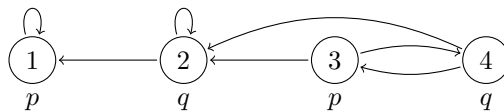


Solved exercises must be marked and solutions (as a single PDF file) uploaded in [OLAT](#). The (strict) deadline is 7 am on June 11.

Exercises

- (3) 1. Consider the following model \mathcal{M} :



- (a) Use the CTL model checking algorithm to determine in which states of \mathcal{M} the CTL formula $\varphi = \text{EF A}[\text{EF } q \text{ U AX } p]$ holds.
- (b) Give an LTL formula ψ such that $\mathcal{M}, s \models \psi$ if and only if $s = 2$.
- (c) Show that the two CTL formulas with fairness constraints $\text{E}_{\{p,q\}} \text{GT}$ and $\text{E}_{\{p \wedge q\}} \text{GT}$ are not equivalent.
- (3) 2. Consider the LTL formula $\varphi = (\text{X } a) \text{U } \neg b$.
- (a) Construct the labelled Büchi automaton $A_{\neg\varphi}$.
- (b) Which of the following traces are accepted by $A_{\neg\varphi}$?
- $\{a\} \{a\} \{a, b\} \{a\}^\omega$
 - $\{b\} \{b\} \{a\}^\omega$
 - $\{b\} (\{a, b\} \{a, b\} \{a\})^\omega$
- (4) 3. Prove the claim on [slide 18](#) that for every CTL formula not containing EG, AF and AU there exists a number $n_\varphi > 0$ such that $\mathcal{M}, n_\varphi \models \varphi$ if and only if $\mathcal{M}, n'_\varphi \models \varphi$.