

# Expressiveness of Temporal Logics

## Conclusions

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# Summary of the course

Three levels for measuring expressiveness:

- **distinguishing power:**
  - very coarse measure:  $\mathcal{L}(\mathbf{X})$  and LTL+Past have the same distinguishing power;
  - proofs generally easy.

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  - proofs generally hard:
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    - ad hoc techniques: families of models;
    - via other formalisms: first-order logic, automata theory, ...
- **succinctness:**
  - very precise measure;
  - proofs generally very involved:
    - through automata theory,
    - Ehrenfeucht-Fraïssé games, ...

# Summary of the course

Linear time

**LTL**

Branching time

**CTL\***

**CTL**

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LTL+Past

**LTL**

$\mathcal{L}(\mathbf{U})$

$\mathcal{L}(\mathbf{X})$

**CTL\***

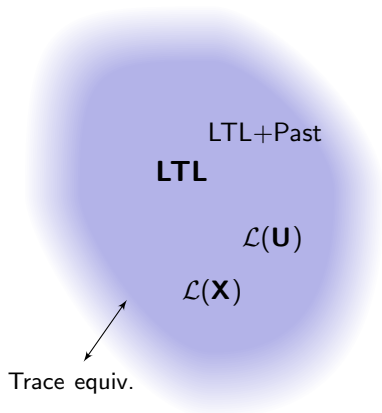
ECTL<sup>+</sup>

ECTL

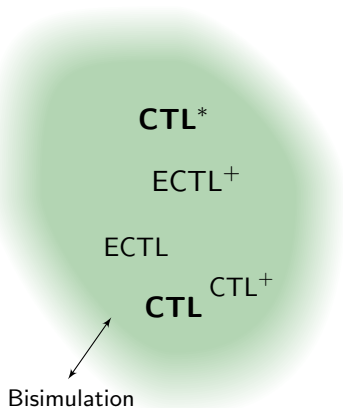
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# Summary of the course

## Linear time

First-order logic



LTL+Past

LTL

$\mathcal{L}(\mathbf{U})$

$\mathcal{L}(\mathbf{X})$

Trace equiv.



## Branching time

Second-order logic



Monadic path logic



CTL\*

ECTL<sup>+</sup>

ECTL

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Bisimulation



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## Linear time

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Trace equiv.



Büchi automata

1-w.ABA



## Branching time

Second-order logic



Monadic path logic



CTL\*

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Bisimulation



Alternating tree automata

