

AI Accountability and Explainability Via Extended Logic Programs

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Where I'm Coming From -- Bio

- AI researcher, executive, and entrepreneur
- *Currently:* Coherent Knowledge (startup): Chief Scientist.
 - Maker of open-source AI tool on KRR. +NL, ML. Applications too.
- Much experience in AI-based automation of law & associated operational policies
 - Contracts, e-commerce, regulations, financial reporting, accounting, banking, taxes, privacy/confidentiality, insurance, medical, defense/security
- *Previously:*
 - Kyndi (VC-backed startup): Chief Scientist (CXO). NL search++ using ML+KRR.
 - Accenture: Principal Director & Research Fellow in AI. Biz Proc. Mgmt.
 - Coherent Knowledge (2013-2017): CTO & CEO, Co-Founder.
 - Allen Institute for AI's predecessor (Vulcan Project Halo): Sr. Program Mgr.
 - Headed Advanced AI research (~ 1/3 of Halo). Built & managed external contractor teams.
 - MIT Sloan: IT professor, and DARPA PI
 - Pioneer in contract automation, knowledge graphs (ontologies, rules, standards)
 - IBM Research: company lead on intelligent agents, e-commerce biz rules

Approach

- Goal: provide/improve accountability etc. OF AI
- Focus: Highly Transparent, Explainable, Accurate (HiTEA)
- Approach (proposed and already pursued to some extent):
 1. leverage AI itself
 - a. build it in to the AI system
 - b. validate and verify via 2nd system for description and analysis
 - i. prove, perhaps simulate
 - ii. NB: SOTA for s/w generally is agile coding + logic-based verification
 2. utilize SOTA extended logic programs (ELP) e.g. ErgoAI (open source)
 - modular capability in overall system, composes/plays nicely with other s/w and AI
 - represent (specify) K. reason (deduce/infer K). (K = knowledge).
 - query -> answer + explain. monitor+react.
 - can be viewed as low-code, often no-code.

Extended Logic Programs

- Extended logic programs (a.k.a. semantic rules):
 - non-classical logic that extends relational DBs, knowledge graphs, Prolog
 - + some NLP: e.g., to map logic syntax \leftarrow \rightarrow text syntax
 - + some ML: e.g., via calling ML dynamically thru a Python interface
 - supports argumentation, deontics, multi-agent belief/desire/intention
 - scales well: computationally (similar to DB/KG), socially (handles conflict, standardization)
- Multiple open source systems available for ELP.
- E.g., Legal English / Logical English by R. Kowalski, work by several other leading AI researchers (Toni, Governatori, Palmirani, Baral, Schaub, ...); early/pilot applications.

SOTA AI Explanation using ELP (ErgoAI)

Why is the proposed transaction prohibited by Regulation W?

Drilling down: Is the transaction's counterparty an "affiliate" of the bank?

YES.

The screenshot shows a software interface with a blue header bar containing the text: "Why 'What proposed transactions are prohibited by RegW? Show ('Pacific Bank','Maui Sunset',23.0) ?". Below the header is a menu bar with "Edit" and "Operations". The main content area displays a hierarchical tree of green text explaining the prohibition. A red arrow points from the word "YES." to the node "Maui Sunset is a RegW affiliate of Pacific Bank". Another red arrow points from the text "And here's why" to the entire tree structure.

- RegW prohibits the proposed transaction by Pacific Bank with Maui Sunset of \$23.0 million
 - The proposed transaction by Pacific Bank with Maui Sunset of \$23.0 million is a RegW covered transaction
 - Maui Sunset is a RegW affiliate of Pacific Bank
 - Hawaii Bank is a RegW affiliate of Pacific Bank
 - There is common control of Hawaii Bank and Pacific Bank
 - Hawaii Bank is controlled by Americas Bank
 - Hawaii Bank is a subsidiary of Americas Bank
 - Pacific Bank is controlled by Americas Bank
 - Pacific Bank is a subsidiary of Americas Bank
 - Maui Sunset is advised by Hawaii Bank
 - There is a proposed loan from Pacific Bank to Maui Sunset of \$23.0 million
 - There is a limit of \$10.0 million for any proposed RegW covered transaction by Pacific Bank with Maui Sunset
 - The proposed transaction of \$23.0 million is greater than the RegW limit of \$10.0 million

And here's why