

Section 2

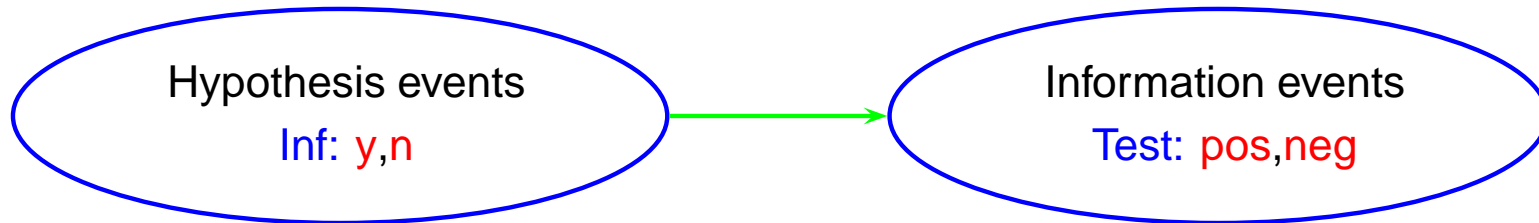
Examples of Bayesian Networks

Infected Milk

Milk from a cow may be infected. To detect whether or not the milk is infected, you can apply a test which may either give a positive or a negative test result. The test is not perfect: It may give false positives as well as false negatives.

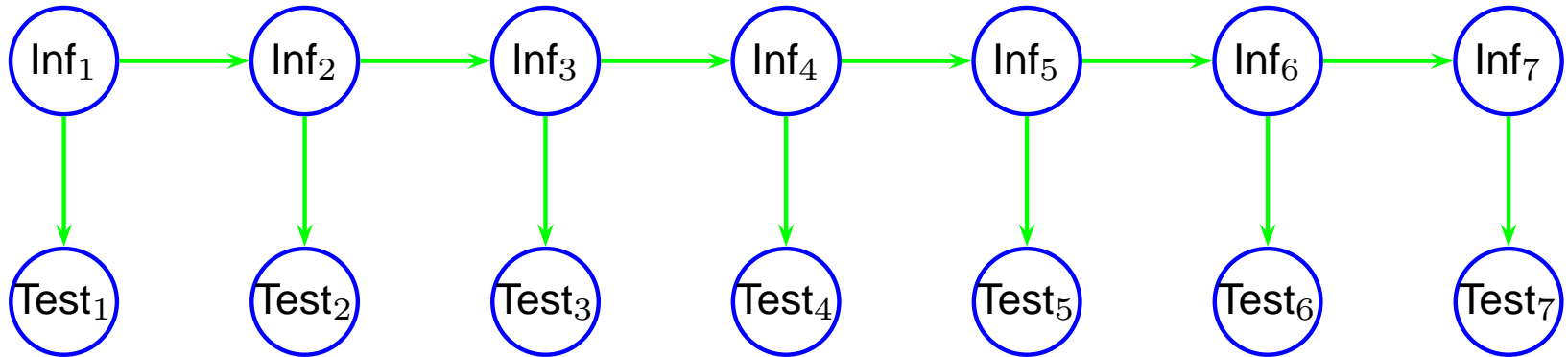
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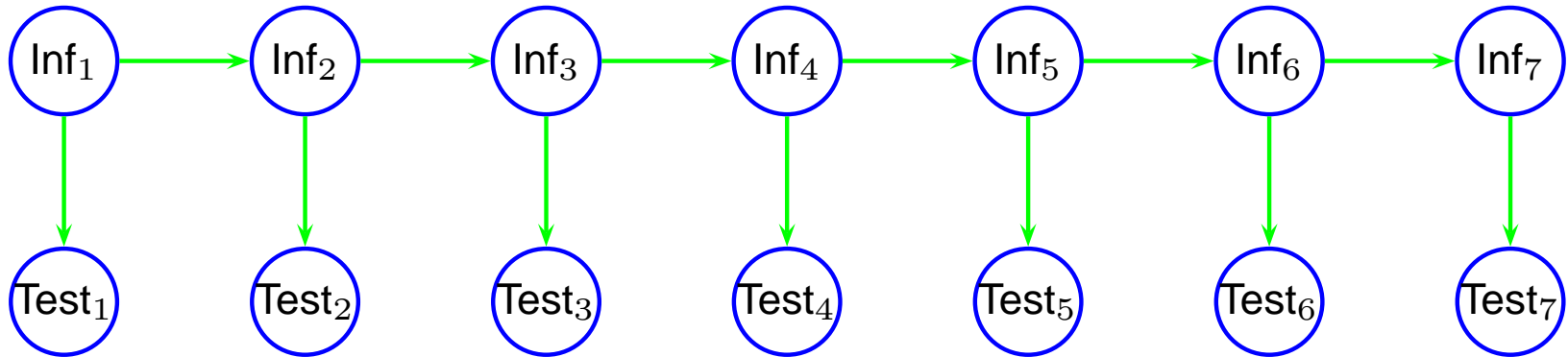
7-day model I

Infections develop over time:



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Assumption:

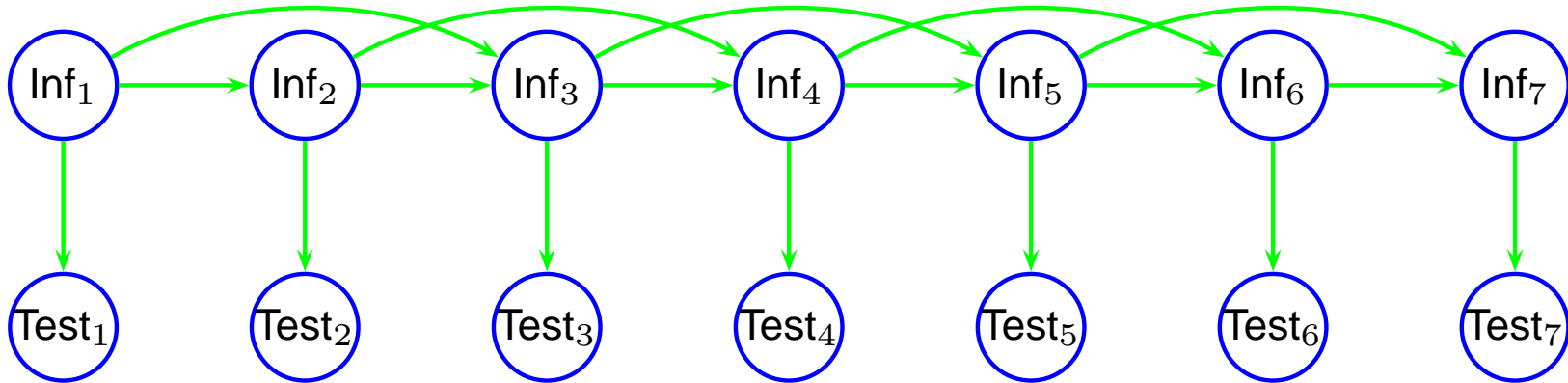
- The **Markov property**: If I know the present, then the past has no influence on the future, i.e.

Inf_{i-1} is d-separated from Inf_{i+1} given Inf_i .

But what if yesterday's Inf-state has an impact on tomorrow's Inf-state?

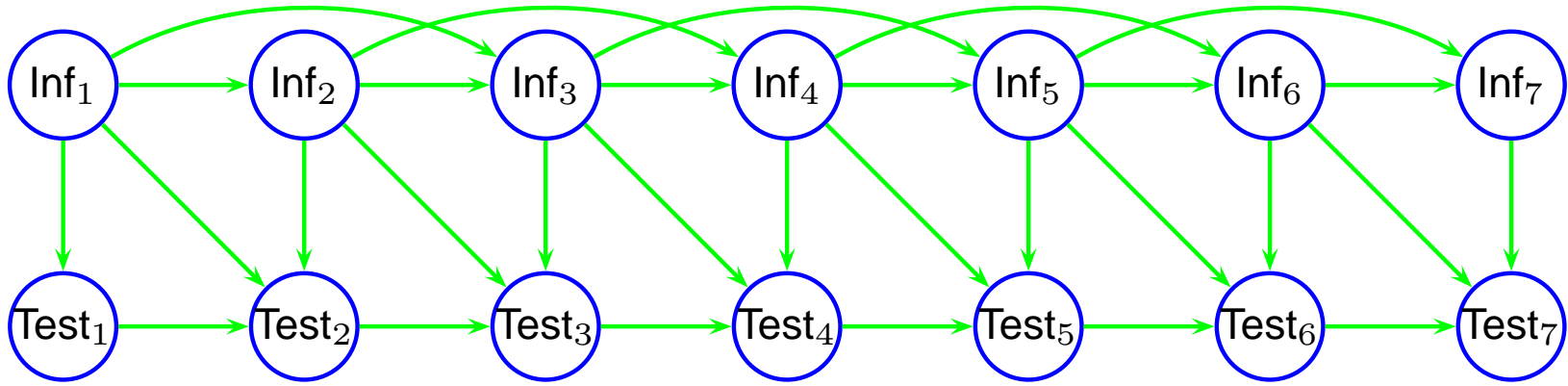
7-day model II

Yesterday's Inf-state has an impact on tomorrow's Inf-state:



7-day model III

The test-failure is dependent on whether or not the test failed yesterday:



A simplified poker game

The game consists of:

- Two players.
- Three cards to each player.
- Two rounds of changing cards (max two cards in the second round)

What kind of hand does my opponent have?

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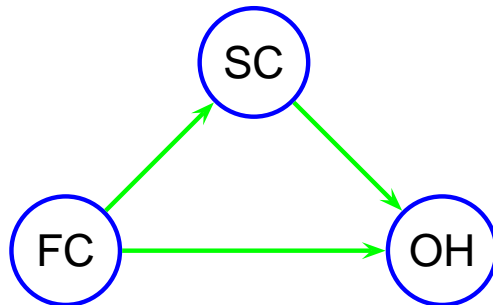
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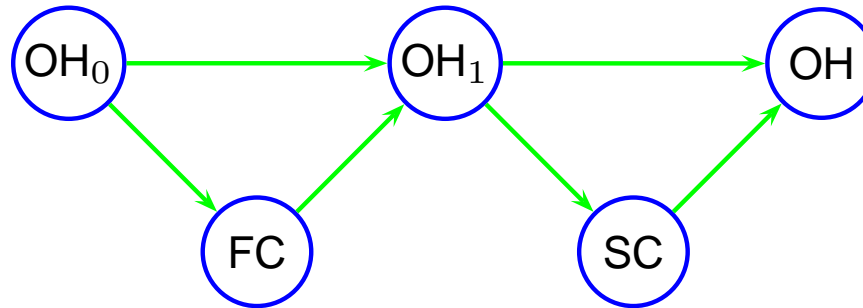
But how do we find:

$P(\text{FC})$, $P(\text{SC}|\text{FC})$ and $P(\text{OH}|\text{SC}, \text{FC})$??

A simplified poker game: Mediating variables

Introduce mediating variables:

- The opponent's initial hand, OH_0 .
- The opponent's hand after the first change of cards, OH_1 .



I am afraid that I do not have time to talk about how to estimate parameters.