

Conflict Driven Learning and Non-chronological Backtracking

$x1 + x4$

$x1 + x3' + x8'$

$x1 + x8 + x12$

$x2 + x11$

$x7' + x3' + x9$

$x7' + x8 + x9'$

$x7 + x8 + x10'$

$x7 + x10 + x12'$

J. P. Marques-Silva and Karem A. Sakallah, "GRASP: A Search Algorithm for Propositional Satisfiability", *IEEE Trans. Computers*, C-48, 5:506-521, 1999.

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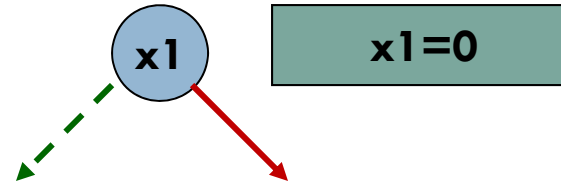
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$$\text{● } x1=0$$

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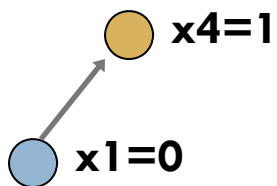
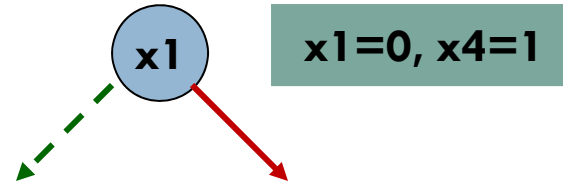
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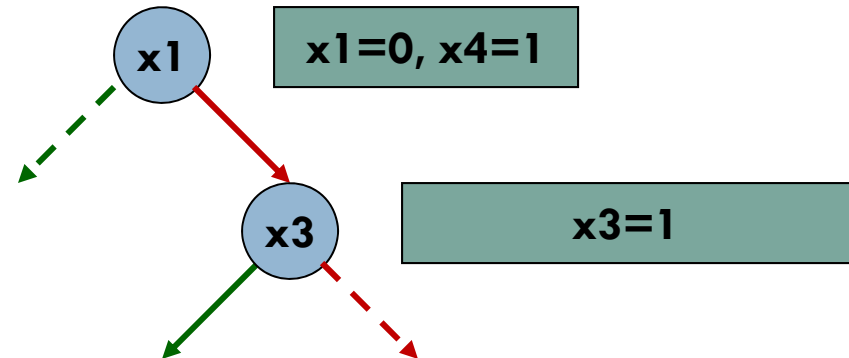
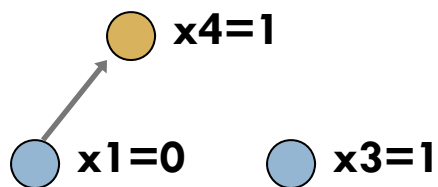
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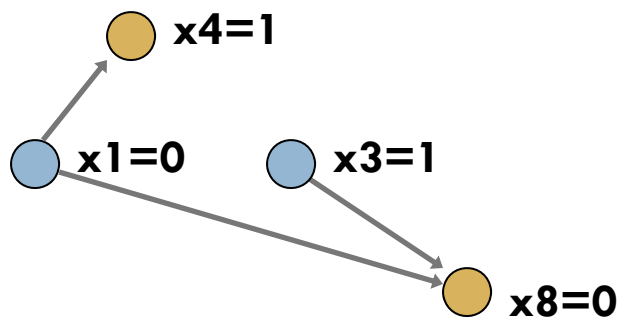
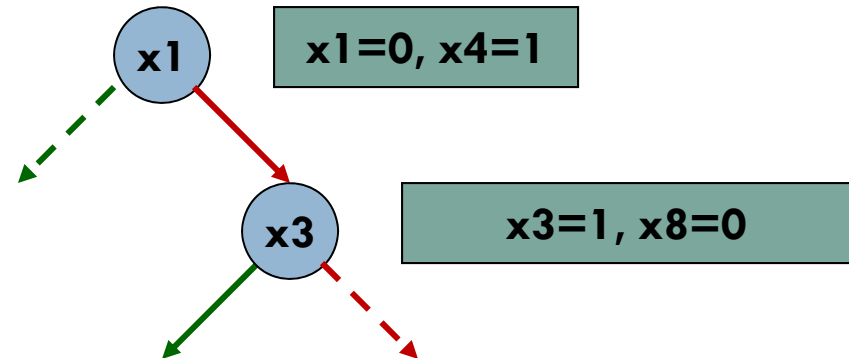
$x7 + x8 + x10'$

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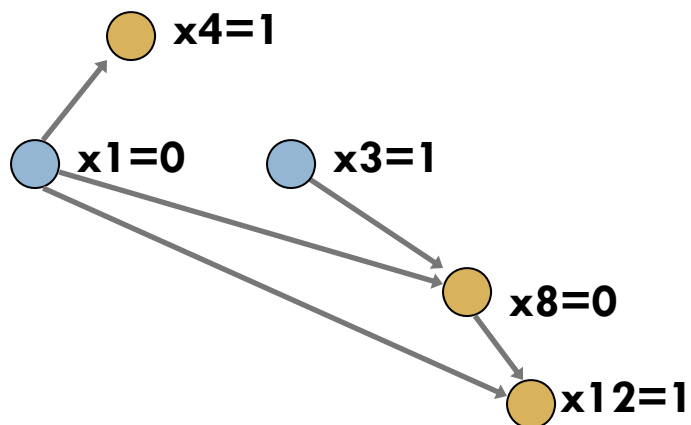
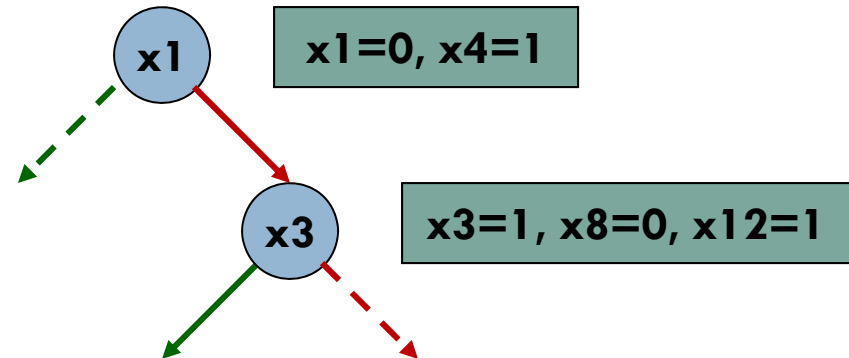
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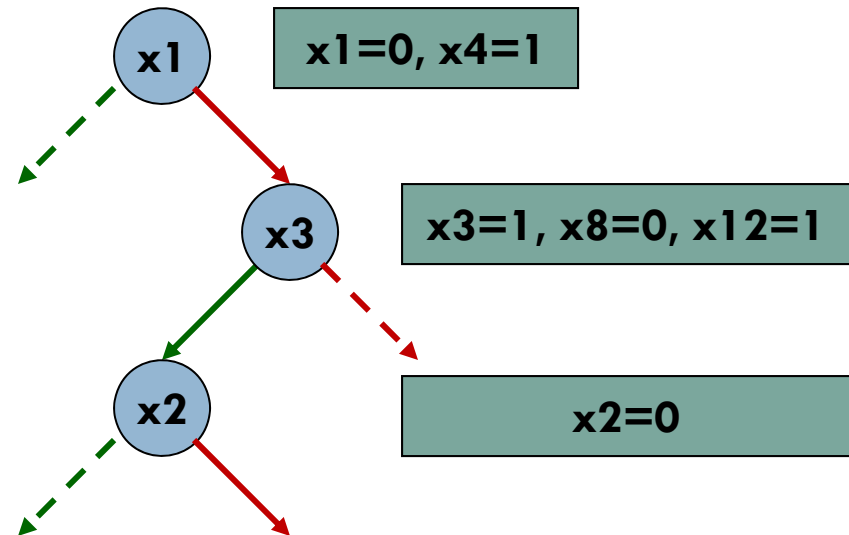
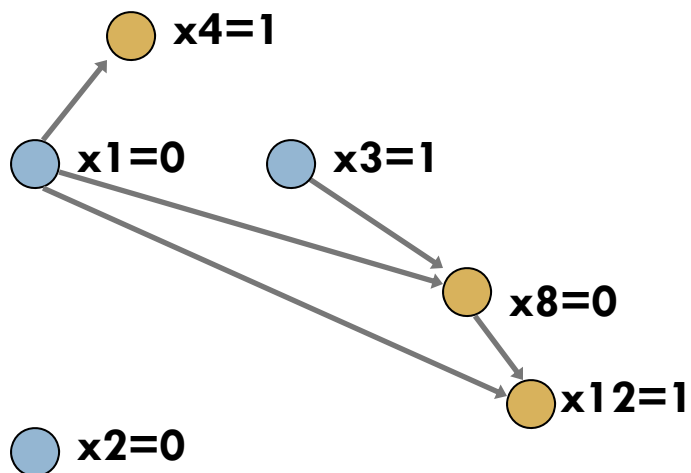
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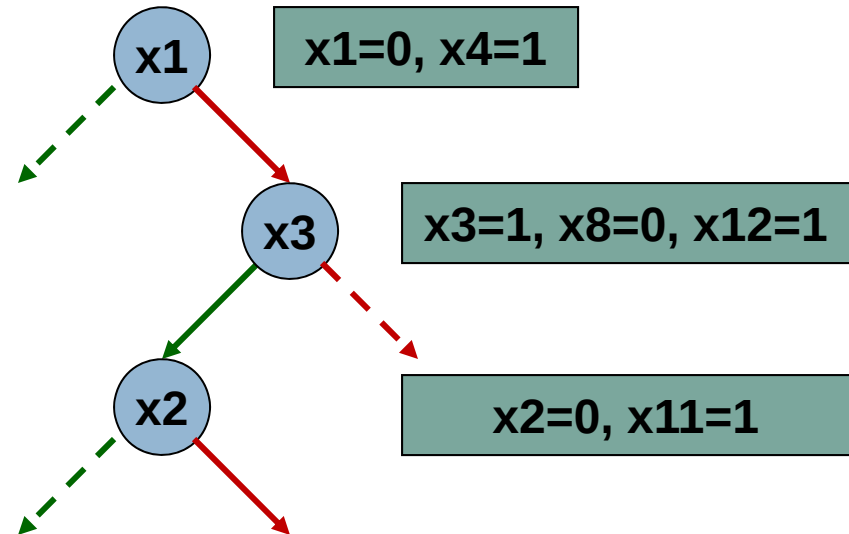
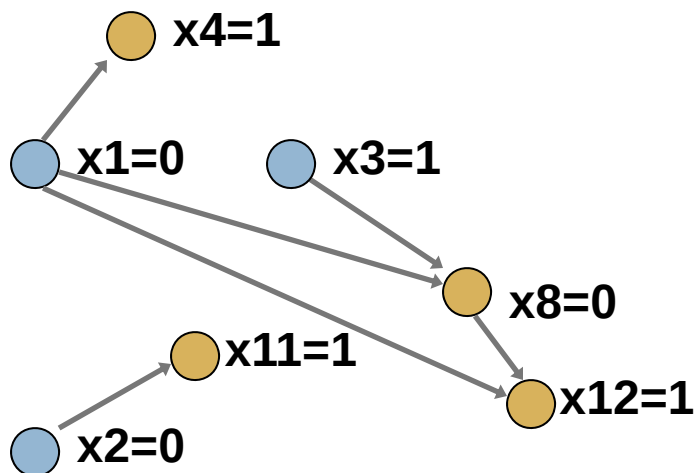
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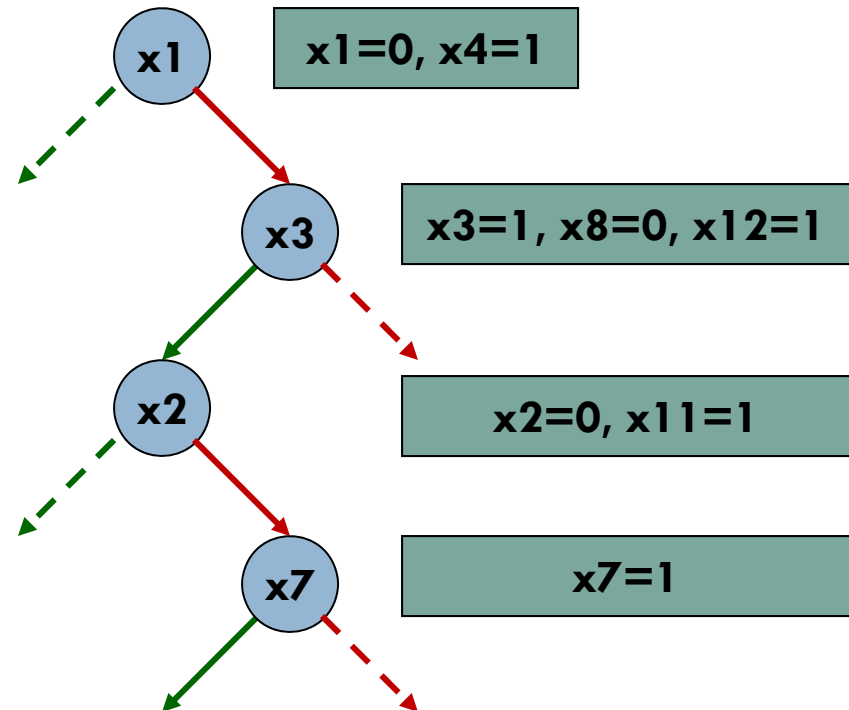
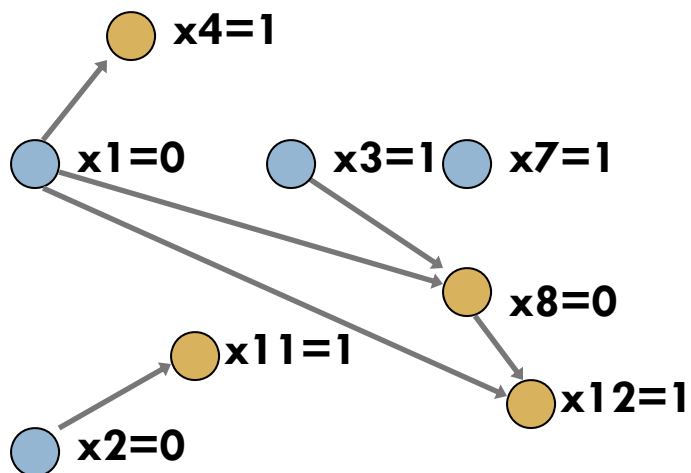
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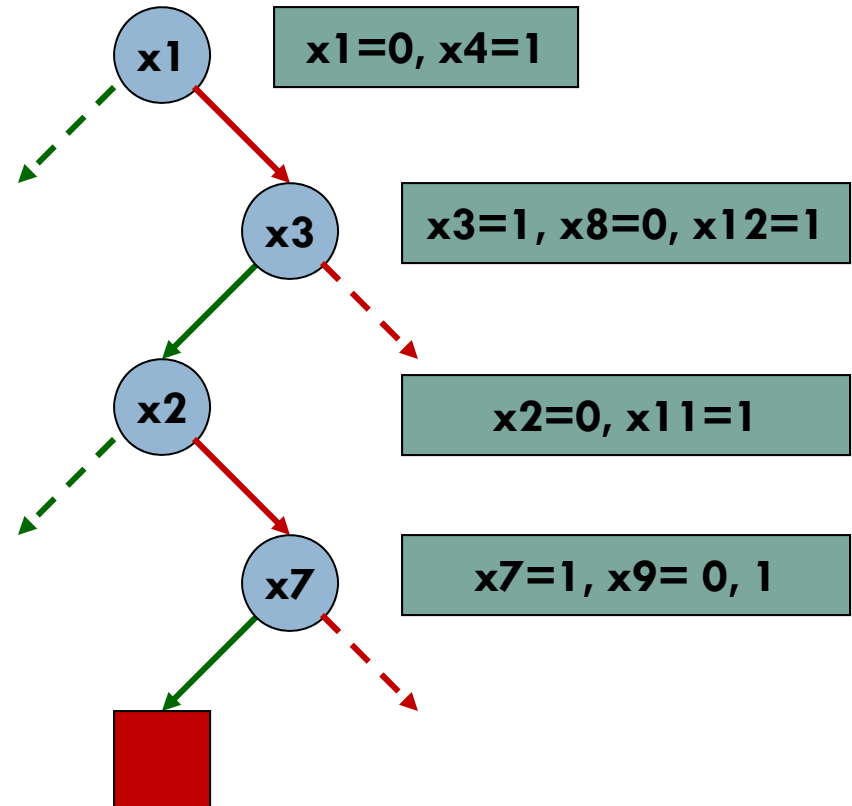
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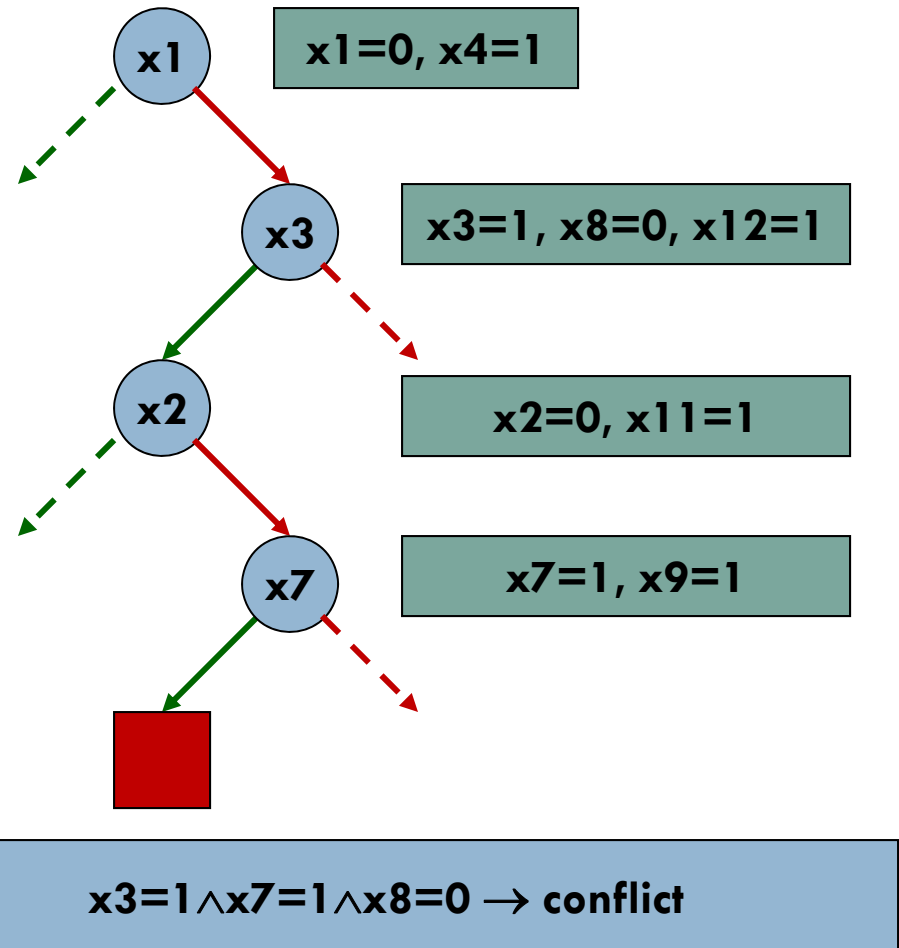
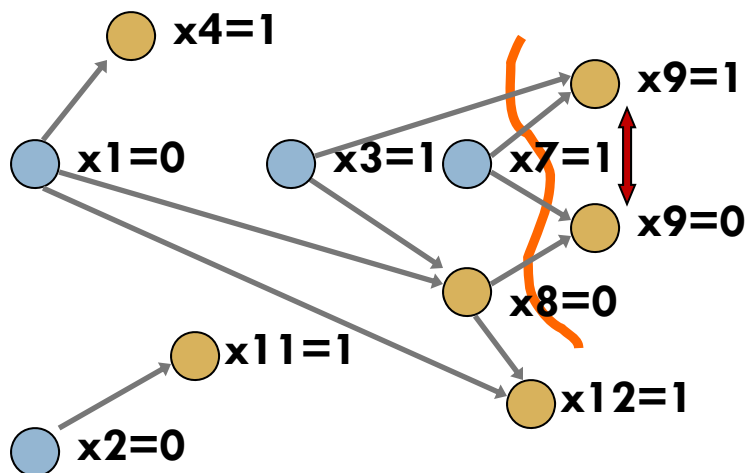
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$$x^7 + x^{10} + x^{12}$$


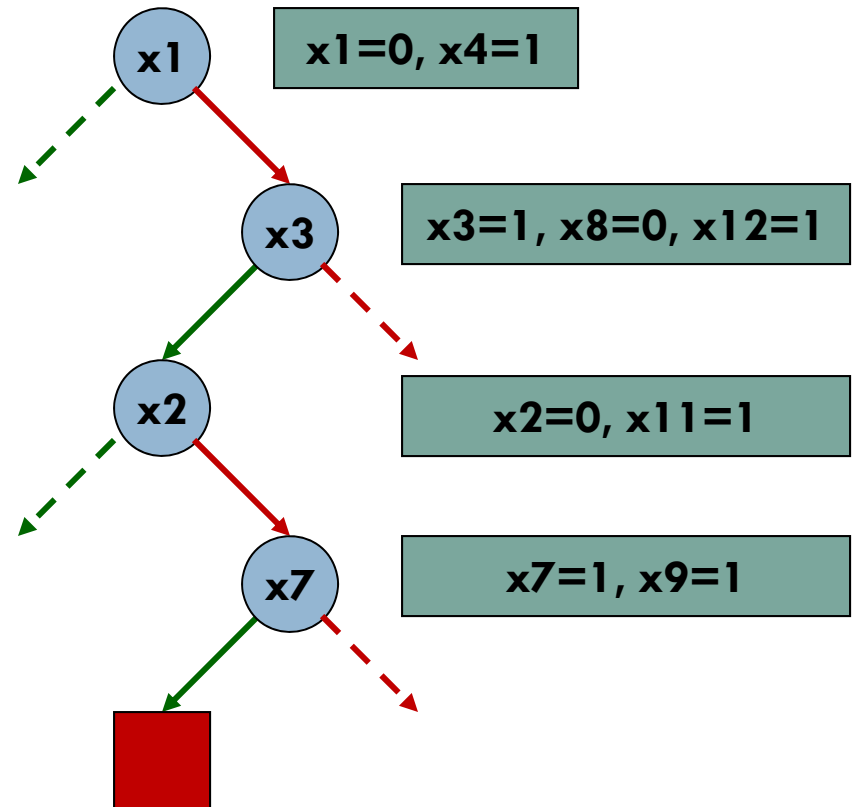
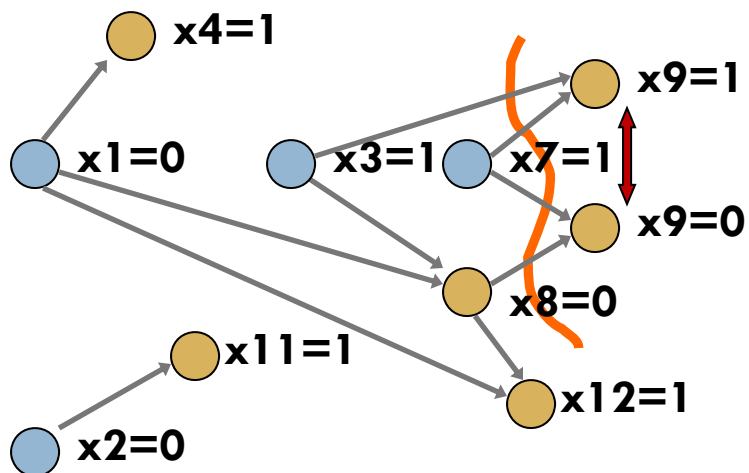
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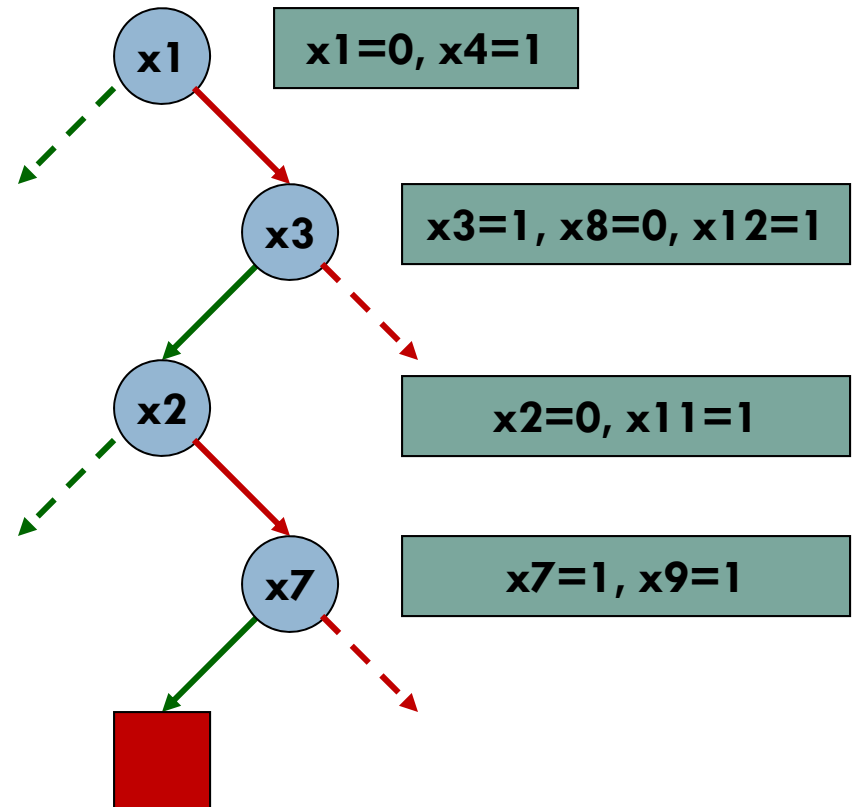
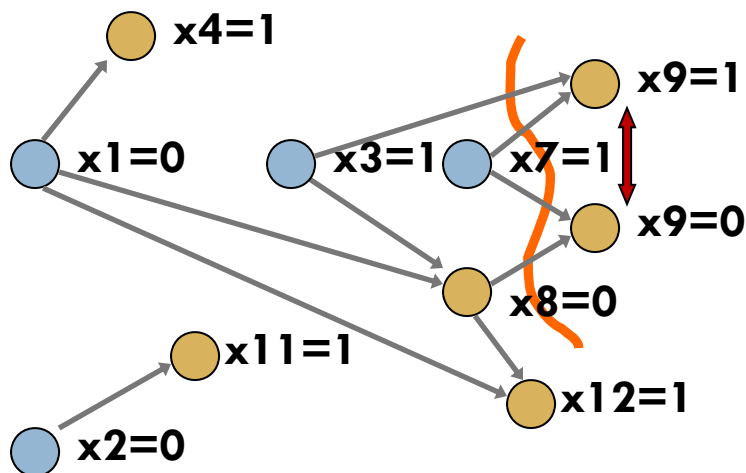
$x3=1 \wedge x7=1 \wedge x8=0 \rightarrow \text{conflict}$

Add conflict clause: $x3' + x7' + x8$

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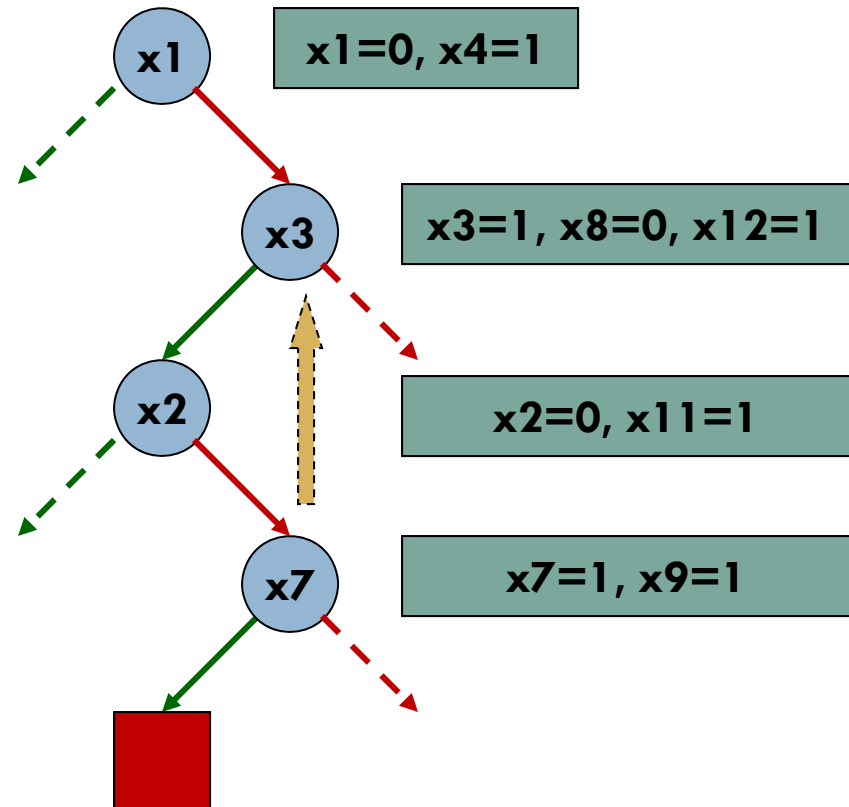
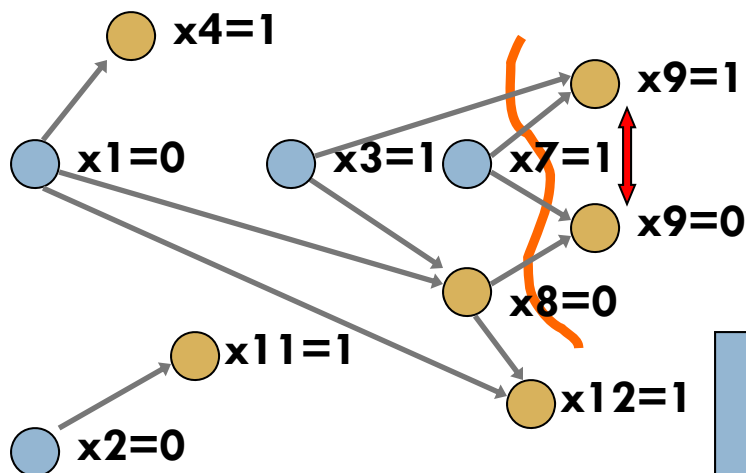
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Backtrack to the decision level of $x3=1$

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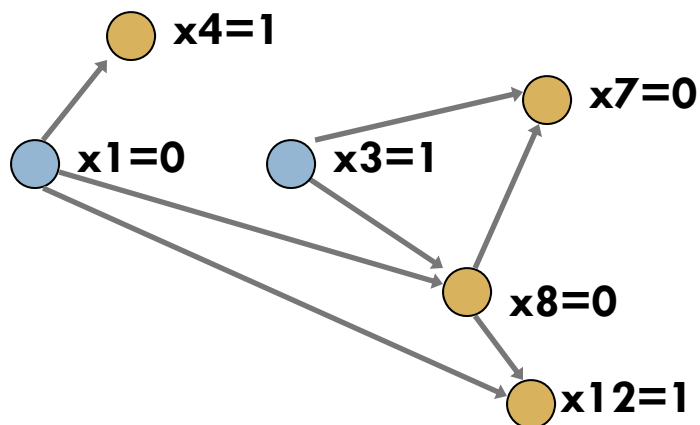
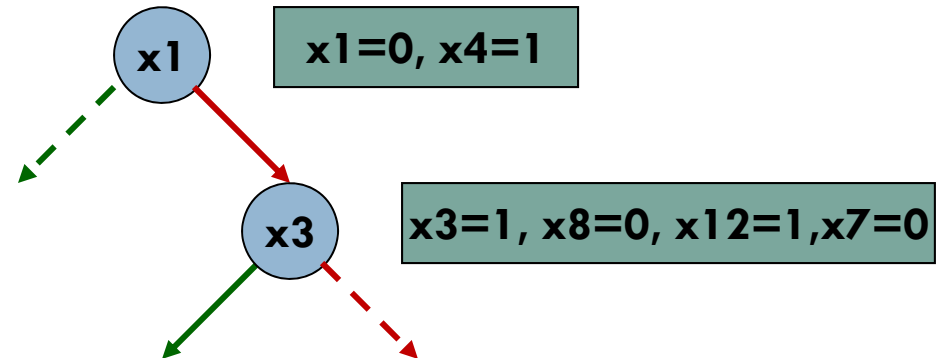
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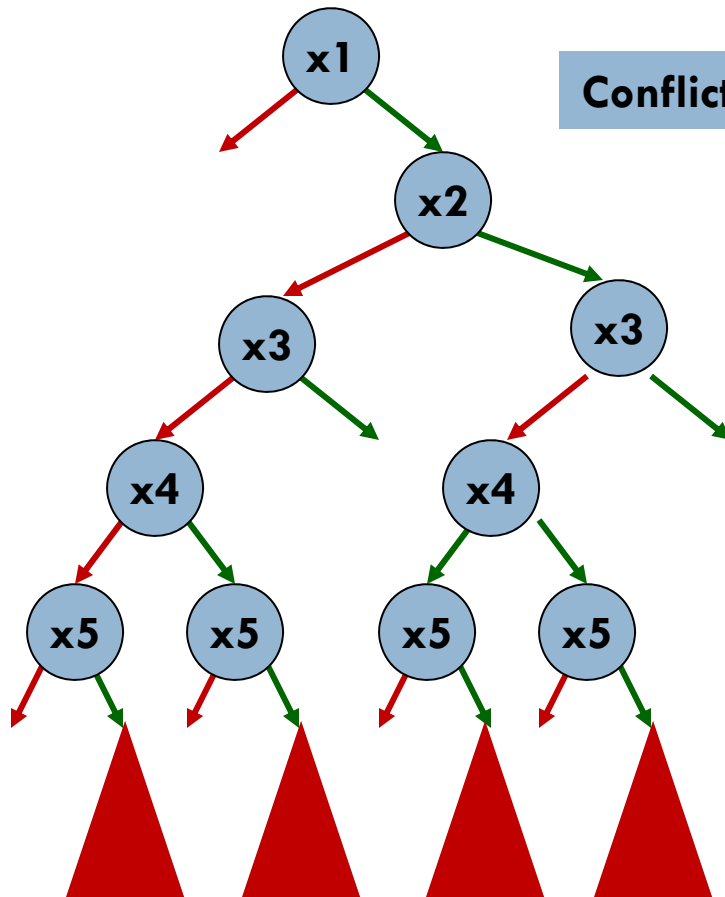
$x7 + x10 + x12'$

$x3' + x7' + x8$ ←new clause



Backtrack to the decision level of $x3=1$
Assign $x7 = 0$

What's the big deal?



Conflict clause: $x1' + x3 + x5'$

Significantly prune the search space –
learned clause is useful forever!

Useful in generating future conflict
clauses.

Restart

- Abandon the current search tree and reconstruct a new one
- The clauses learned prior to the restart are *still there* after the restart and can help pruning the search space
- Adds to robustness in the solver

