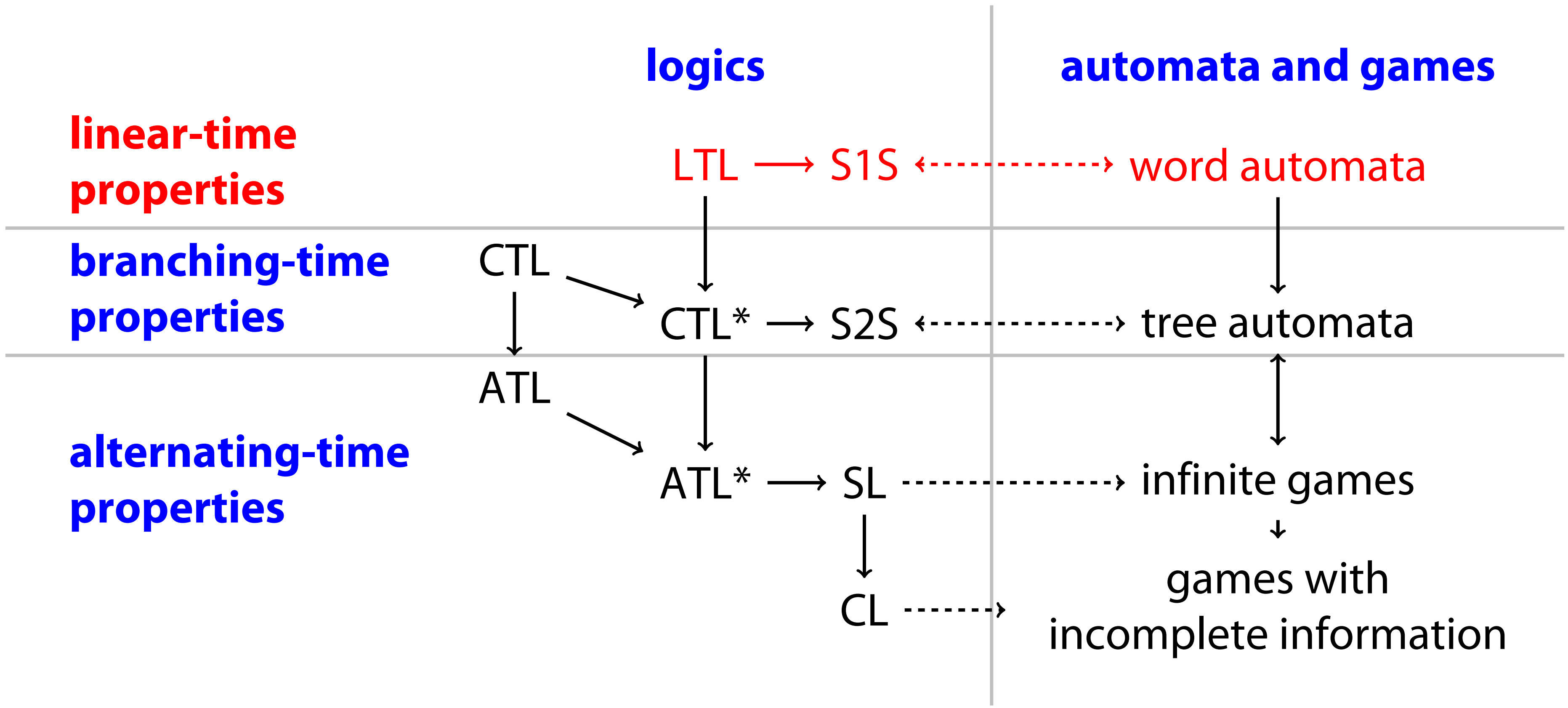
Automata, Games & Verification

#8


logics
automata and games
linear-time properties
LTL
S1S
word automata
branching-time properties
CTL
CTL*
S2S
tree automata
ATL
alternating-time properties
ATL*
SL
infinite games
CL
games with incomplete information

LTL & QPTL

LTL: $a \quad | \quad \neg\varphi \quad | \quad \varphi \wedge \psi \quad | \quad \mathsf{X}\varphi \quad | \quad \varphi\,\mathsf{U}\,\psi$
where $a \in AP$ and φ and ψ are LTL formulas.
Additional derived operators: F and G.

QPTL: $\varphi \quad | \quad \psi \wedge \eta \quad | \quad \neg\psi \quad | \quad \exists p.\, \psi$
where φ is an LTL formula and ψ and η are QPTL formulas.

QPTL Semantics:

$\alpha \models \exists q.\varphi$ iff there is an α' with
$\alpha'(j) \cap (AP \setminus \{q\}) = \alpha(j) \cap (AP \setminus \{q\})$ for all $j \in \omega$,
s.t. $\alpha' \models \varphi$.

LTL- & QPTL-definable languages

Definition 1. *A language $L \subseteq \Sigma^\omega$ is non-counting iff*
$\exists n_0 \in \omega \,.\, \forall n \geq n_0 \,.\, \forall u, v \in \Sigma^*, \gamma \in \Sigma^\omega \,.$
$uv^n\gamma \in L \;\Leftrightarrow\; uv^{n+1}\gamma \in L$

Theorem 1. *For every LTL-formula φ, $\mathcal{L}(\varphi)$ is non-counting.*

Theorem 2. *For every Büchi automaton $\mathcal{A}$ over $\Sigma = 2^{AP}$ there exists a QPTL formula φ such that $\mathcal{L}(\varphi) = \mathcal{L}(\mathcal{A})$.*

S1S

- first-order variable set $V_1 = \{x, y, \ldots\}$
- second-order variable set $V_2 = \{X, Y, \ldots\}$
- Terms t:

$$t ::= 0 \mid x \mid \mathit{Succ}(t)$$

- Formulas φ:

$$\varphi ::= t \in X \mid t_1 = t_2 \mid \neg\varphi \mid \varphi_0 \vee \varphi_1 \mid \exists x.\varphi \mid \exists X.\varphi$$