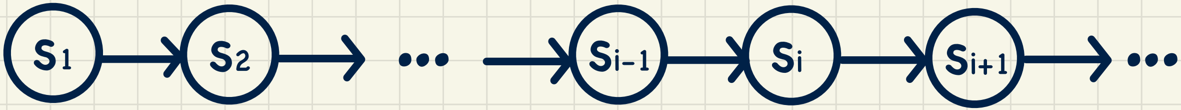
Path Satisfaction: Temporal Operations (4)

$\pi \models \phi 1 \, U \, \phi 2$

There is some future state satisfies $\phi 2$, and until then, all states satisfy $\phi 1$.



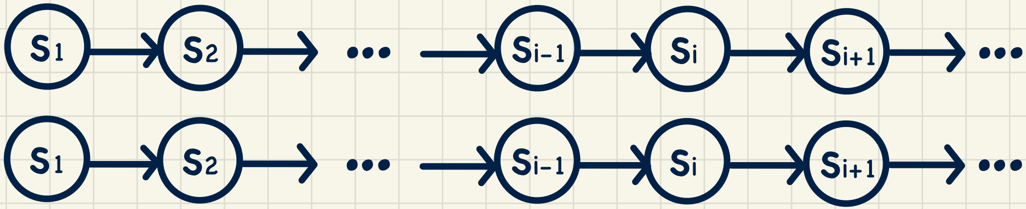
Formulation (over a path)

Path Satisfaction: Temporal Operations (5)

$\pi \models \phi 1 \ \mathbf{W} \ \phi 2$

If there is ever a future state that satisfies $\phi 2$, then until then, all states satisfy $\phi 1$.

Or, $\phi 1$ must always be the case.



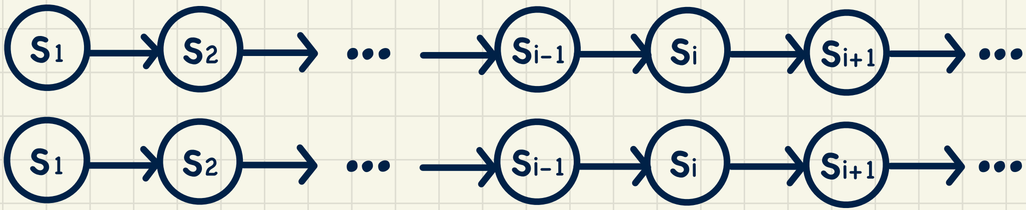
Formulation (over a path)

Path Satisfaction: Temporal Operations (6)

$\pi \models \phi 1 \, \mathbf{R} \, \phi 2$

If there is ever a future state that satisfies $\phi 1$, then until then, all states satisfy $\phi 2$.

Or, $\phi 2$ must always hold (i.e., never released).



Formulation (over a path)

Formulating Natural Language in LTL (1)

Natural Language:

I had smoked until I was 22.

Atom t: I was 22

Atom s: I smoke

Q. Is s U t an appropriate formulation?

$$\pi \models \phi_1 \, \mathbf{U} \, \phi_2 \iff \left(\exists i \bullet i \geq 1 \land \left(\begin{array}{l} \pi^i \models \phi_2 \\ \land \\ (\forall j \bullet 1 \leq j \leq i-1 \Rightarrow \pi^j \models \phi_1) \end{array} \right) \right)$$

Formulating Natural Language in LTL (2.1)

Natural Language:

It's impossible to reach a state
where the system is started but not ready.

Assumed atoms:

- started
- ready

LTL Formulation

Formulating Natural Language in LTL (2.2)

Natural Language:

Whenever a request is made,
it will be acknowledged eventually.

Assumed atoms:

- requested
- acknowledged

LTL Formulation

Formulating Natural Language in LTL (2.3)

Natural Language:

An elevator traveling upwards at the 2nd floor
does not change its direction
when it has passengers wishing to to to the 5th floor.

Assumed atoms:

- floor2, floor5
- directionUp
- buttonPressed5

LTL Formulation