CONNECTING DATA to CAUSALITY

MOST SCIENTIFIC ENDEAVORS have a CAUSAL ELEMENT.

HOW? WHY? WHAT? WHAT IF...?

ACROSS DOMAINS, SCIENTIST HAVE DIFFERENT WAYS to I.D. CAUSE & EFFECT RELATIONSHIPS

RESEARCHERS INSERT & TEST VARIABLES in CAUSAL MODELS

= "A"
= "B"
= "C"

IN CONTRAST...

ML LEARNS from DATA RATHER THAN SYSTEM RULES (like PHYSICAL LAWS)

SOMETIMES, DATA can be NOISY.

RESEARCHERS can IMPROVE AI APPLICATIONS by BEING ATTENTIVE to STRUCTURES w/in DATA!

BUT, FAILURE CAN HAVE HUGE NEGATIVE EFFECTS...

AIM in AI RESEARCH... CAUSAL INFERENCE: the ABILITY to ID CAUSE-&-EFFECT RELATIONSHIPS in DATA -

MIS-IDENTIFICATION of US vs. USSR TANKS...

INACCURATE ASSESSMENT of COLLAPSED LUNG...

AI FOUND CO-INCEDENT PATTERNS, RATHER THAN CAUSAL ONES

THESE ERRORS COME from a CORE ASSUMPTION..

DATA in the REAL WORLD DOES NOT FOLLOW IID (INDEPENDENT + IDENTICAL DISTRIBUTION)

WE NEED AI MODELS that can MANAGE this VIOLATION

DISTINGUISH BETWEEN PATTERNS that:
- CO-OCCUR
- are CAUSAL

a TRULY CAUSAL AI MODEL WOULD...
- FUNCTIONAL ACROSS VARIED ENVIRONMENTS
- ROBUST
- EFFICIENT to TRAIN & DEPLOY

COMBINES the STRENGTH of STATISTICAL MODELING w/ DIFFERENTIAL EQUATIONS

ACHIEVING this POTENTIAL will REQUIRE...
- OPERATE w/OUT-of-DISTRIBUTION DATA
- LEARN a TASK from FEX EXAMPLES
- HELP ATTRIBUTE CREDIT for ACTIONS in DIFFERENT INTERVENTIONS
- COMMUNICATE in MULTIPLE METHODS

GOOD MODEL DESIGN REQUIRES COLLABORATION

LOT'S of MICRO-DECISIONS to MAKE

"HAND-CRAFTED" APPROACH MAY MAKE METHODS LESS ACCESSIBLE!

THERE is a TENSION BETWEEN SPECIFICATION & LEARNING

ADVANCES in CAUSAL INFERENCE can HELP ANSWER BROADER QUESTIONS on the NATURE of INTELLIGENCE!

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