

Responsible AI in Genomics & Precision Health: From Molecules to Patients

Tina Hernandez-Boussard, PhD, MPH, MS

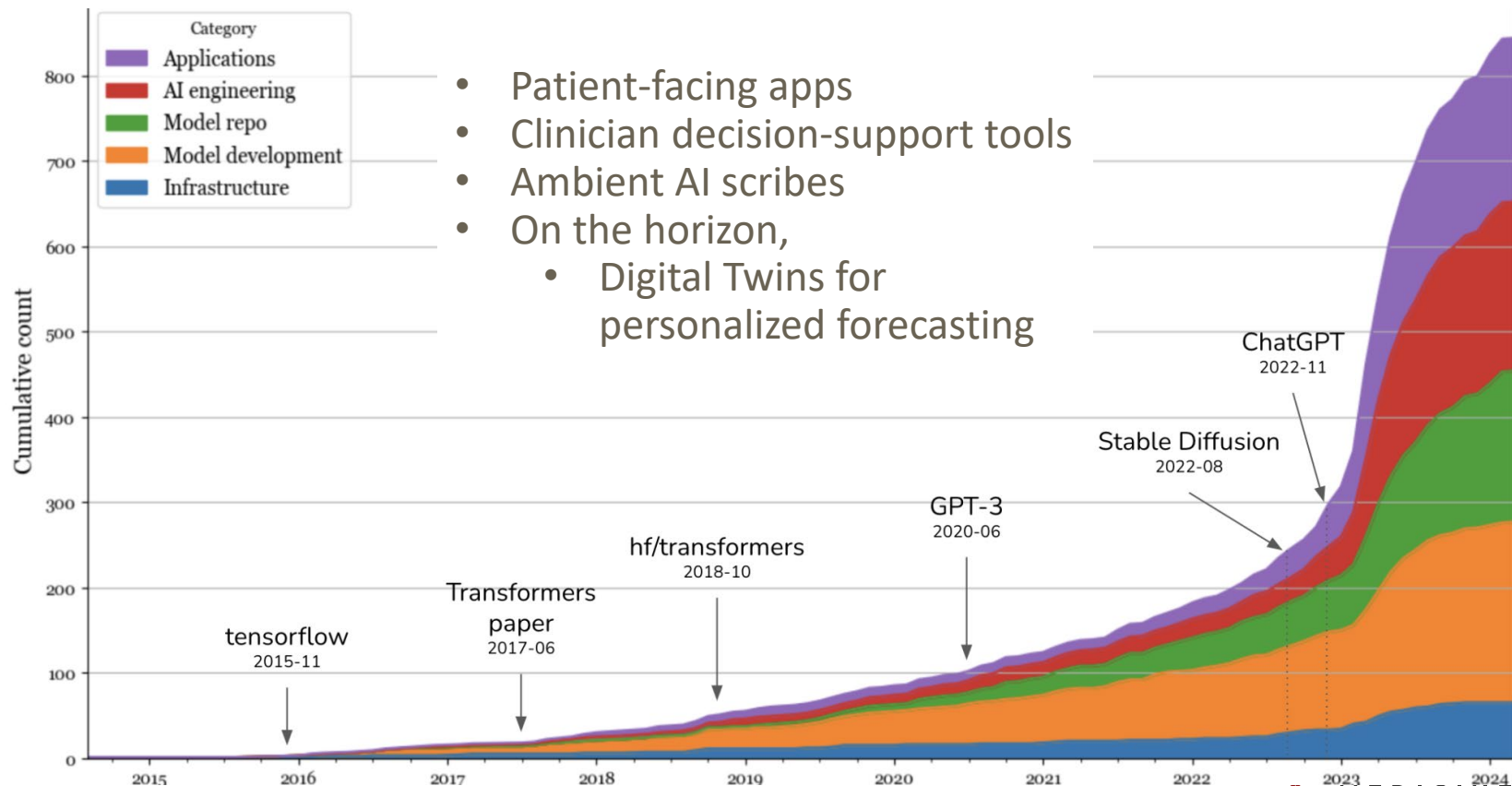
Associate Dean of Research, Stanford SOM

Professor of Medicine, Biomedical Data Science, Surgery, and
Epidemiology & Population Health (by courtesy)

Director, Health Informatics CTSA Spectrum

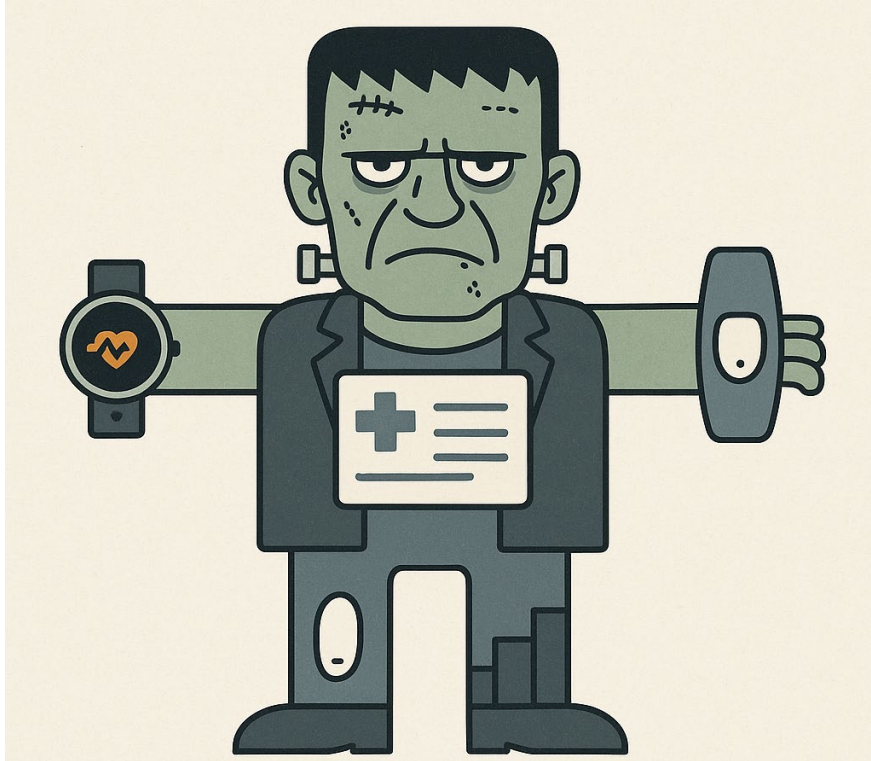
boussard@Stanford.edu

The New Clinical Toolbox



- Patient-facing apps
- Clinician decision-support tools
- Ambient AI scribes
- On the horizon,
 - Digital Twins for personalized forecasting

Expanding Data Ecosystem



Data Types

- Clinical history
- Patient characteristics
- Social determinants of health
- Genomics -Omics
- Environmental measures
- Mechanistic models
- Novel data streams
 - Ambient AI
 - Voice

It's not just clinical history or biology,
its **biography** – shaped by
lived experiences

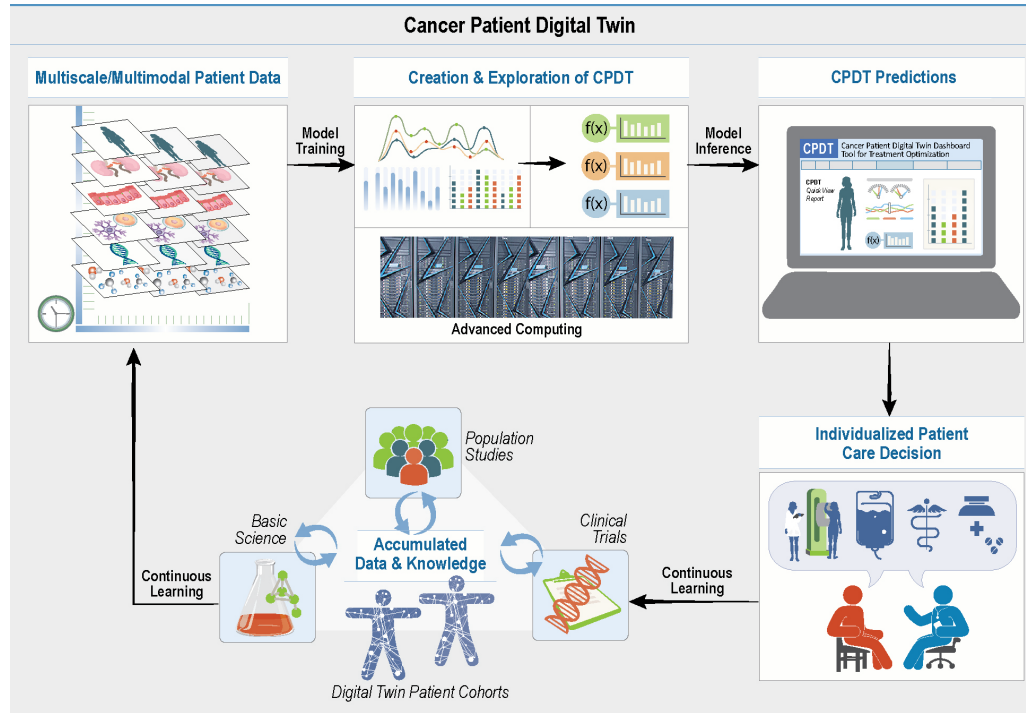
The Promise and Peril of AI Tools

- Shifting from siloed data to robust tools
- Fueled by RWD
- Promises turn lived experience into actionable insight
- Peril is blurred boundaries between technical innovation and ethical responsibility

Dynamic, data-driven representations of people



Individual Digital Twin



- + Hernandez-Boussard, Tina, et al. Digital twins for predictive oncology will be a paradigm shift for precision cancer care. *Nature medicine* 27.12 (2021)
- + Sadée, Christoph, et al. "Medical digital twins: enabling precision medicine and medical artificial intelligence." *The Lancet Digital Health* (2025).

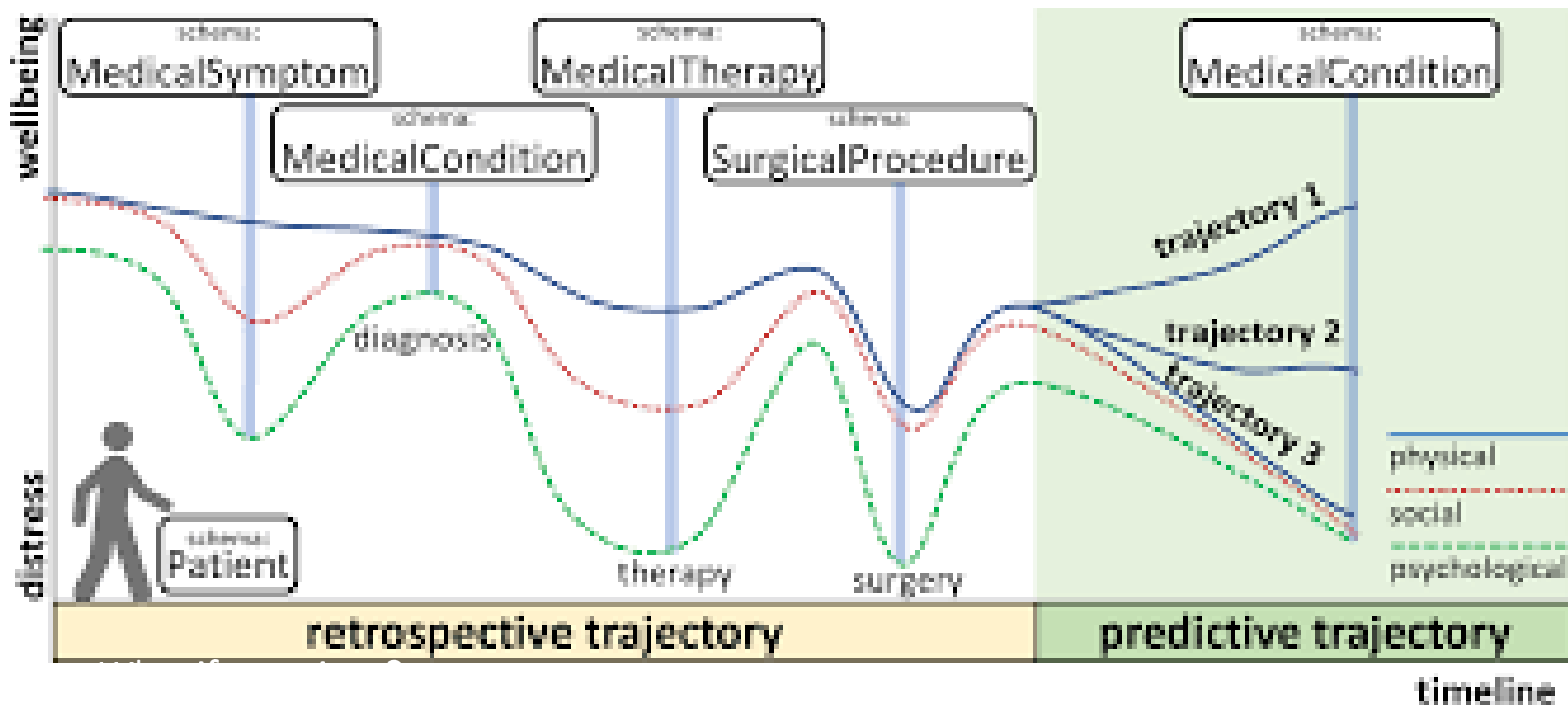
What is a Digital Twin?

- Virtual representation of real-world entities & processes synchronized at a specified frequency and fidelity
- Real-time & historical data to represent past, present and simulate predicted future states
- One platform to bring all experts together providing powerful analysis, insights, and diagnostics

Ownership and Regulations



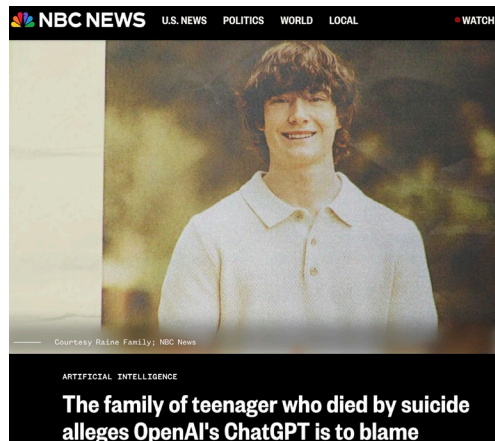
From Measurement to Intervention



AI Chatbots for Mental Health



- Promise
 - 24/7 support
 - Lower stigma
 - Scalable access
- Perils
 - Fundamental Lack of Oversight
 - Wellness tools – not FDA regulated



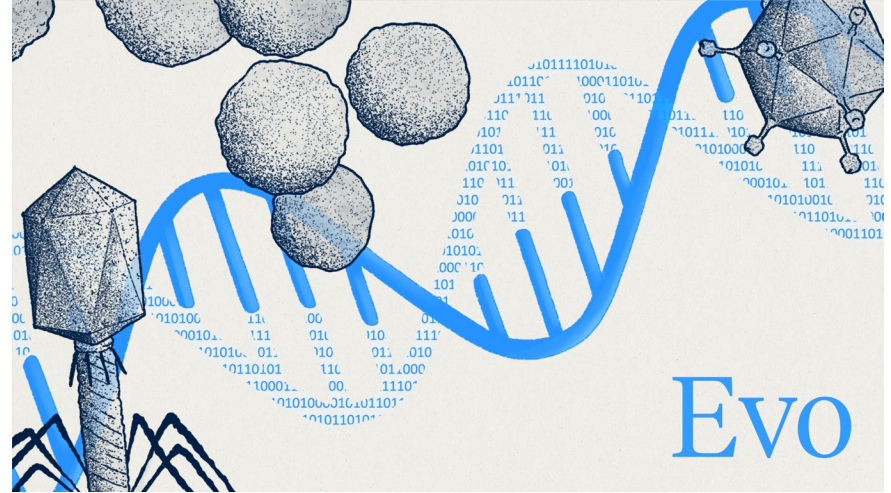
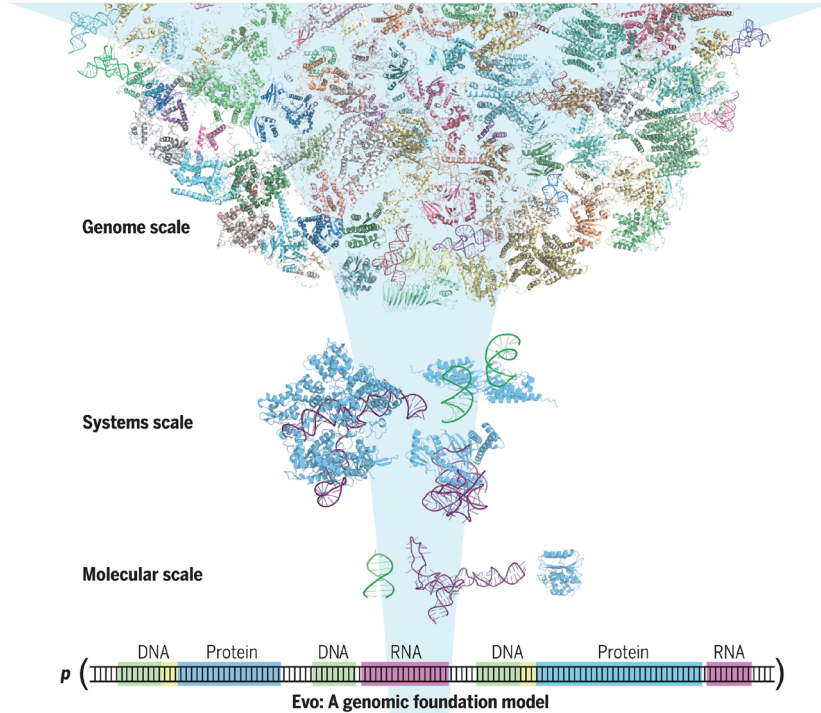
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Building AI for – *not with* - Clinicians & Patients

- Tools must **be clinically bounded**—**built**, tested, and interpreted with domain experts
 - Patients and clinicians define utility
 - technologists ensure safety and transparency
- Human-in-the-loop architectures, embedding expert review directly into model training and interpretation
- Misaligned incentives



EVO and EVO-2: Power, Precision, Precaution



Garyk Brixi et al. under review

Eric Nguyen et al. Science 386,eado9336(2024).

Fragile Intelligence of Responsible AI

- Leap in language fluency and benchmark performance
 - Clinical reliability remains fragile.
- Hallucinations, rule-breaking, and latent biosecurity risks persist
- Disclaimers are disappearing
 - <1% of medical responses now include “not a medical device” warnings





— Courtesy Raine Family; NBC News

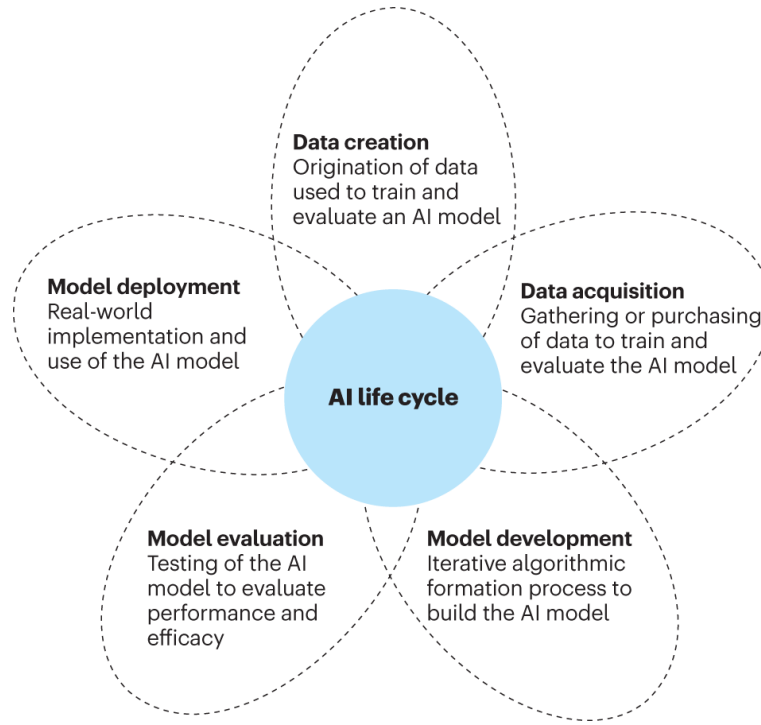
ARTIFICIAL INTELLIGENCE

The family of teenager who died by suicide alleges OpenAI's ChatGPT is to blame



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Holistic View of the AI Life Cycle



Transparency & Explainability



EQUITY AS FIRST
PRINCIPLE



TRANSPARENCY



COMMUNITY CO-
DESIGN



ENFORCEABLE
INSIGHT



INTERDISCIPLINARY
STEWARDSHIP

A photograph of a modern, multi-story building with a large, flat, reddish-brown roof and large glass windows. A tall palm tree is in the foreground on the left. The building has a modern architectural style with concrete pillars and a mix of glass and solid wall sections. The scene is set outdoors on a grassy area with some trees and a clear sky.

Thank you



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