# AUGMENTED INTELLIGENCE

*Ivy Lee, MD, FAAD*

*DIS October 2022*

Created with DALL-E, Sept 21, 2022.

# CONFLICTS

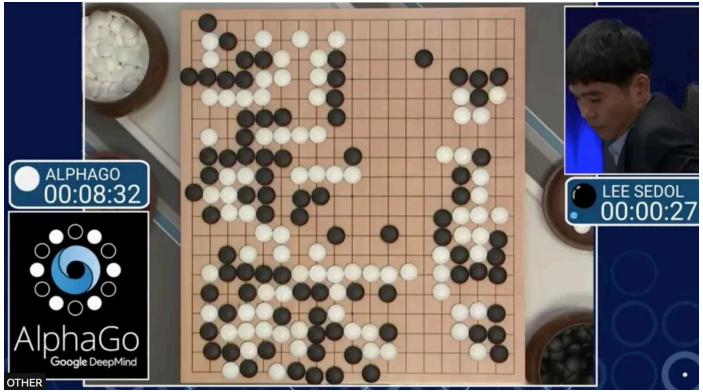
AAD Augmented Intelligence Committee (Deputy Chair)

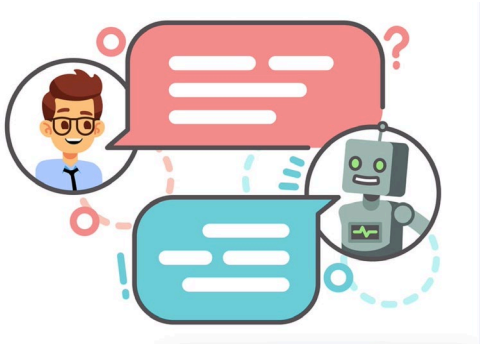
L'Oreal (Advisor)

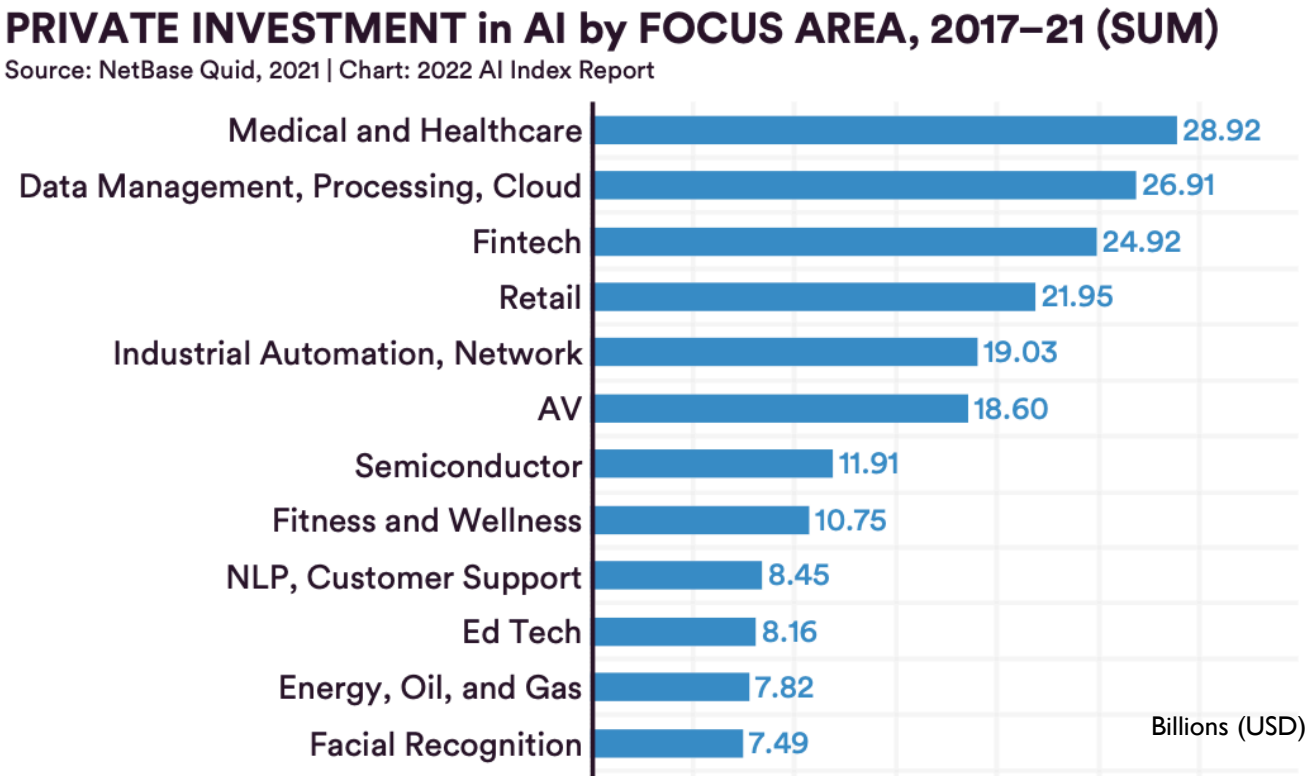
NOIE (Advisor)

# ARTIFICIAL INTELLIGENCE (AI)

The ability of a computer or robot to perform tasks commonly associated with intelligent beings.




Daniel Zhang, Nestor Maslej, Erik Brynjolfsson, John Etchemendy, Terah Lyons, James Manyika, Helen Ngo, Juan Carlos Niebles, Michael Sellitto, Ellie Sakhaee, Yoav Shoham, Jack Clark, and Raymond Perrault, "The AI Index 2022 Annual Report," AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University, March 2022.

# AI CAPABILITIES EMBEDDED in STANDARD BUSINESS PROCESSES, 2021

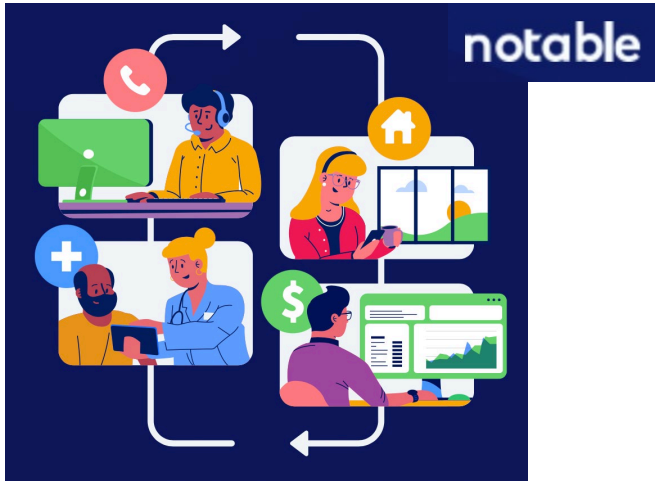
Source: McKinsey & Company, 2021 | Chart: 2022 AI Index Report

| Industry | Computer Vision | Deep Learning | Facial Regonition | Knowledge Graphs | NL Generation | NL Speech Un-derstanding | NL Text Un-derstanding | Physical Robotics | Recom-mender Systems | Reinforce-ment Learning | Robotic Process Automation | Simulations | Transfer Learning | Virtual Agents |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Industries | 23% | 19% | 11% | 17% | 12% | 14% | 24% | 12% | 17% | 16% | 26% | 17% | 12% | 23% |
| Automotive and Assembly | 15% | 14% | 9% | 16% | 3% | 11% | 12% | 24% | 12% | 5% | 33% | 27% | 6% | 12% |
| Business, Legal, and Professional Services | 29% | 24% | 15% | 20% | 23% | 18% | 19% | 13% | 22% | 27% | 31% | 18% | 21% | 19% |
| Consumer Goods/Retail | 23% | 12% | 14% | 17% | 11% | 13% | 14% | 4% | 8% | 8% | 16% | 9% | 1% | 15% |
| Financial Services | 17% | 16% | 11% | 16% | 12% | 18% | 32% | 4% | 13% | 16% | 33% | 12% | 12% | 28% |
| Healthcare Systems/Pharma and Medical Products | 30% | 25% | 12% | 19% | 10% | 8% | 26% | 28% | 22% | 13% | 28% | 22% | 19% | 31% |
| High Tech/Telecom | 28% | 22% | 6% | 17% | 17% | 18% | 34% | 5% | 19% | 15% | 23% | 14% | 11% | 25% |

% of Respondents (AI Capability)

Daniel Zhang, Nestor Maslej, Erik Brynjolfsson, John Etchemendy, Terah Lyons, James Manyika, Helen Ngo, Juan Carlos Niebles, Michael Sellitto, Ellie Sakhaee, Yoav Shoham, Jack Clark, and Raymond Perrault, "The AI Index 2022 Annual Report," AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University, March 2022.

Figure 4.3.3




Scheduling, intake, documentation, prior auth, payment

NUANCE

Suki®

Dragon speech recognition documentation

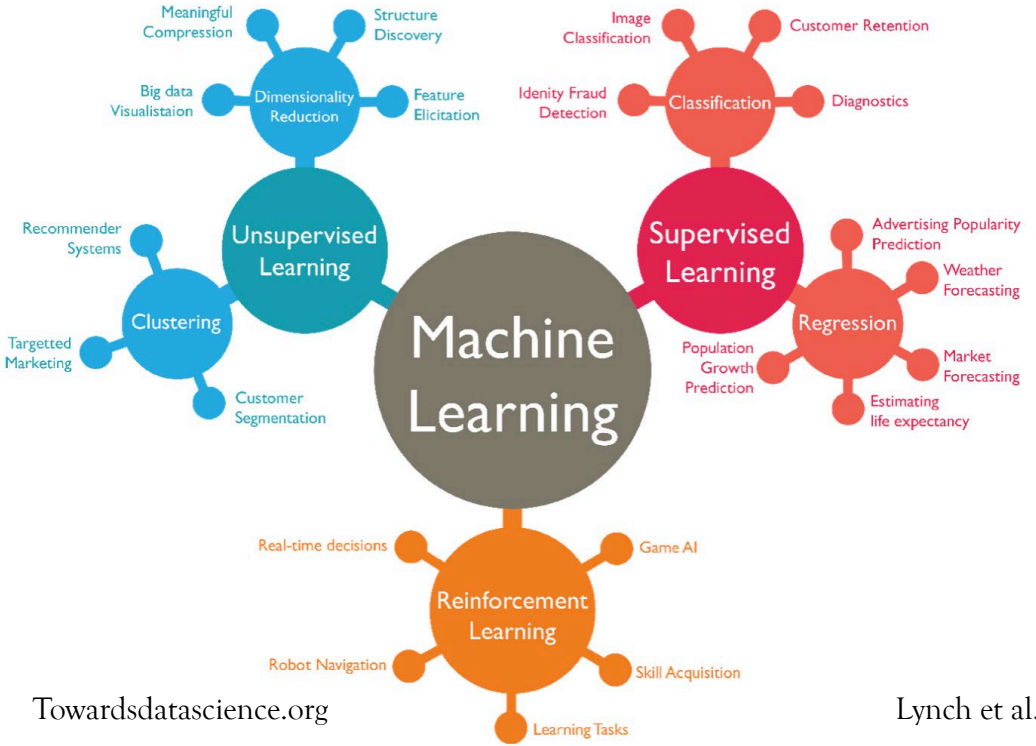


American Society of Anesthesiologists®

Using AI to create work schedules significantly reduces physician burnout

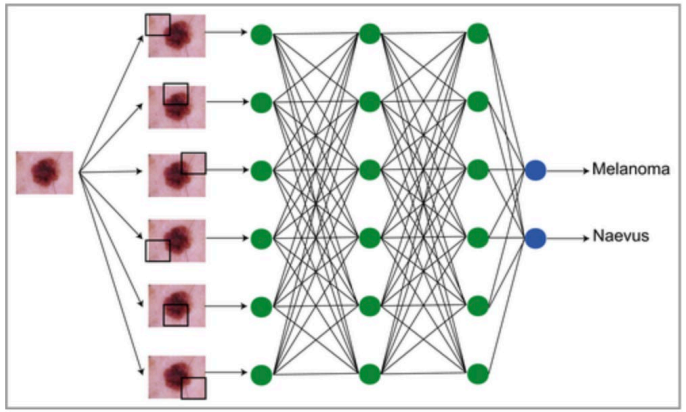
ADVANCE 2022

# AI




Towardsdatascience.org

# Neural Networks




Lynch et al. What is AI? Applications of AI in Dermatology. BJD 2020.

# AI REALITY

Rising interest in computer vision tasks

Cheaper and faster to train image classification

More affordable & higher performing

# CLINICIAN SENTIMENT

Digital health

.....will enable **positive transformation** (70%)

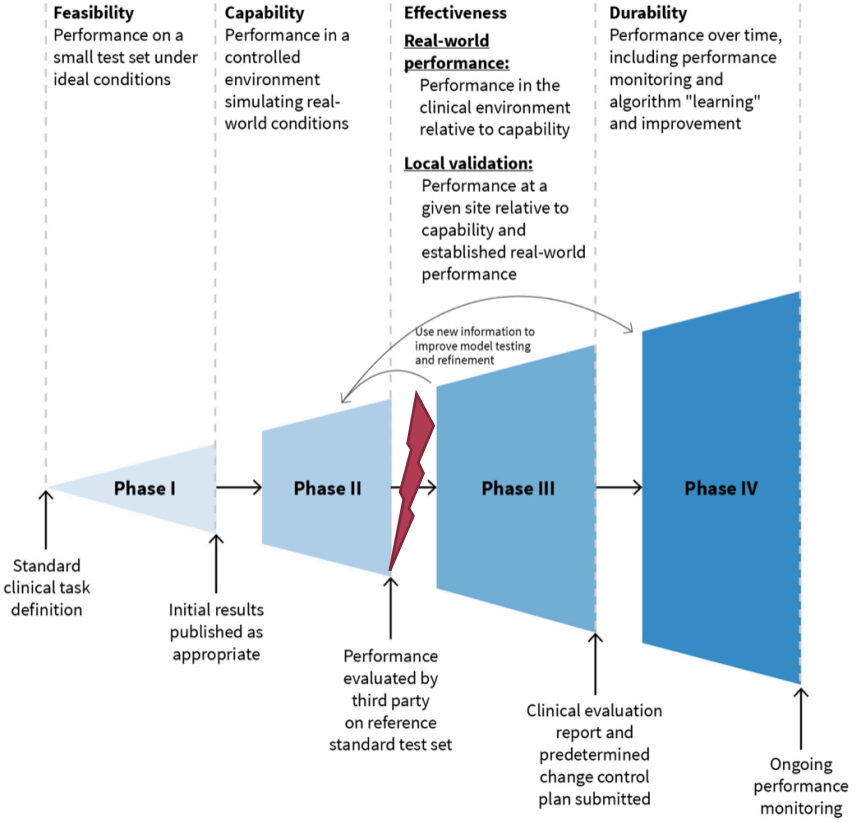
.....will be a challenging **burden** (69%)

.....will exacerbate health **inequalities** (64%)

56% expect to make most decisions with AI-enabled clinical decision support.

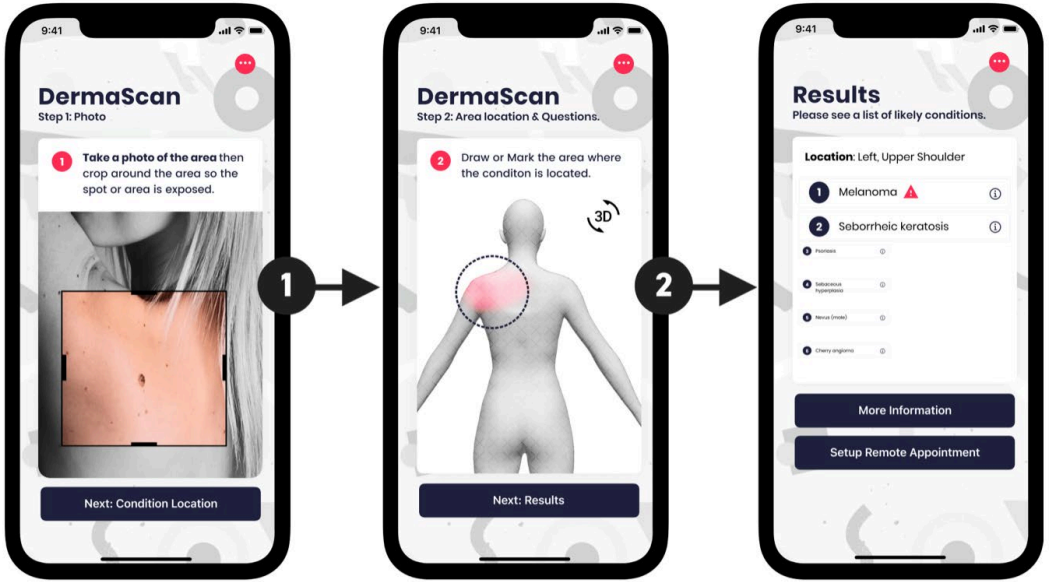
Clinician of the Future Report,
Elsevier 2022

# CODE-TO-CLINIC CHASM




Larson D, Rubin, D, Langlotz, C. Building Better Diagnostic Standards for Medical AI. Brookings Institute. Sept 2021

# DERM IMPLICATIONS




- No FDA-approved Derm AI solutions at this time
- Significant industry interest
- Active leadership in
  ....research
  ....advocacy
  ....education

# HOT TOPICS

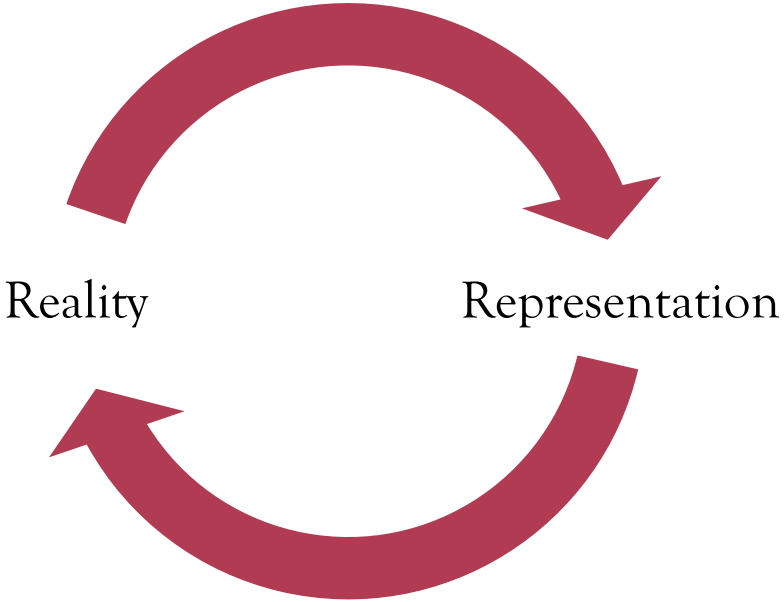
Data

Ethics

# Past Data → AI → Future Prediction

Quantity & Quality
Correct labelled
Diverse, representative

# DATA COLLECTION IS FOUNDATIONAL



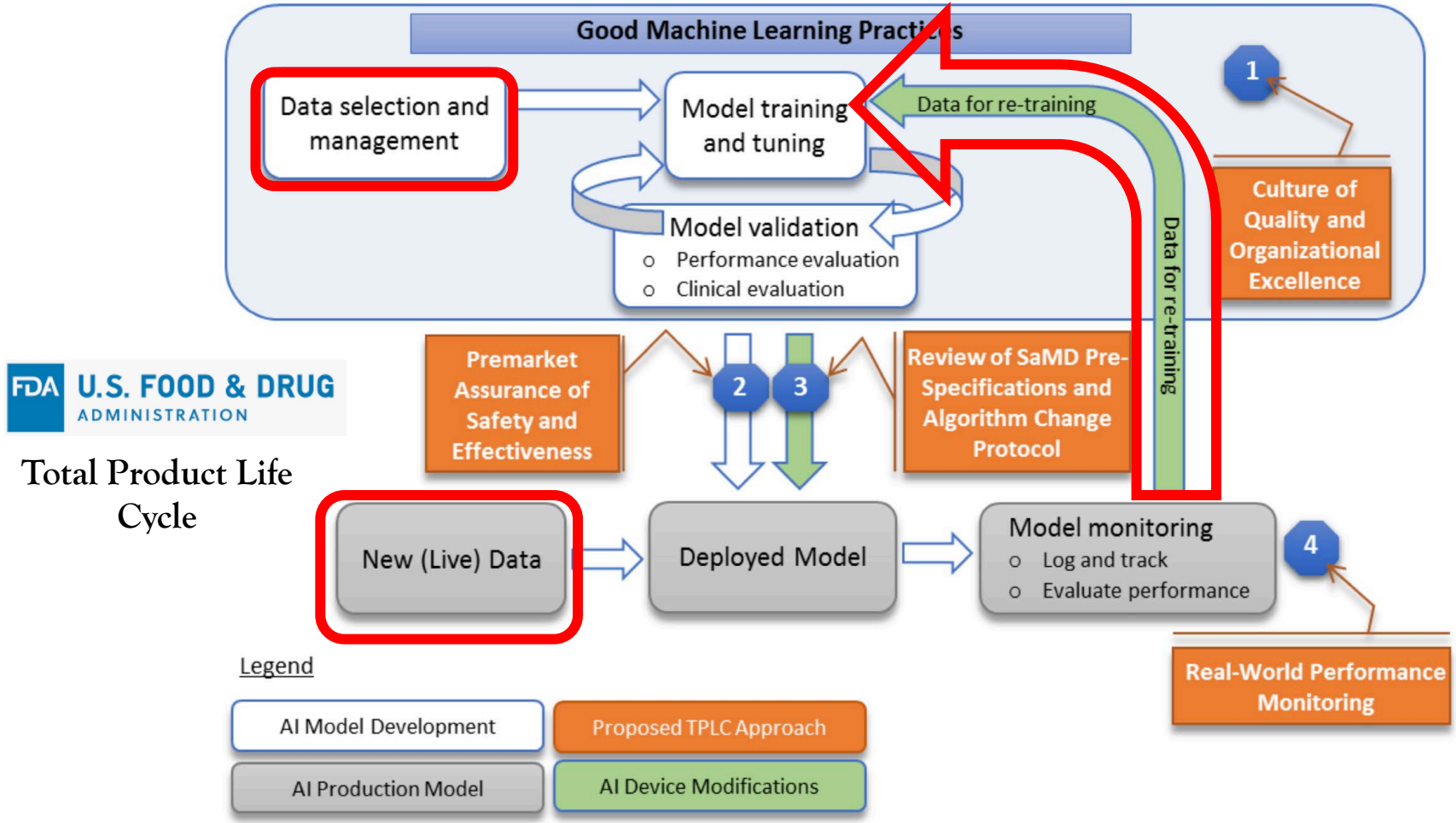



*Figure 2: Overlay of FDA's TPLC approach on AI/ML workflow*

FDA.gov. Accessed Sept 9, 2022.

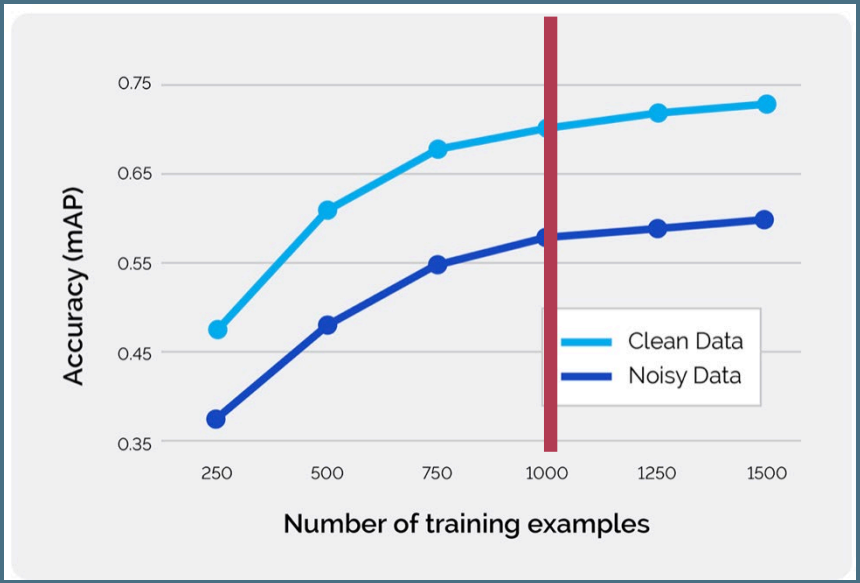
# DATA = FOUNDATION

Noisy
Lacks diversity
- Regional
- Racial
- Economic

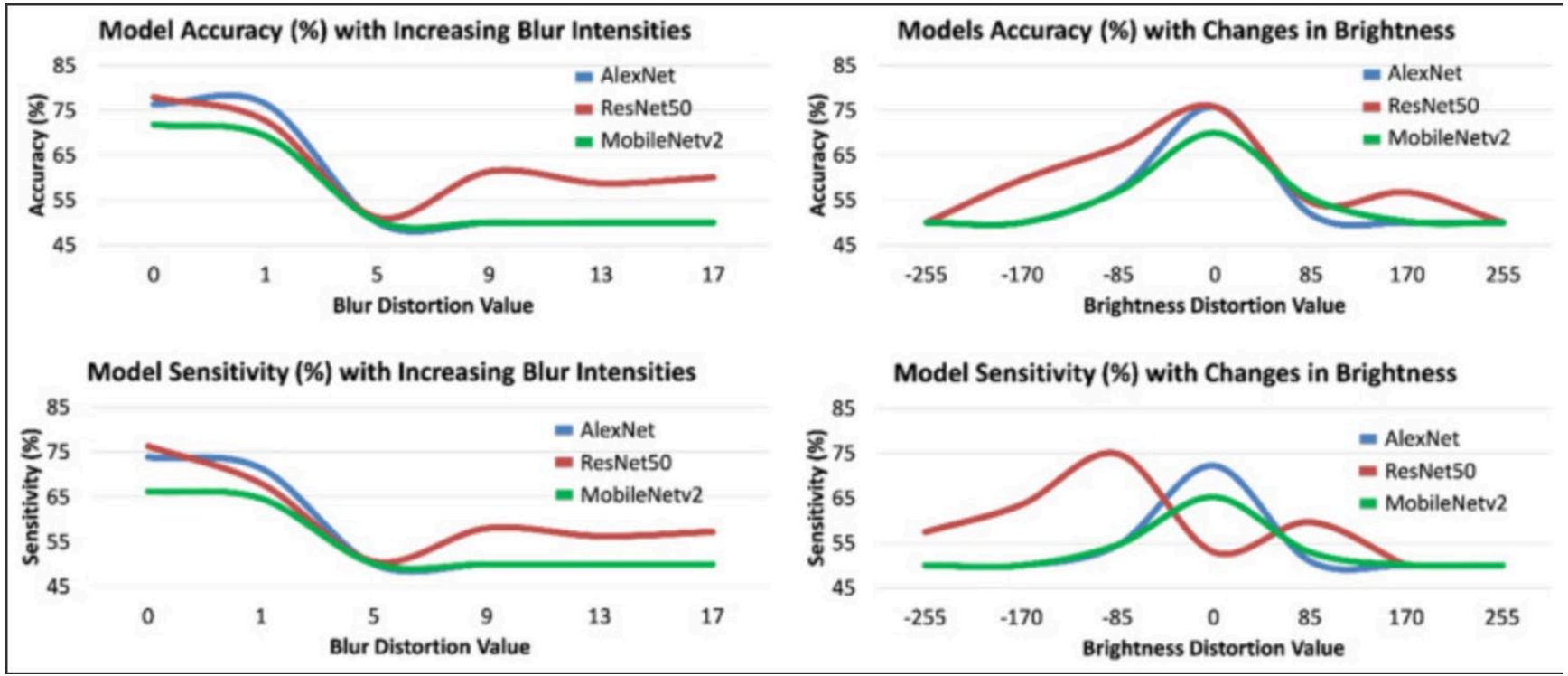
Siloed

Labelling can be subjective, human-intensive.

# AI = Math Model + Data




Andrew Ng. *Landing.ai*




Maier K, Zaniolo L, Marques O. Image quality issues in teledermatology: A comparative analysis of artificial intelligence solutions. J Am Acad Dermatol. 2021.

# DATA

| | | |
|---|---|---|
| Consent | Privacy | Security |
| Standards | Bias | Drift |

U.S. FOOD & DRUG ADMINISTRATION

Health Canada Santé Canada

Medicines & Healthcare products Regulatory Agency

## Good Machine Learning Practice for Medical Device Development: Guiding Principles

October 2021

| | |
|---|---|
| Multi-Disciplinary Expertise Is Leveraged Throughout the Total Product Life Cycle | Good Software Engineering and Security Practices Are Implemented |
| Clinical Study Participants and Data Sets Are Representative of the Intended Patient Population | Training Data Sets Are Independent of Test Sets |
| Selected Reference Datasets Are Based Upon Best Available Methods | Model Design Is Tailored to the Available Data and Reflects the Intended Use of the Device |
| Focus Is Placed on the Performance of the Human-AI Team | Testing Demonstrates Device Performance During Clinically Relevant Conditions |
| Users Are Provided Clear, Essential Information | Deployed Models Are Monitored for Performance and Re-training Risks are Managed |

FDA.gov. Accessed Sept 9, 2022.

SPIRIT-AI

Reporting Guidelines for Clinical Trial Protocols for Interventions Involving Artificial Intelligence

The SPIRIT-AI Extension

CONSORT-AI

Reporting Guidelines for Clinical Trial Reports for Interventions Involving Artificial Intelligence

The CONSORT-AI Extension

# ETHICS

- Consent & Choice
- Transparency & Explainability
- Bias, Fairness, & Equity

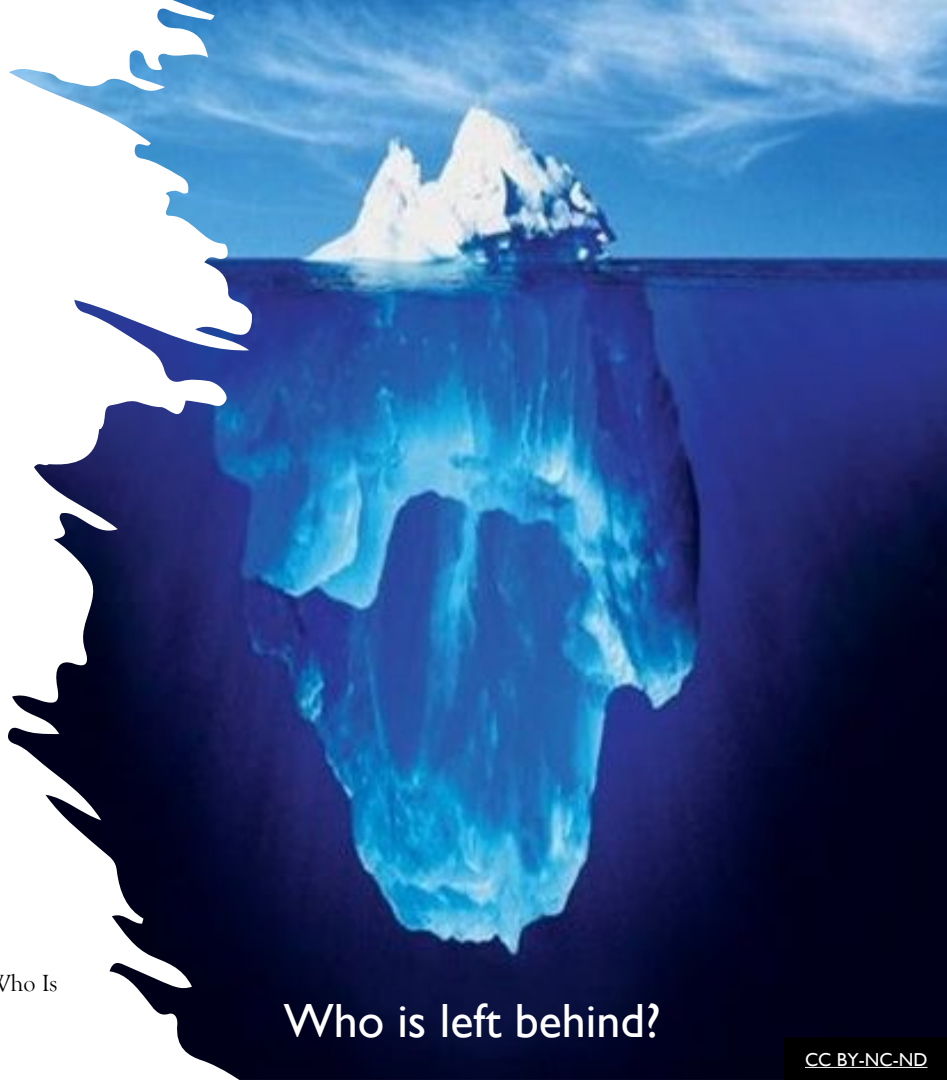
# TECHQUITY & THE DIGITAL DIVIDE

**Data Disparities**

- Older
- Non-White
- ESL
- Lower income
- Rural
- Uninsured or underinsured

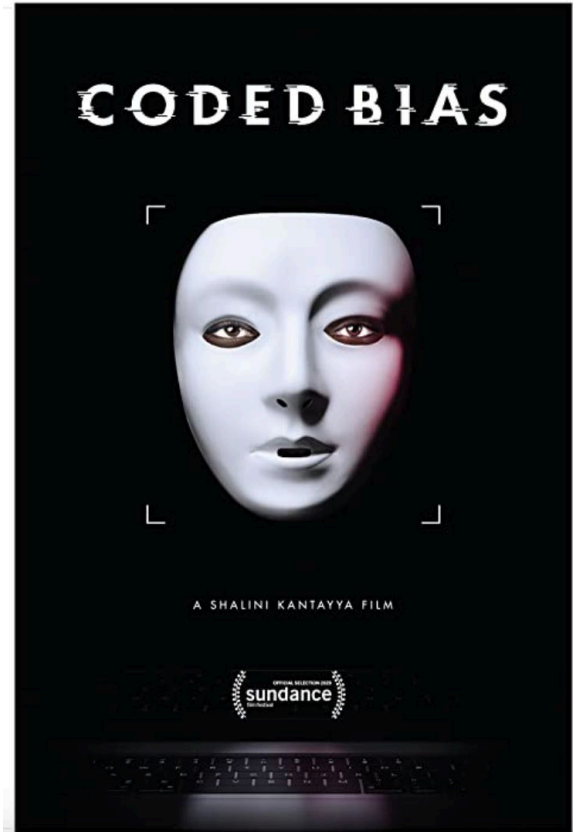
**AI Algorithmic Bias**

- Representational harm
- Allocative




Jonathan H. Cantor, Ryan K. McBain, Megan F. Pera, Dena M. Bravata, Christopher M. Whaley, Who Is (and Is Not) Receiving Telemedicine Care During the COVID-19 Pandemic, American Journal of Preventive Medicine,Volume 61, Issue 3,2021,Pages 434-438.

OPTUM®




Joy Buolamwini. Algorithmic Justice League.

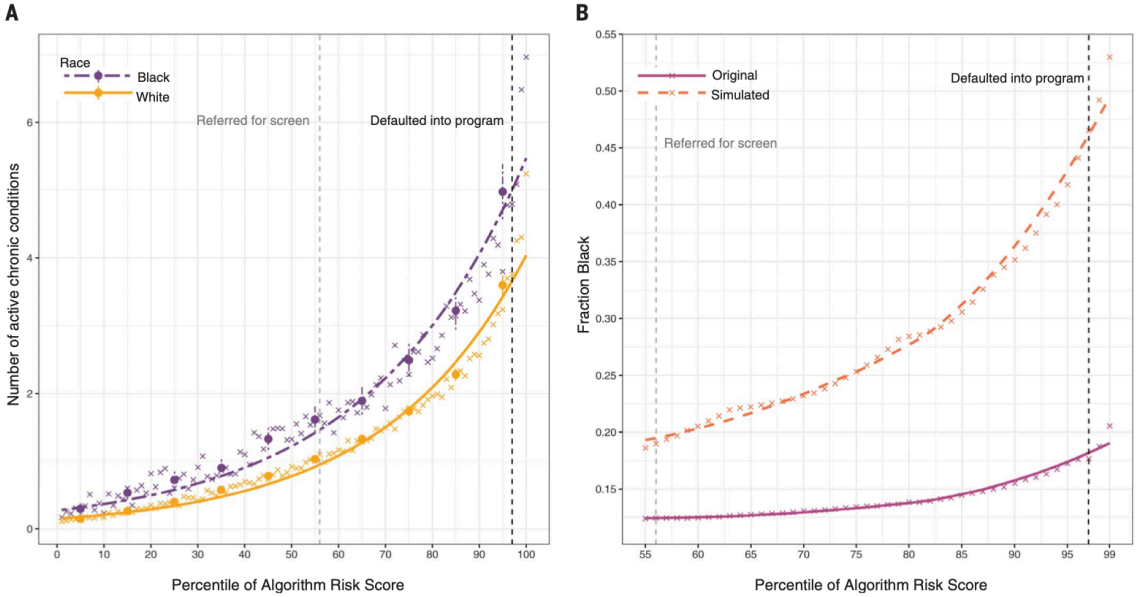
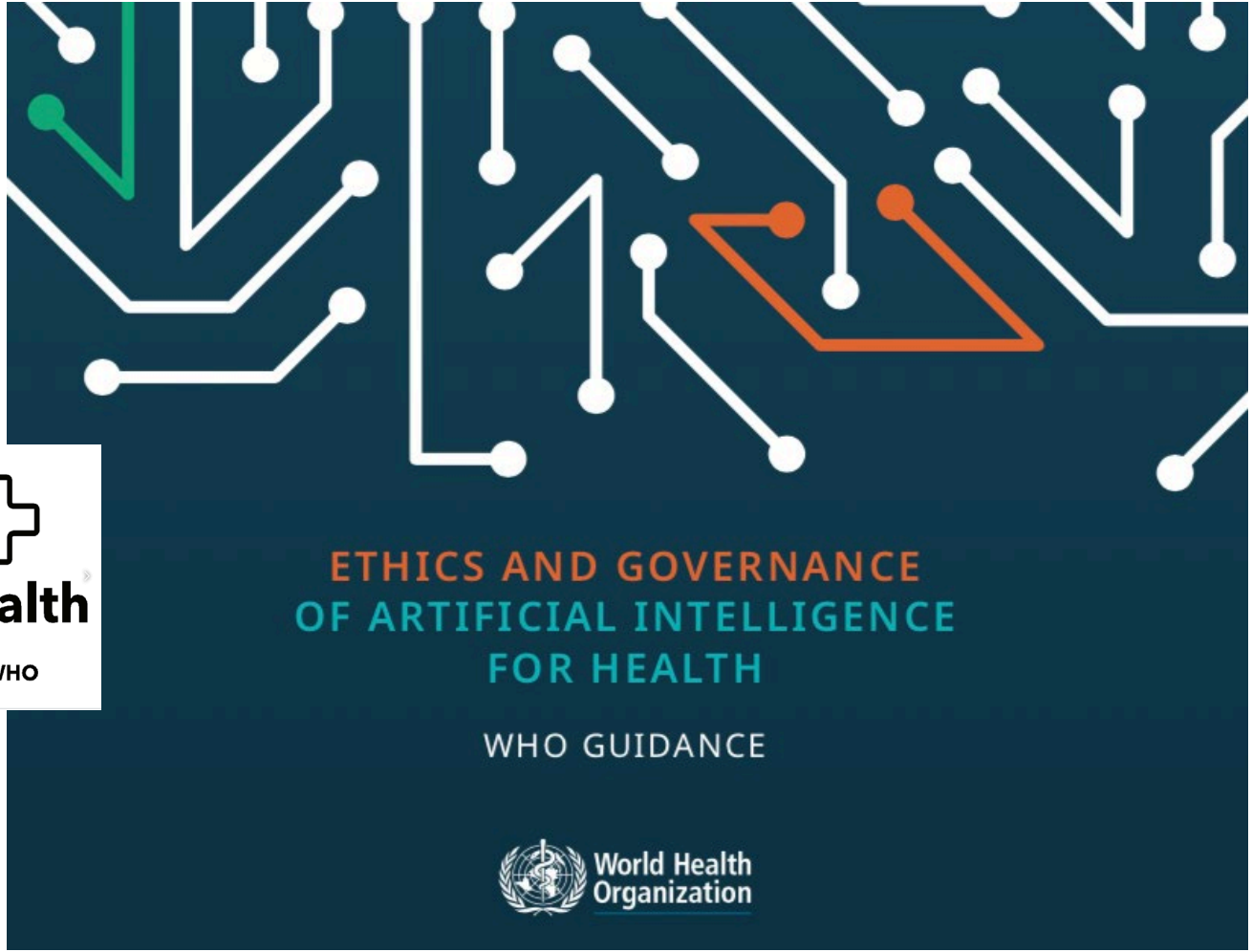



**Fig. 1. Number of chronic illnesses versus algorithm-predicted risk, by race.** (**A**) Mean number of chronic conditions by race, plotted against algorithm risk score. (**B**) Fraction of Black patients at or above a given risk score for the original algorithm ("original") and for a simulated scenario that removes algorithmic bias ("simulated": at each threshold of risk, defined at a given percentile on the *x* axis, healthier Whites above the threshold are replaced with less healthy Blacks below the threshold, until the marginal patient is equally healthy). The × symbols show risk percentiles by race; circles show risk deciles with 95% confidence intervals clustered by patient. The dashed vertical lines show the auto-identification threshold (the black line, which denotes the 97th percentile) and the screening threshold (the gray line, which denotes the 55th percentile).

Obermeyer Z, Powers B, Vogeli C, Mullainathan S. Dissecting racial bias in an algorithm used to manage the health of populations. Science. 2019 Oct 25;366(6464):447-453.




AI for Health

An ITU Focus Group
In collaboration with WHO

# AUGMENTED INTELLIGENCE

The synergy between human +AI.

Focus on AI's assistive role to enhance human intelligence and the physician/patient relationship rather than replace it.

AAD Position Statement, 2019

# OUR ROLE & RESPONSIBILITY

Human in the loop

Domain expertise

- Define the task
- Determine intended, appropriate, and meaningful use
- Data strategy (collect, curate, label/annotate)
- Intentional inclusivity

Patient trust

North Star: safe, fair, trustworthy

# DERM PERSPECTIVES ON AI & AUI

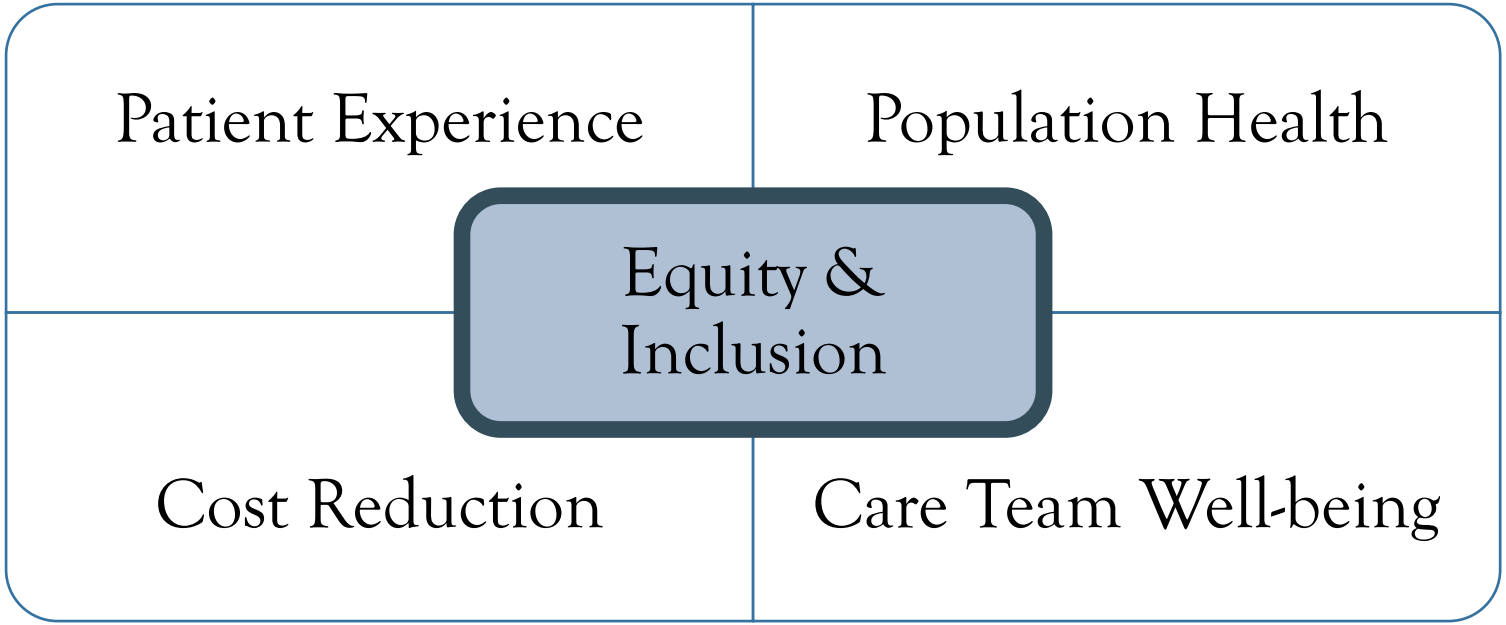
- 46% believe AI will positively impact derm practice
- 64% believe AuI will positively impact derm practice
- Top 3 potential benefits: Improve triage (66%), increase access (47%), quicker dx (31%)
- Top 4 potential risks: Lack follow-up (54%), lack control (47%), human deskilling (42%)
- 57% would use an AI-enabled diagnostic tool for skin lesions (if comparable accuracy)
- If human vs AI dx differed (benign vs malig) , 76% were more likely to biopsy
- If human vs AI dx differed (malig vs benign), 8% were less likely to biopsy
- 75% would use an AI-enabled skin lesion monitoring tool
- Top 3 challenges to implementation: disrupt patient-provider relationship (54%), accuracy (53%), liability (47%)

Kovarik et al. JAMA Derm. 2021

# OUR PATIENTS

- Literacy
- Safety
- Consent & Choice
- Transparency, Explainability
- Cost
- Care Coordination
- Connection & Trust

# QUINTUPLE AIM




Institute for Healthcare Improvement


Identify core values and priorities

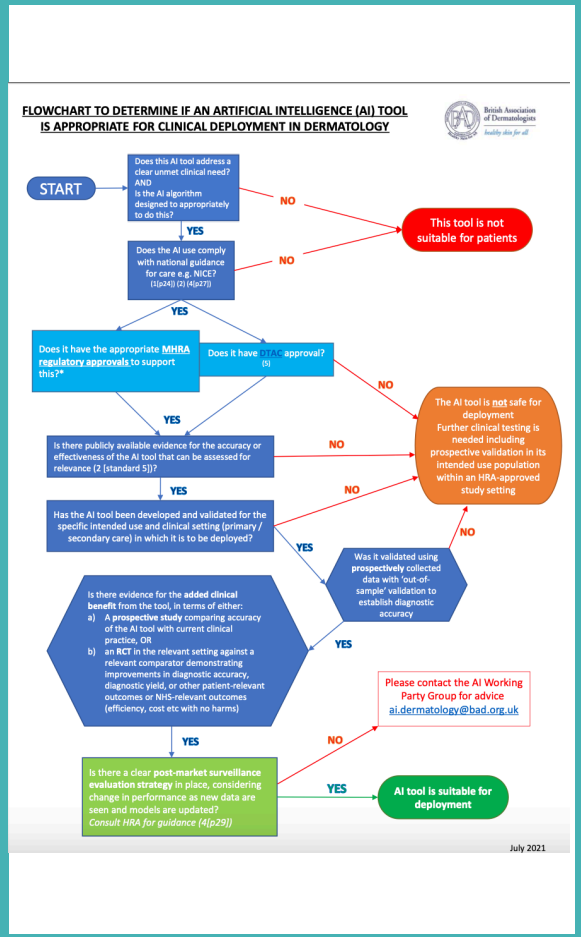
Anticipate and address concerns

Educate ourselves and our patients

Collaborate within and beyond medicine

Luo Y, Wunderink RG, Lloyd-Jones D. Proactive vs Reactive Machine Learning in Health Care: Lessons From the COVID-19 Pandemic. *JAMA*. 2022;327(7):623–624.

AMERICAN TELEMEDICINE ASSOCIATION




AMA AMERICAN MEDICAL ASSOCIATION

BRITISH ASSOCIATION OF DERMATOLOGISTS BAD EST. 1920 - HEALTHY SKIN FOR ALL

AAD American Academy of Dermatology Association

Bad.org.uk. Accessed Sept 9,2022.

# REGULATION

## State

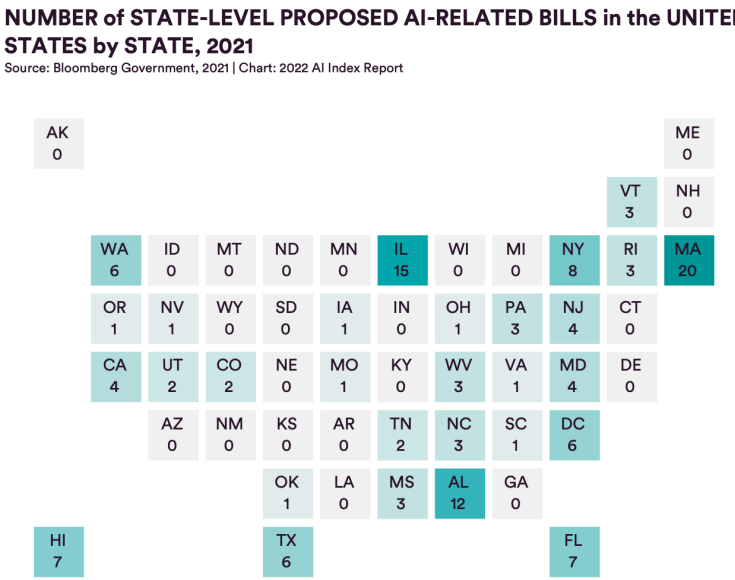



Figure 5.1.6

## Federal

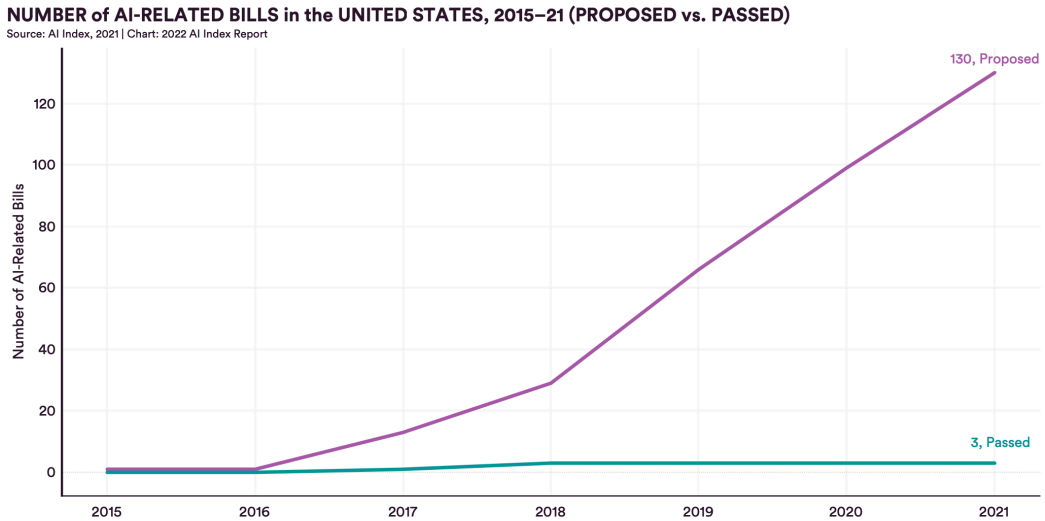



Figure 5.1.3

Daniel Zhang, Nestor Maslej, Erik Brynjolfsson, John Etchemendy, Terah Lyons, James Manyika, Helen Ngo, Juan Carlos Niebles, Michael Sellitto, Ellie Sakhaee, Yoav Shoham, Jack Clark, and Raymond Perrault, "The AI Index 2022 Annual Report," AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University, March 2022.

# SUMMARY

AI has potential for significant **benefit or harm**.

Dermatologists can **shape the trajectory** of augmented intelligence and **set standards** by curating **data**, infusing **ethics**, and honoring patient and societal **trust**.

We must **proactively** integrate our values and priorities in the design and deployment of AuI that is appropriate and **clinically meaningful**.

**Education** and **collaboration** will amplify our impact through AuI.

*MEDICINE IS EVOLVING FROM A CLINICAL SCIENCE SUPPORTED BY DATA TO A DATA SCIENCE SUPPORTED BY CLINICIANS.*

*- Pamela Spence*
*The Economist*
*December 2, 2020*