Learning Automata

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This is a formal presentation of the L^* algorithm presented in Tutorial 6. Special thanks to Ariella Smofsky and Prakash Panangaden for the write-up. This is an adpated version from the original 1987 paper "Learning regular sets from queries and counterexamples."

L* Algorithm

Algorithm 1 L* Algorithm

Initialize observation table with $S, E \leftarrow \{\epsilon\}$. Denote the observation table as $O = (S, E)$.
repeat
  while (S, E) not closed or not consistent **do**
    if (S, E) not closed **then**
      Find $s_i \in S$ and $x \in \Sigma$ such that $row(s_i x) \neq row(s)\ \forall s \in S$
      $S \leftarrow S \cup \{s_i x\}$ and extend observation table
    end if
    if (S, E) not consistent **then**
      Find $s_1, s_2 \in S$, $x \in \Sigma$, $e \in E$ such that $row(s_1) = row(s_2)$ and $T(s_1 xe) \neq T(s_2 xe)$
      $E \leftarrow E \cup \{xe\}$ and extend observation table
    end if
  end while
  Build candidate DFA M_O
  if Teacher replies NO with counterexample t **then**
    $S \leftarrow S \cup prefixes(t)$ and extend observation table
  end if
until Teacher replies YES to candidate DFA M_O
return M