Runtime Verification of Cognitive Applications

Jonathan Springer (PI), Donald Nguyen, Richard Lethin
Reservoir Labs, Inc.
Overview

• **We are building a tool for runtime verification of intelligent, learning cognitive systems based on the following techniques:**
  – *Formal specifications of cognitive systems*: rigorous formal specifications drive the verification system from system execution to post-mortem diagnosis.
  – *First-fault debugging*: when an error is detected, the tool saves sufficient context to allow debugging without first recreating the error.
  – *Effective visualization and analysis*: based on saved context data, the tool can identify for an error: the immediate causes, the sufficient conditions, and the possible contributing factors.

• **This tool will provide:**
  – More efficient utilization of programmer time by partially automating debugging
  – An effective method of verifying that a cognitive system upholds certain strict formal properties
  – An machine-verifiable description of a cognitive system beyond “the system is what the code does”
Verification System: Architecture

- Instrument cognitive system to emit a stream of events to a runtime checker and also to a data collector
- Checker verifies if events are valid with respect to the formal specification
- If an error occurs, visualization and analysis simplifies diagnosis