Enabling Dynamic Agent-Defined Learning Problems in Soar

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A Core Capability

• Dynamically “declare” a concept

• “Define” the concept flexibly via a combination of (hierarchical) symbolic knowledge/reasoning/learning and/or data-driven ML

• Immediately integrate it within task processes
Example (1)

- Given knowledge about the world, construct a (graphical) model

- Parameterize via (episodic) experience and/or semantic facts

- Query for inferred consequences based upon a novel situation
Example (2)

- Given knowledge about the world, construct a (supervised) problem

  \[ \hat{y} = \arg \max_{k \in \{1 \ldots K\}} P(C_k)P(x|C_k) \]

- Supply training examples in real time or via episodic retrievals

- Query for likely output given novel inputs
  - And meta-data, such as confidence?!
Core Issues

• Representation of input/output knowledge
  – Dynamic features?

• Algorithm(s)
  – Ideally online/incremental; or asynchronous
  – Assumptions (particularly with dynamic fn’s)
  – Degree of configurability/inspectability
Approach

• To start, SML I/O
  – Provides speed/flexibility during experimentation

• Agent creates/parameterizes problem(s) via symbolic structures
  – Train/supply evidence & query via subsequent commands
  – Possibly support for SVS metric via ids?
Evaluation

• Novel approach to tight-loop integration of Soar and ML
• Likely useful for research (e.g. Rosie) and applications

• No results to show yet
• No killer app to speak of