



# Applications of AI in Healthcare

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57 Million  
Lives

33  
Published Papers

7  
Countries

2018 Finalist  
Microsoft Partner  
of the Year

2018, 2019 Winner  
Microsoft Health Innovation  
Awards

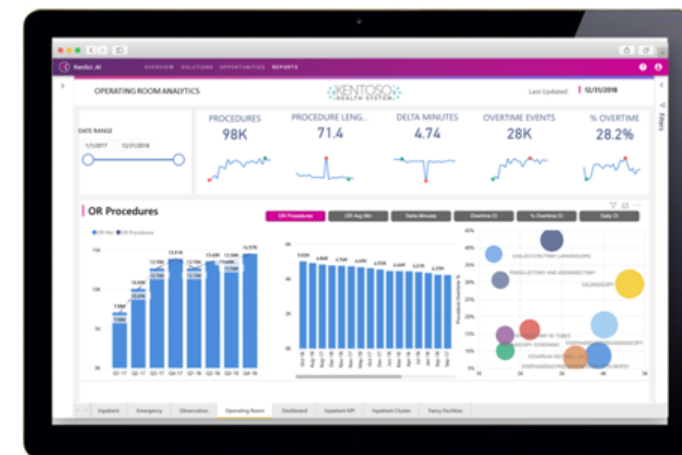




# AI Platform for Digital Health

Transform healthcare data into real-time insights to enable BI and AI applications at scale

KenSci's AI platform for Digital Health increases time-to-value for healthcare analytics teams and helps deliver more outcomes with existing resources.



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# What we will talk about today...

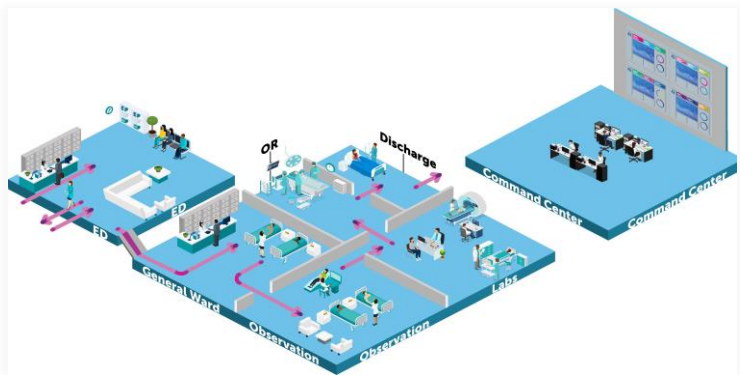
- Opportunities for AI in Healthcare
  - What value can AI deliver for healthcare
  - Problems where AI can be applied in hospital systems
  - Applications in integrated value-based health systems
- Challenges for AI in Healthcare
  - Infrastructural Challenges
  - Adoption & Implementation Challenges
  - Ensuring Explainability & Fairness



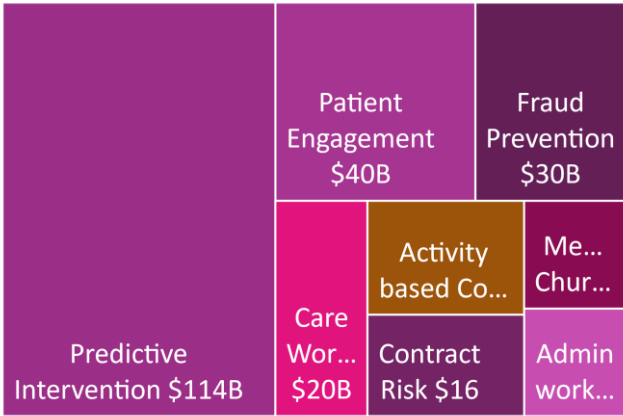


# Opportunities for AI in Healthcare

# Healthcare operations are very inefficient



Majority of health systems are reacting to the individual symptoms of **throughput** and **utilization** complications



Health Systems are looking for guidance on how to **leverage their massive amounts of silo'd data** and add consumer health value while reducing costs

**\$260 B**

Opportunity for value-based care optimization

**52%**

YoY growth rate for AI opportunity in healthcare till 2024

**\$48 B**

AI led Application and Data Modernization opportunity by 2020

The problem is only getting more complex...

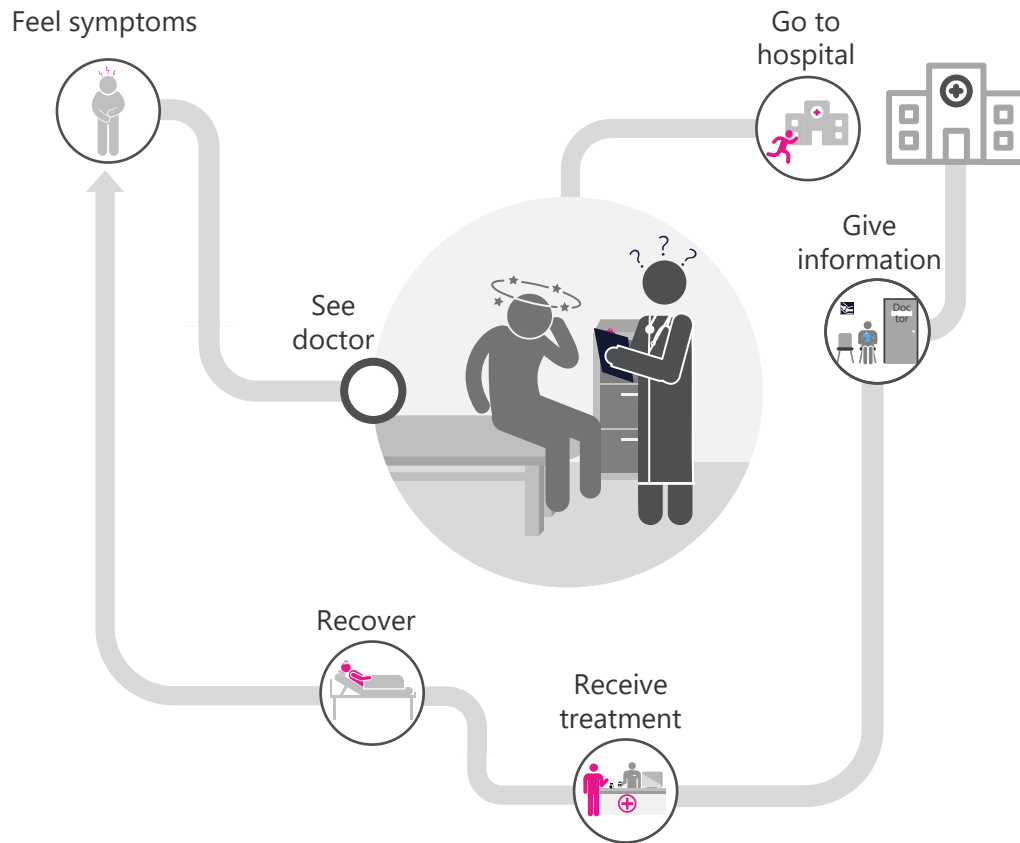
U.S. Healthcare spending will climb from \$3.5T to **\$6T by 2027**

The global ageing population (60+) is expected to **double to 1.4B + by 2030**

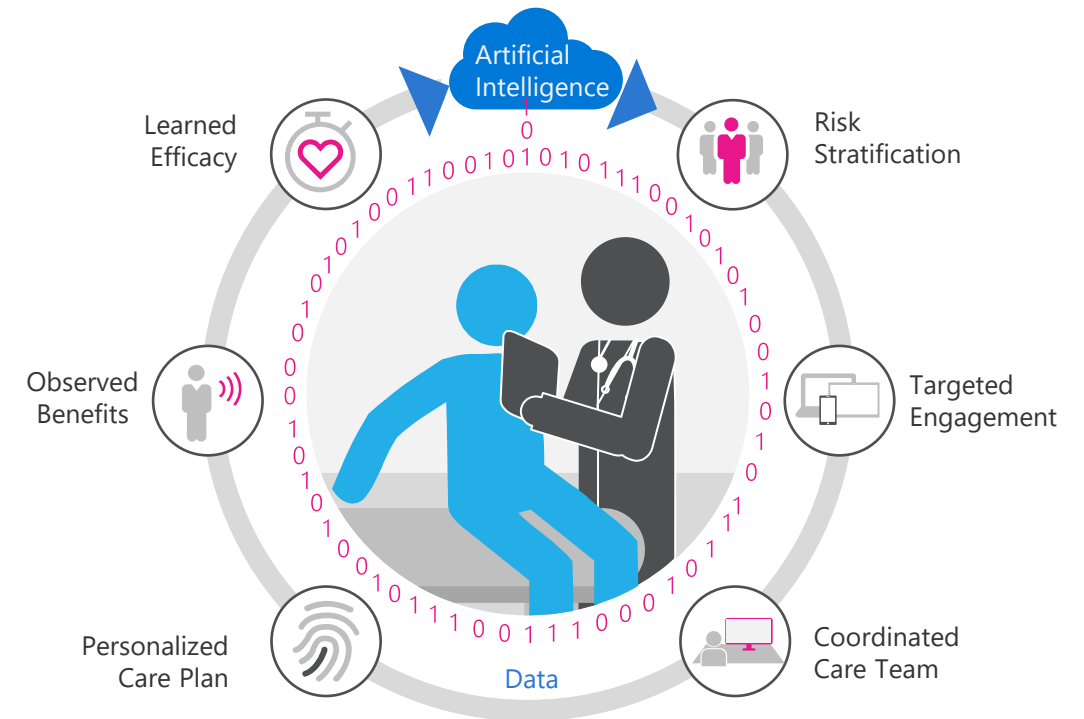
**46% rise** in demand for acute inpatient beds by 2027

# Enable Every Health Decision with Intelligence

From a reactive, disconnected and cyclical process



To a coordinated, targeted, continuously learning system of care



# Key Opportunities: Patient Flow

- Inefficiencies in moving patients through the healthcare system lead to unnecessary transfers, longer waits, and wasteful costs.
- Poorly managed patient flow in hospitals can lead to adverse health outcomes, including increased readmissions and mortality rates.
- Disorganized handoffs between referring physicians and hospitals, as well as between departments within a hospital also lead to patient flow problems

Is this patient appropriate for OBS status?

How long will they stay in the hospital?

When will they be ready for discharge?



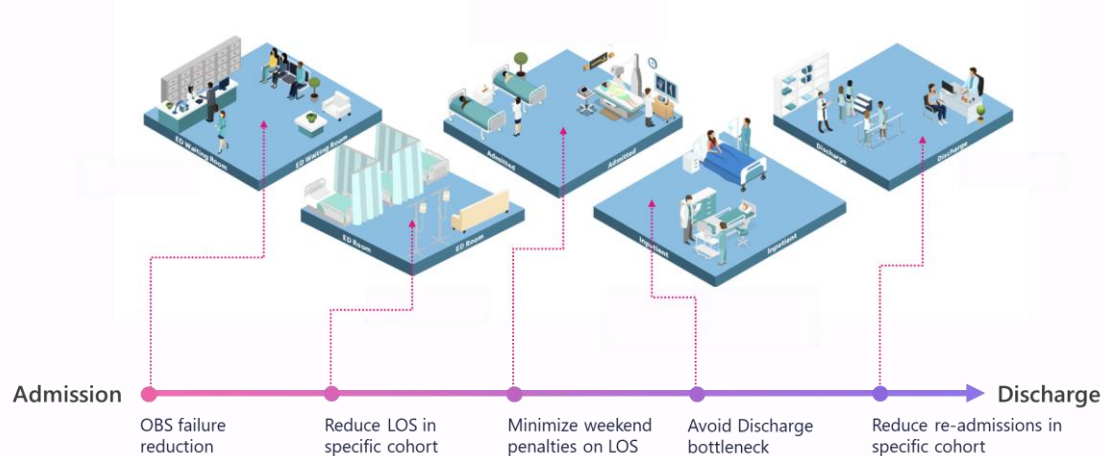
Where will they be discharged to?

Will they leave over a weekend?

Are they at risk for readmission?

# Patient Journey

A series of AI predictions can guide the patient's journey to the right outcomes at the right time



## Objective

## Improvement in clinical KPI

## Potential savings for health system

Reduce excess LOS

10% reduction in excess LOS

\$10 – \$40M per year

Prevent avoidable readmissions

3-5% reduction in readmissions

\$9.5 - \$16M per year

Prevent HRRP readmissions

Reduce HRRP readmissions to mean

\$1M per year

Avoid OBS failure

25% reduction in OBS failures

\$1.3M per year

## Total

**\$21.8 - \$58M** per year

\* Projections are based on various assumptions





# Risk Stratification using AI

A series of AI predictions can guide care coordination to the right patient at the right time at the right cost

Who might get sick?



Predict Population Health Risk by identifying future patterns of clinical and cost outcomes.

How sick will they get?



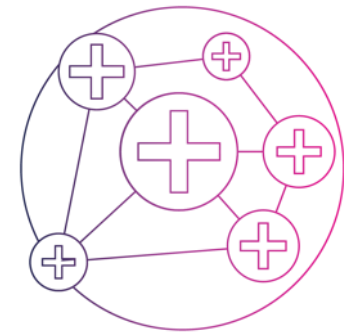
Model the complex interplay of disease progression and utilization to anticipate chronic and critical illness.

How do we prioritize the coordination of their care?



Optimize Care Coordination at out-patient, in-patient and home care levels by using predictive risk stratification

How can we optimize outcomes, quality and cost?



Identify and intervene to reduce variation in outcomes, quality, and cost measures.



# Risk Stratification Use Cases

Enhance administrative operations alongside member engagement & population health activities.

Reduce  
**cost of care**

## ED Utilization & High Utilizers

Predict members that are likely to use the ED for care more than N times in the next 12 months

## Unplanned Acute Utilization

Predict members that are likely to be admitted to the hospital for non-elective reasons

## Population Cost Stratification

Identify emerging high cost/receding high cost members and associated drivers of utilization

Improve  
**care team capabilities**

## Predictive Care Planning

Predict "time to" events that mark transitions in treatment

## Transitions of Care

Predict LOS, Discharge Disposition, Readmission Risk, & Rehab Needs

## Med Adherence

Predict member adherence to key medication classes

Enhance  
**administrative operations**

## Member Benefit Maximization

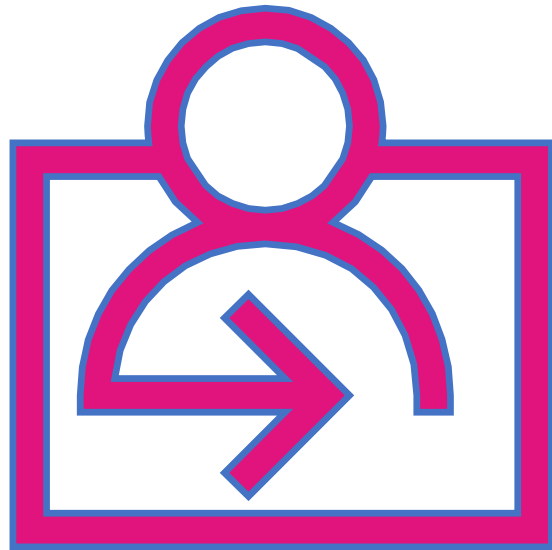
Identify variance in network utilization suggest appropriate level/acuity of care for specific procedures

## HCC Optimization

Flag members for uncoded or undercoded chronic condition categories

## Waste & Abuse

Identify anomalies in billing and coding

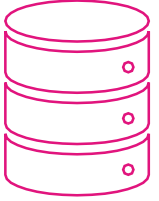


# Review: Opportunities for AI in Healthcare

- Patient's journey from admit to discharge in terms of flow prediction
  - *Admit to ED – Reduce wait times & Obs (patient observed status) failure*
  - *Admit to inpatient – Improve timely care, Reduce LOS, minimize weekend penalties*
  - *Discharge – Improve patient experience avoid discharge bottlenecks, reduce readmission*
- Benefits of Risk Stratification using AI
  - *Guide care coordination to the right patient at the right time at the right cost*
  - *Prioritize coordinate of care*
  - *Reduce variation in outcomes, quality and cost*
  - *Identify Rx abuse risk, predict Rx spend, optimize drivers of high-cost & utilization*

# Challenges for AI in Healthcare

# Challenges applying AI to Healthcare



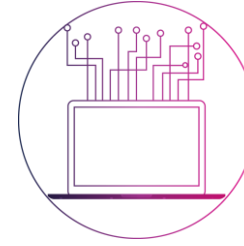
## Infrastructural Challenges

- Elasticity and flexibility in Compute, Storage, Network
- Quality of Data – Accurate data, semantic, syntactic and morphological correctness
- Security & Privacy – HIPPA, PHI, GDPR



## Business & Operations

- Operationalizing AI in decision making across operations, financial and clinical setups
- Engaging Stakeholders & integrating across workflows



## Explainability & Fairness

- Ensuring AI outcomes are interpretable and explain the why
- Ensuring systemic biases do not get reinforced with AI

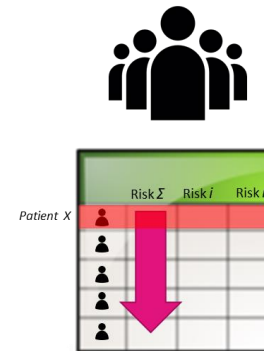


# Operationalizing AI

- Insights from AI need to be actionable
- Results should be communicated to end users in a format easy to comprehend
- Integrating AI into the hospital workflow can be challenging, requiring multiple systems and teams
- Explainability and interpretability are important to build trust in the models and provider adoption

## The Three Sorts of Actionable Risk Stratification

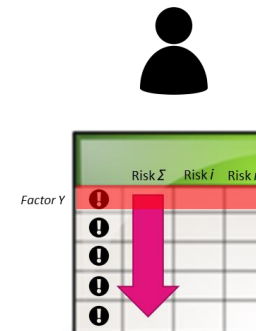
**Sort 1:**  
"Which Patient  
should I pay attention to first?"



Define actionable **risks**:

- Diabetes progression
- Complications
- Utilization
- Noncompliance

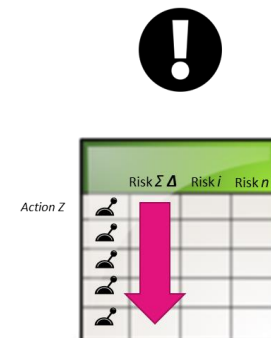
**Sort 2:**  
"Which Risk factor  
should I pay attention to first?"



Define actionable **risk factors**:

- Care Gaps
- Noncompliance
- Uncontrolled comorbidities etc

**Sort 3:**  
"Which Action  
Minimizes modifiable risk?"



Map Action Space

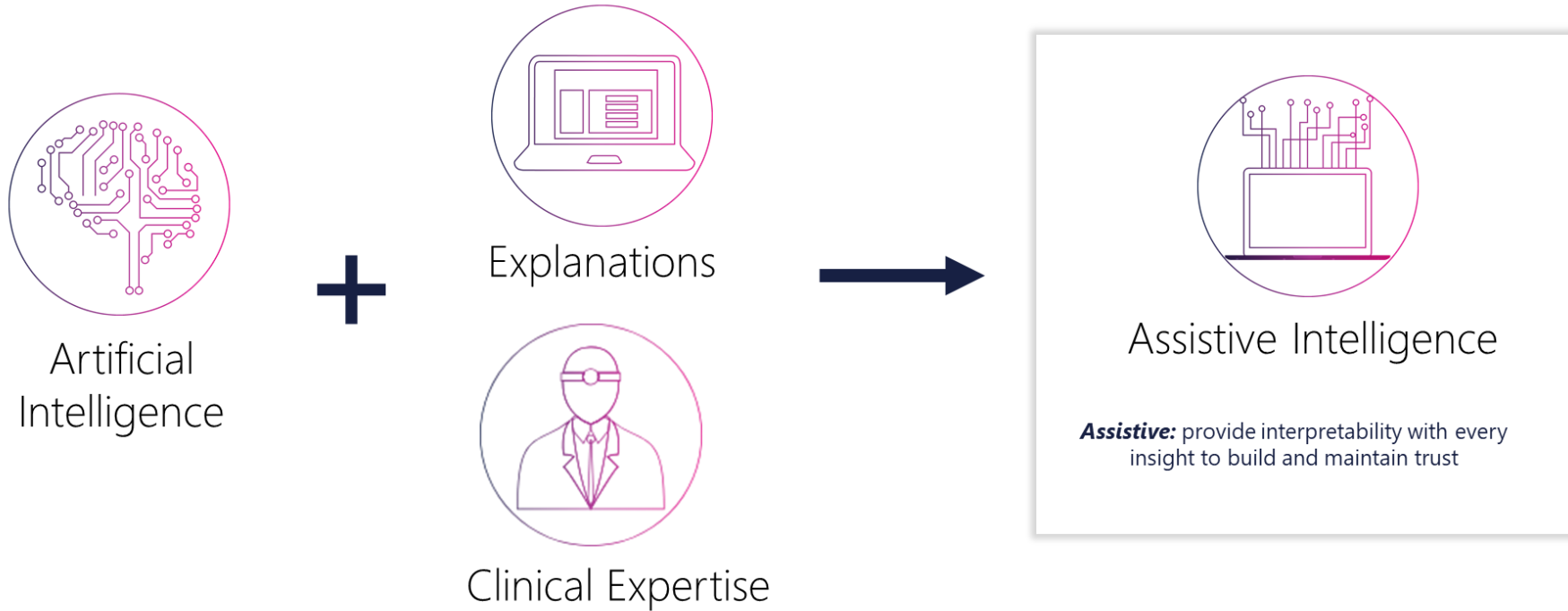
- Rx stop/start/change
- Visit follow up type/channel/cadence
- Patient outreach type/channel/cadence etc.

"What if...?"



# Explainability of AI outcomes in Healthcare

Explainable AI: Giving explanations of AI models to humans with domain knowledge to build trust so AI becomes Assistive Intelligence



Explainable AI is **Interpretable** by you

Length of stay

**5.6 days**



Typical LOS for similar patients:

5 days

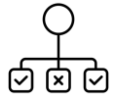
versus

Length of stay

**5.6 days**



# FATML – Key Concepts for Explainability



## Fairness

What drives model predictions?

Ensure non-discrimination in the ML/AI process & model decision making



## Accountability

Why did the model make a certain decision?

Validate and justify why certain key features drives the model's decisions



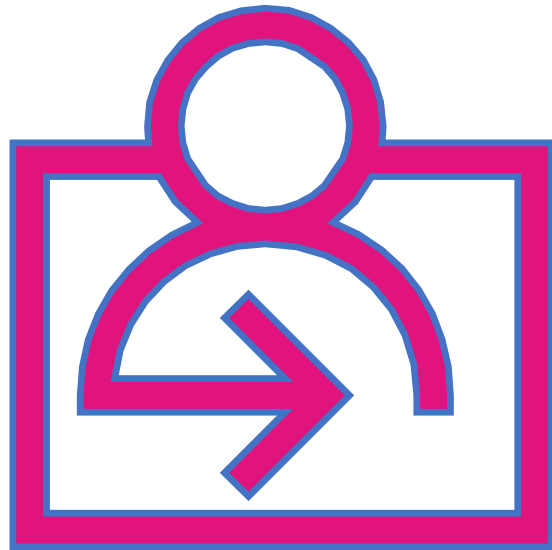
## Transparency

How can we trust model predictions?

Ability to audit the data and how a model makes decisions on it







# Review: Challenges applying AI to Healthcare

1. What are the unique challenges for AI in healthcare
  - *Infrastructure, Nature and Quality of Data, Security & Privacy, Operationalizing AI, Stakeholder Engagement, Workflow integration*
2. Challenges in applying AI to healthcare
  - *AI insights need to be actionable*
  - *Explainability and interpretability are important to build trust in the models and physician adoption*
  - *Integrating AI into the hospital workflow can be challenging, requiring multiple systems and teams*
  - *FATML – Fairness, Accountability, Transparency is at the core of healthcare AI*



# THANK YOU!!

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