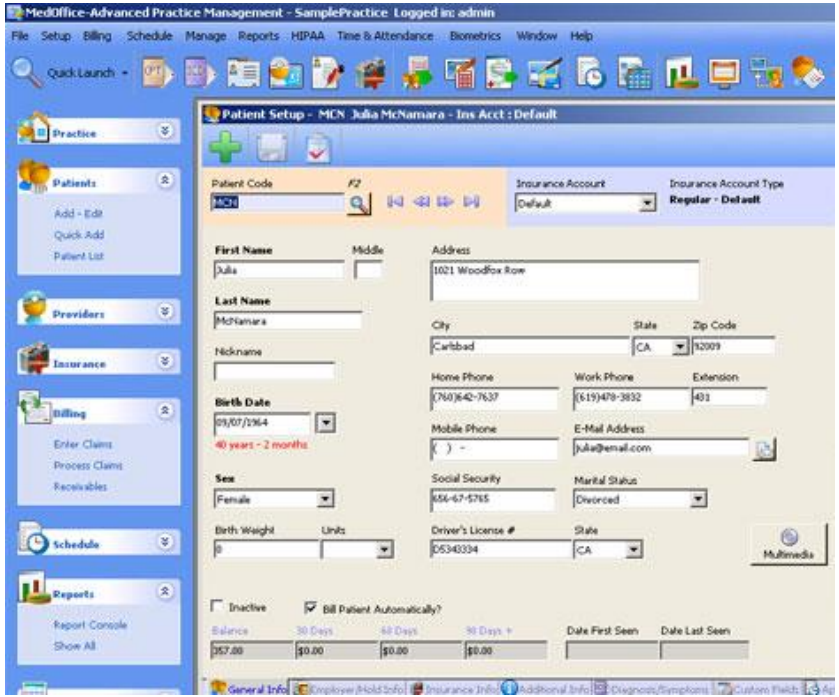


Data standard

Infrastructure



Data entry is constantly evolving



http://www.casemdmedical.com/MedOffice/m-scr-shot2

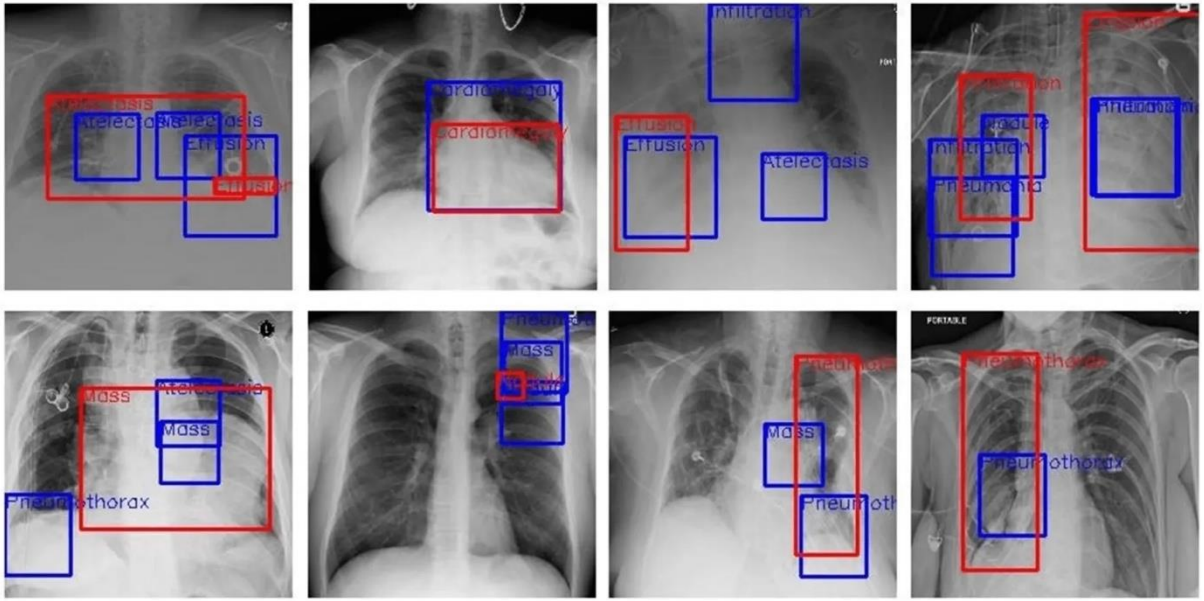
- New elements
  - Tests and data fields
  - Terms and codes
- Standard and compatibility across versions
- Free text and PDF are not machine-readable

Unclear responsibility and objective

- It is everybody's job, but it is nobody's duty
- No oversight, no incentive
  - Lack of QC
- No recognition of the importance of data

www.shutterstock.com

Data annotation: Raw data is only half the story

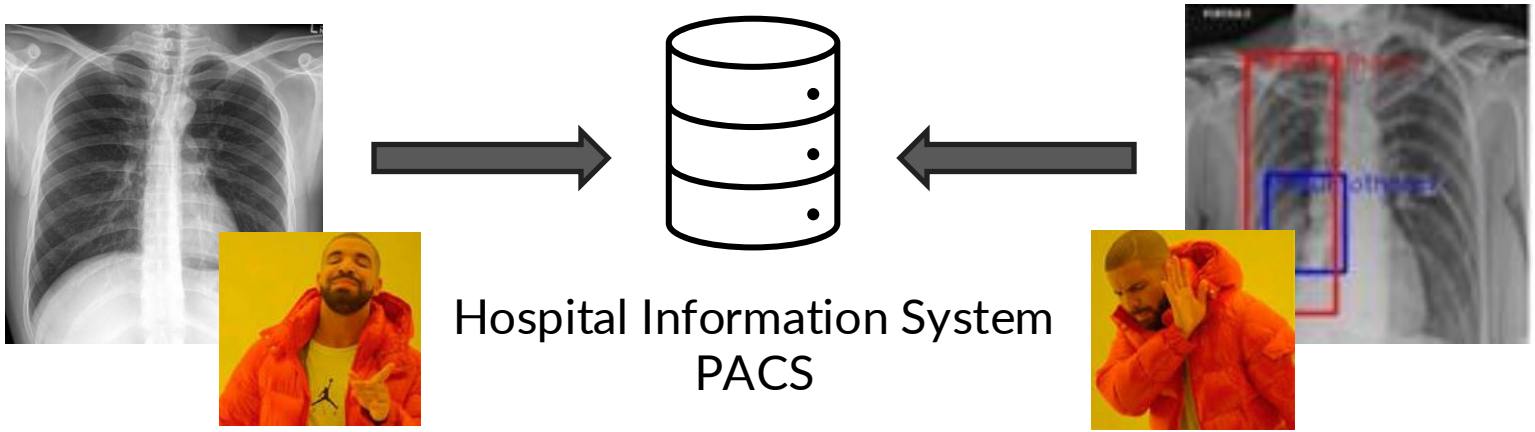


https://cbirt.net/disease-prognosis-using-deep-learning-and-he-images-emerging-tool-for-clinical-trial-optimization/

www.dreamstime.com

- Objectives for training and evaluating the AI

Hospital information system is not designed for R&D



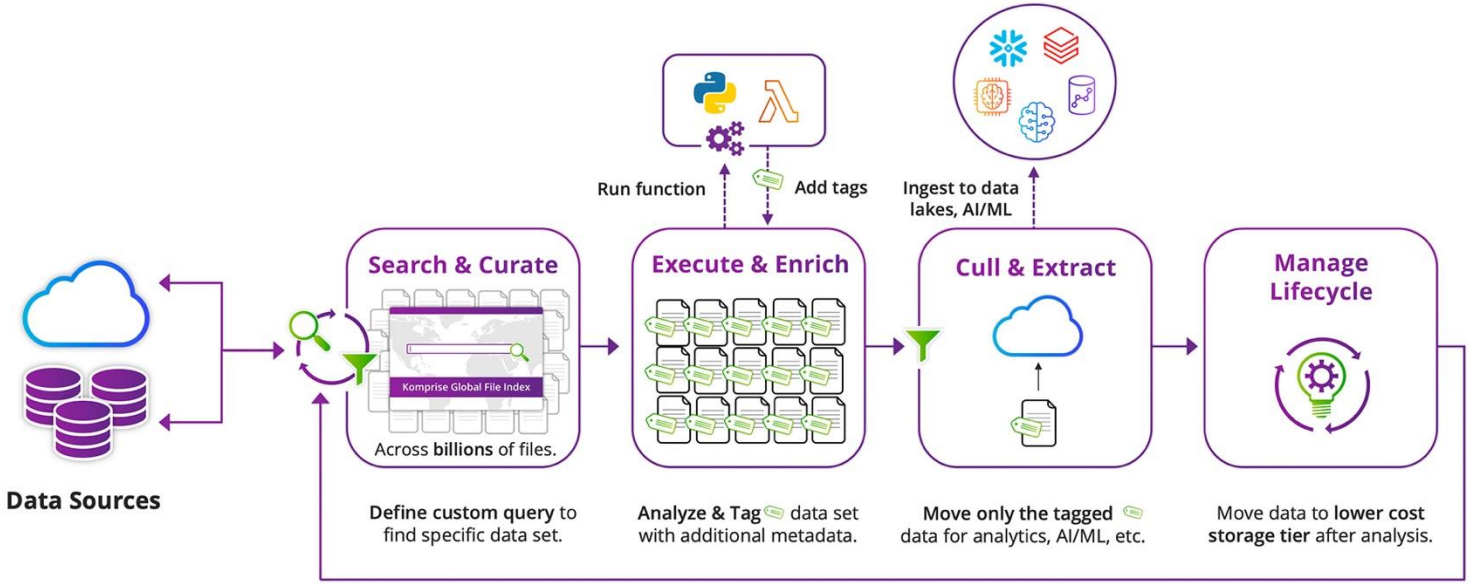
- Data on the hospital systems are visible to too many others
  - Including requests by patients
- No room to re-organize data or add unofficial annotations
- Lack of data retrieval support

Unclear data governance and objectives

- What are your organization’s objectives regarding data?
- What to do?
- Who are involved?

Get your digital data infrastructure up and running

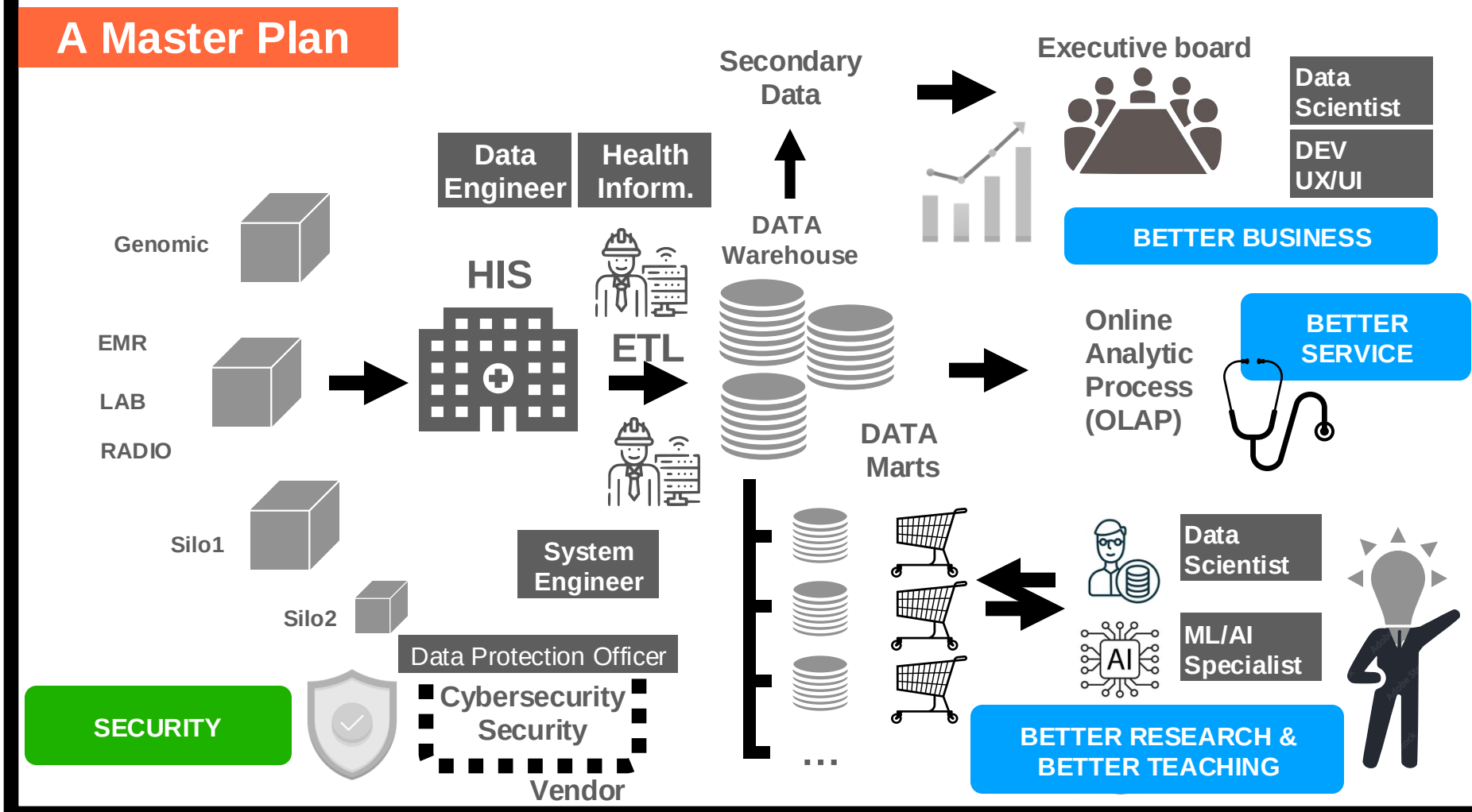
Key processes in digital data infrastructure



https://www.komprise.com/glossary_terms/smart-data-workflows/

- Entry & QC → Curate & Annotate → Utilize
- Data life cycle management

A Master Plan



Assemble your data team

- Small but complete
  - Data scientist
  - Data engineer
  - Software developer
  - Manager
- One problem at a time
- Computing resources

Get buy-in from your staff

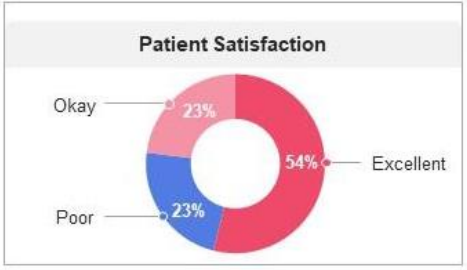
EMPLOYEE BUY-IN

When a company has great employee buy-in, workers are engaged and connected with each other and with management. They have a strong sense of belonging to a team. An employee who buys in thinks like a stakeholder. They wholeheartedly embraces the company's values and beliefs.

marcuslemonis.com/business/employee-buy-in

- Co-design UX/UI with each team
- Differing priorities: Data curation for R&D, dashboard, etc.

Smart, data-driven operation benefits everyone



Total Patients

61,948

Patients Admitted 31,786

Operational expense

$15,856K

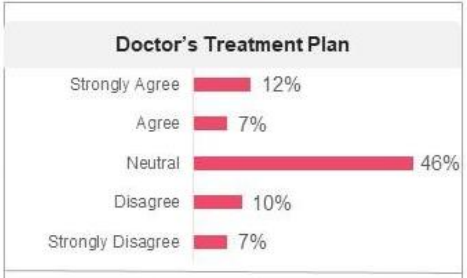
Avg Cost per Patient 5.1K

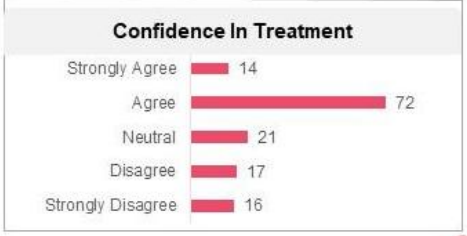
Doctors

Average patients per month

24.79

Available 290





Better data and quality-of-life improvement

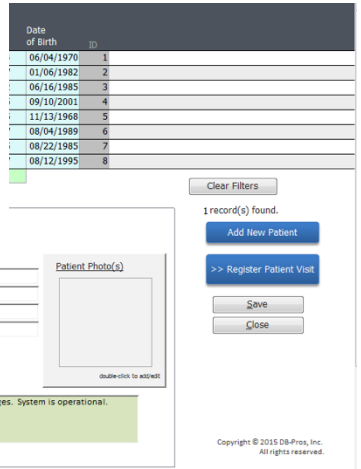
Practical

Address/Location Description: 814 Cemetery St. Saint Albans, NY 11412
Test Hydrant Facility ID WHYD 29
Flow Hydrant Facility ID WHYD 5

APPLICATION INFORMATION
Name John Doe
Address 257 Manhattan Drive Brainerd MN 56401 NY 34512345
Contact Person John Doe Phone (541) 754-3010

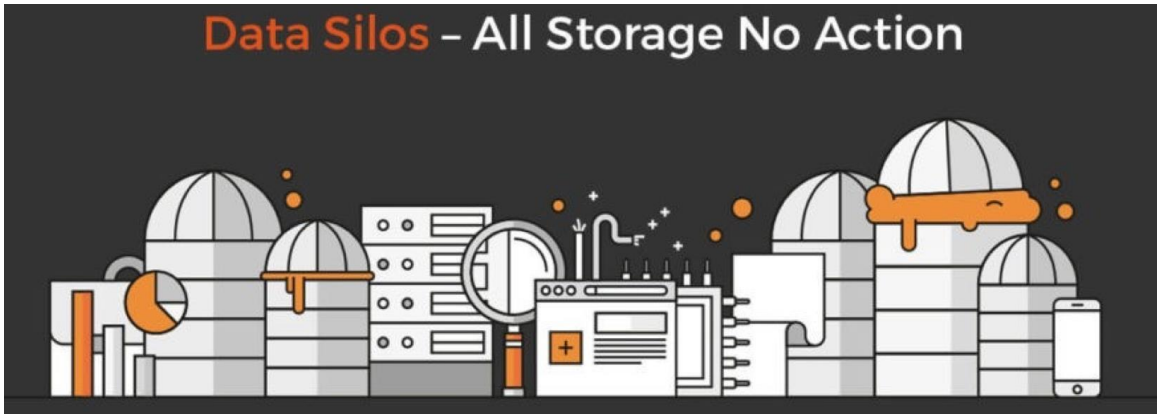
SYSTEM INFORMATION
Test Date 2020-04-14 Time of Test 02:09:06
Nearest Elevated Tank A water tower Test Hydrant Elevation 400
Main Size 24 Pressure Zone 20
Tank Hydraulic Grade 24 Use 20ft below pressure zone (tank overflow) for design*
Pump Info 12 Theoretical Pressure 300

RESULTS
Static Pressure 260 psi Number of Outlets Flowing 12
Residual Pressure 100 psi Flow Hydrant Discharge Pressure 400 psi
Outlet Diameter 250 inches Volume of Discharge 16 gpm



Ideal transformation

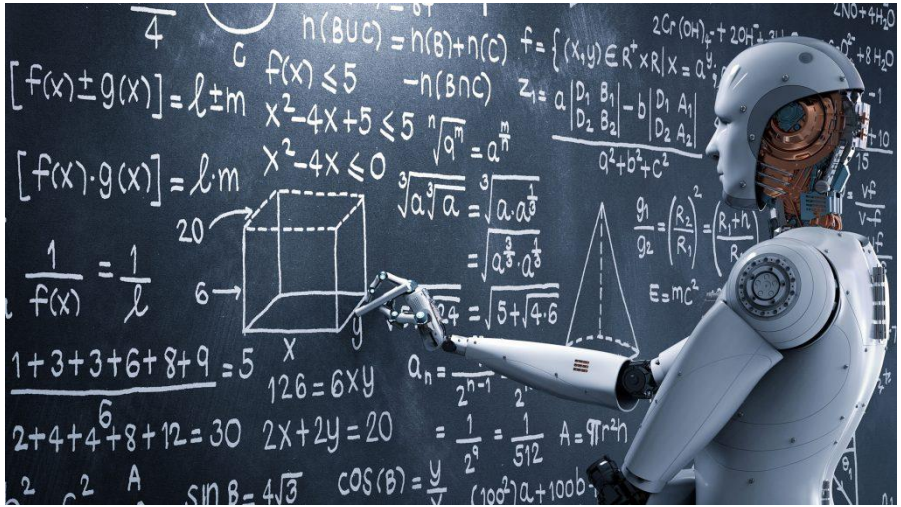
Digital sandbox: A safe heaven for R&D



- Data silos create potential data leak and inconsistency
- Provide a centralized computing resource / virtual machine
  - Enforces data consistency and standard
  - Foster good data practice
  - Ensure proper governance

Prioritize the right tasks for AI

Misconceptions about (current) AI

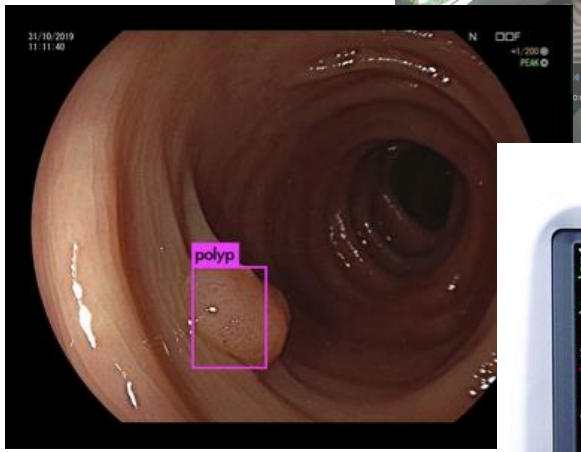


https://bgr.com/tech/this-is-the-breakthrough-that-may-lead-to-superhuman-ai/

- AI can find a solution to anything
- AI reduces human workload by replacing human
- Just develop AI for XXX

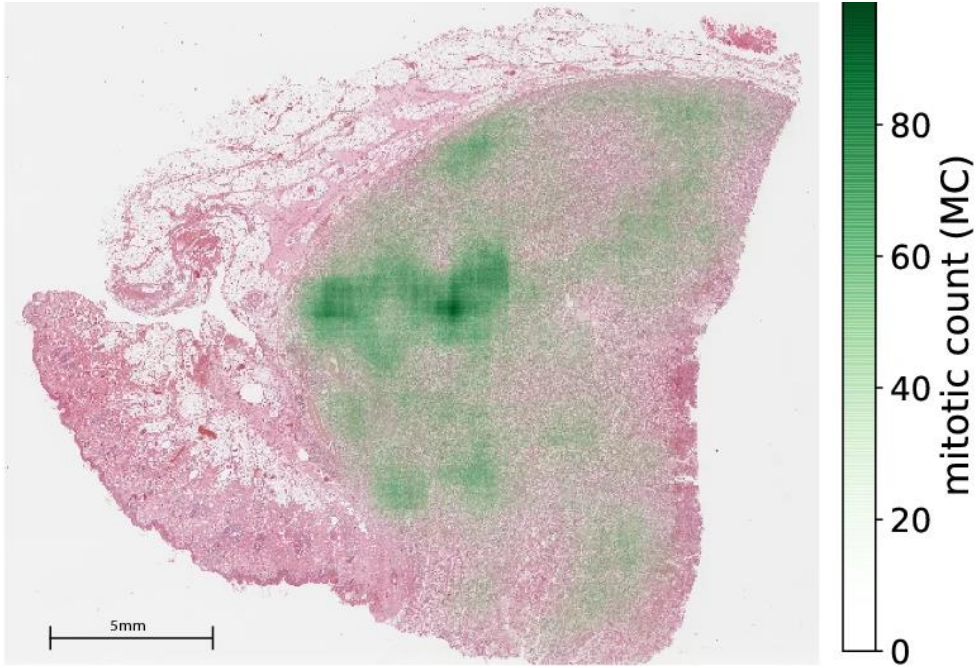
Strong points of AI

- Real-time monitoring
  - Vital signs
- Automatic detection
  - Alert
- Focus
  - AI may be confused but rarely distracted



https://coastbiomed.com/2018/07/20/an-overview-of-patient-monitoring-devices/

Balance benefit and effort

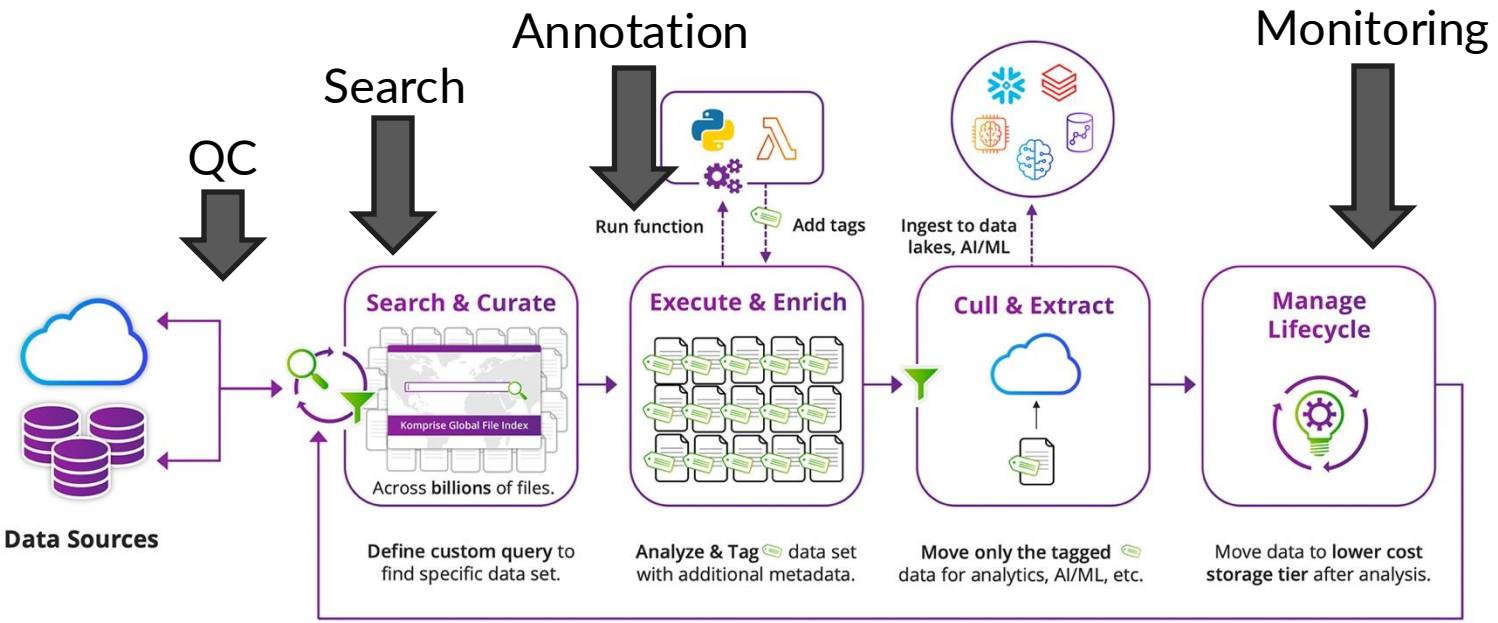


Aubreville, M. et al. Scientific Reports 2020

- A perfect AI may be impossible to achieve
- Imperfect AI can still
  - Reduce time spent, *by proposing hotspots*
  - Reduce turnaround time, *by prioritizing critical patients*
  - Improve diagnosis, *by serving as 2nd opinion*

Integrate AI into the workflow

AI integration at every step



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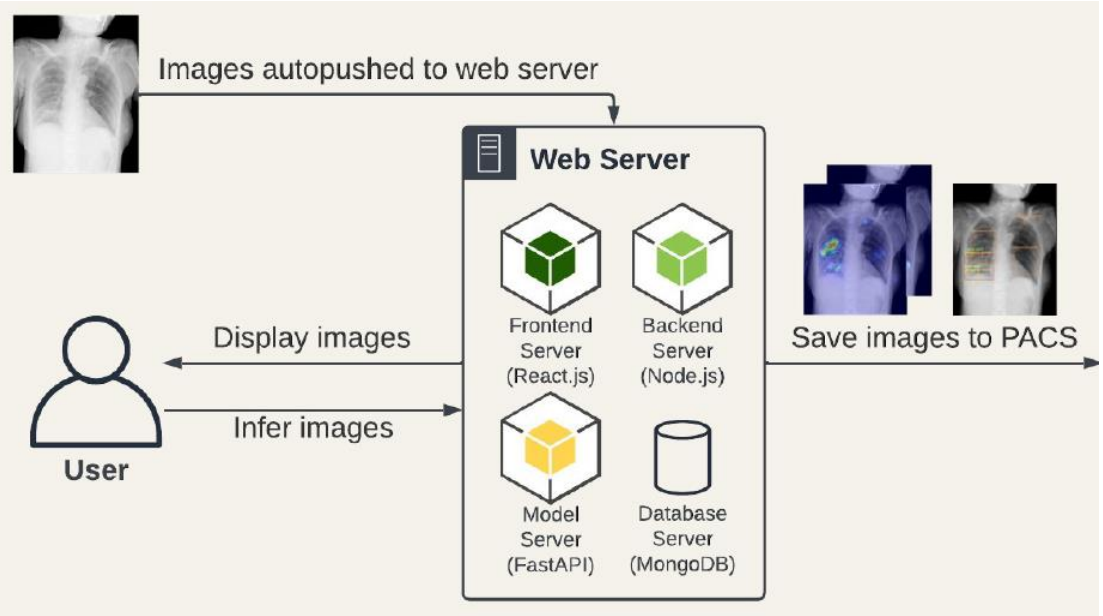
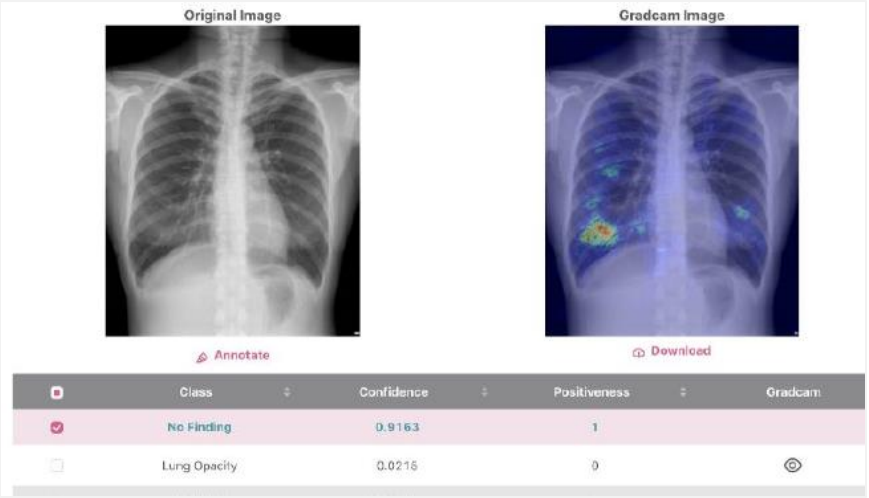
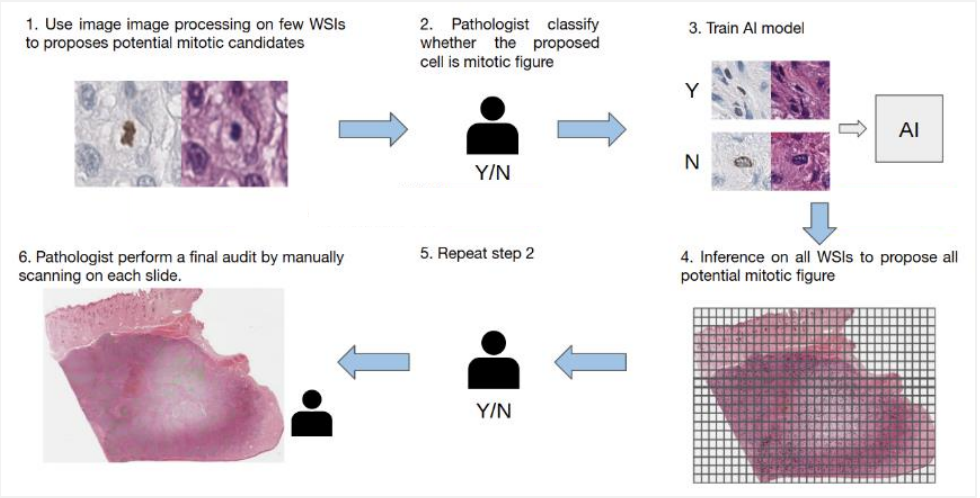
Don’t just add an AI, revise the workflow



- “Doctor only look once”
- Interaction between AI and human user
- Opportunity to gain user feedback
  - Evaluate & improve

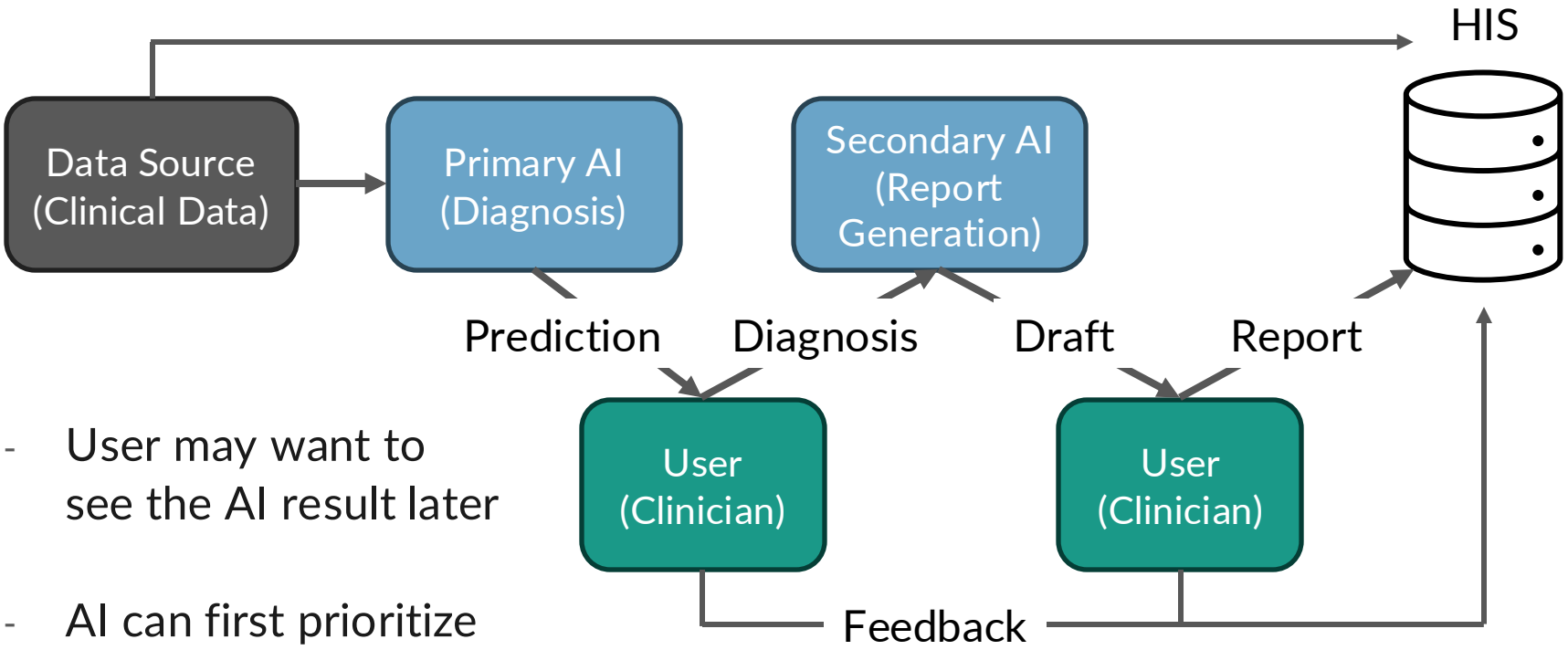
Value multiplied by AI assistance





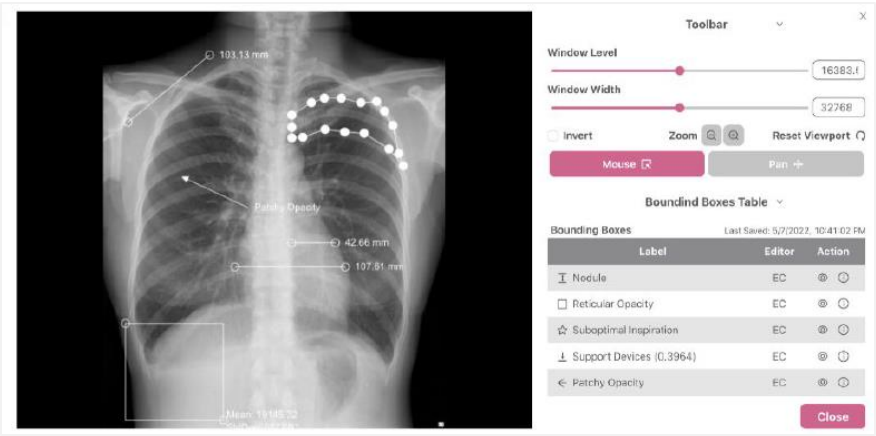
- Improve medical service performance & speed
- Get datasets from day-to-day work
  - Develop new AI or improve current AI

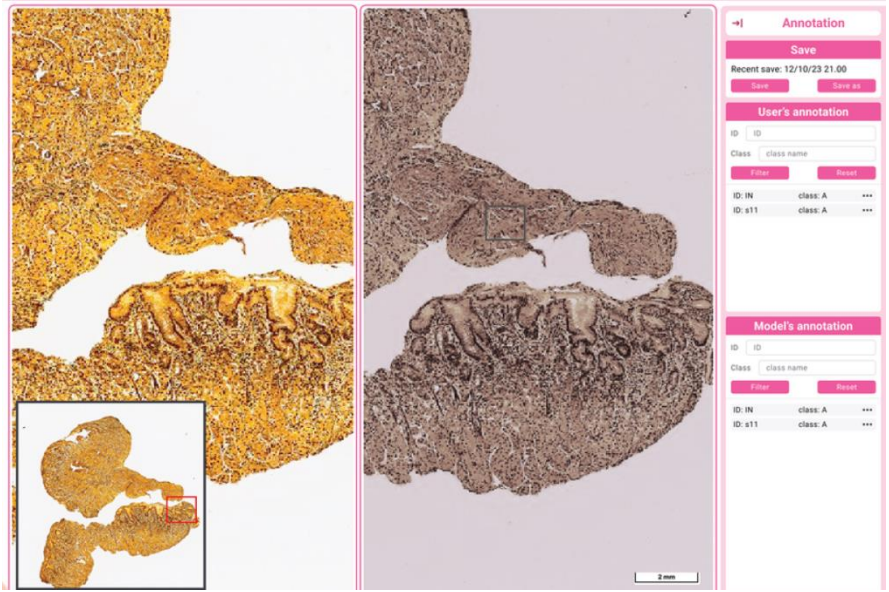
A simple design of user-side AI integration



- User may want to see the AI result later
- AI can first prioritize

Partner with software developer (or vendor)





- Good AI integration requires good software and UX/UI
  - Handle new details in the workflow
  - Minimize the burden for your staff

Take-home messages

- Assemble your data team
  - A ready-made solution rarely fits your organizational culture
- Get buy-in from your staff
  - They are the judges, juries, and executioners of AI
- Data and AI literacy training
  - Smart hospital needs contribution from employee
  - Awareness of the importance of data quality and usability
  - Maximize the benefits from software and AI
  - Ability to identify critical gaps in infrastructure and workflow