Tutorial 8: Proposition and Inference

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Exercise 8.2: CSI Stellingen

- Assumables:
  Gardener has been working in the garden all day: g_garden
  Butler has been fixing the car in the garage all day: b_garage

- Oberservations:
  Gardener has no dirt on his hands: $\neg g\_dirt$
  Butler has dirt on his hands: b_dirt

- Rules:
  If the gardener worked in the garden all day, he will have dirt on his hands: $g\_dirt \leftarrow g\_garden$
  If the butler worked in the garage all day, he will have dirt on his hands: $b\_dirt \leftarrow b\_garage$

- Integrity Constraints:
  The gardener has either dirt on his hands or he has no dirt on his hands: $false \leftarrow g\_dirt \wedge \neg g\_dirt$
  The butler either has dirt on his hands or he has no dirt on his hands: $false \leftarrow b\_dirt \wedge \neg b\_dirt$

Since there are only two suspects, one of them must be lying. This is the minimal conflict: $\{g\_garden, b\_garage\}$.
Thus follows: $KB \models \neg g\_garden \vee \neg b\_garage$
By applying the rules, we know that the person without dirt on their hands is lying: $KB \models \neg g\_dirt \vee \neg b\_dirt$
The integrity constraints define that each person has either clean or dirty

hands. The obsevations tell us that the gardener has clean hands. Considering this knowledge, we can conclude that the gardener has to be the murderer.

Exercise 8.3 : (Diagnosis)

- Assumables:
  Battery is charged: bat_ok
  Ignition key works: ign_ok
  Electric fuel regulation works: $fureg\_ok$
  Starter works: $start\_ok$
  Fuel tank ist filled: $tank\_ok$
  Fuel pump works: $pump\_ok$
  Filter is not clogged: $filt\_ok$
  Engine is fine: eng_ok

- Observations:
  One of the noises is not hearable. A component making a noise is working.

- Rules:
  If the starter works, the ignition key works. $ign\_ok \leftarrow star\_ok$
  If the ignition key works, the battery works. $bat\_ok \leftarrow ign\_ok$
  If the engine works, the starter works and the filter is not clogged.
  $start\_ok \leftarrow eng\_ok$
  $filter\_ok \leftarrow eng\_ok$
  If the filter is not clogged, the fuel pump works. $pump\_ok \leftarrow filt\_ok$
  If the fuel pump works, the fuel tank is filled and the electronic regulation works.
  $tank\_ok \leftarrow pump\_ok$
  $fureg\_ok \leftarrow pump\_ok$
  If the electronic fuel regulation works, the ingition key works and the battery is charged.
  $ign\_ok \leftarrow fureg\_ok$
  $bat\_ok \leftarrow fureg\_ok$