**# Introduction to Causal ML/AI and its relevance in healthcare**

* Outline for White Paper Section 1

**The Challenge: In a World of Big Data, "Why" Matters More Than Ever**

The Data Revolution in Healthcare

- Explosion of electronic health records, medical claims, disease registry, wearables, genomics, and other real-world data

- Success stories: early disease detection, personalized medicine, operational efficiency

Power of Traditional AI/ML and Its Fundamental Limitation:

- common successes like image recognition for radiology (finding tumors) or predicting which patients are at high risk for sepsis or readmission.

- Traditional AI/ML is great at answering "What will likely happen?" but it cannot answer "What should we do about it?"

- The hidden challenge: correlation vs. causation: Traditional ML is great at answering "What will likely happen?" but it cannot answer "What should we do about it?"

**The Core Problem: Correlation is Not Causation.**

Moving Beyond "What" to "Why"\*\*

- Traditional ML: excellent at prediction ("Who will be readmitted?")

- Causal ML: answers intervention questions ("Will this treatment reduce readmissions?")

- The fundamental difference: correlation tells us what happened, causation tells us what will happen if we act

**The Bridge to Causality: What is Causal ML/AI**

Fig 1. The Three Levels of Evidence (Ladder of Causation - simplified)

-Level 1 - Association: e.g. “Patients on statins have fewer heart attacks”

-Level 2 - Intervention: e.g. “If we give statins to this patient, will heart attacks decrease?”

-Level 3 - Counterfactual: e.g. “Would this patient's outcome have been different with a different treatment?”

🡺 requires moving beyond observing associations to understanding cause and effect.