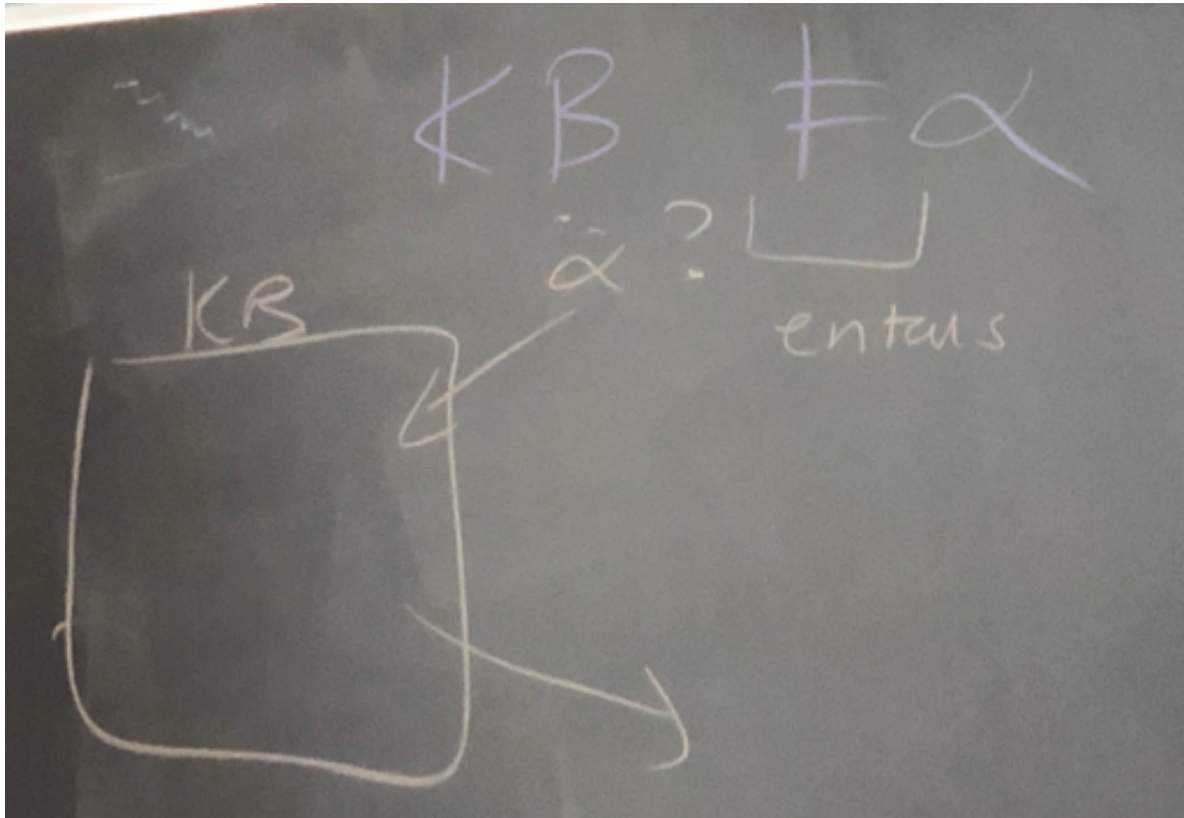


## L3 Reasoning techniques

Terms:

Knowledge Base (KB) -



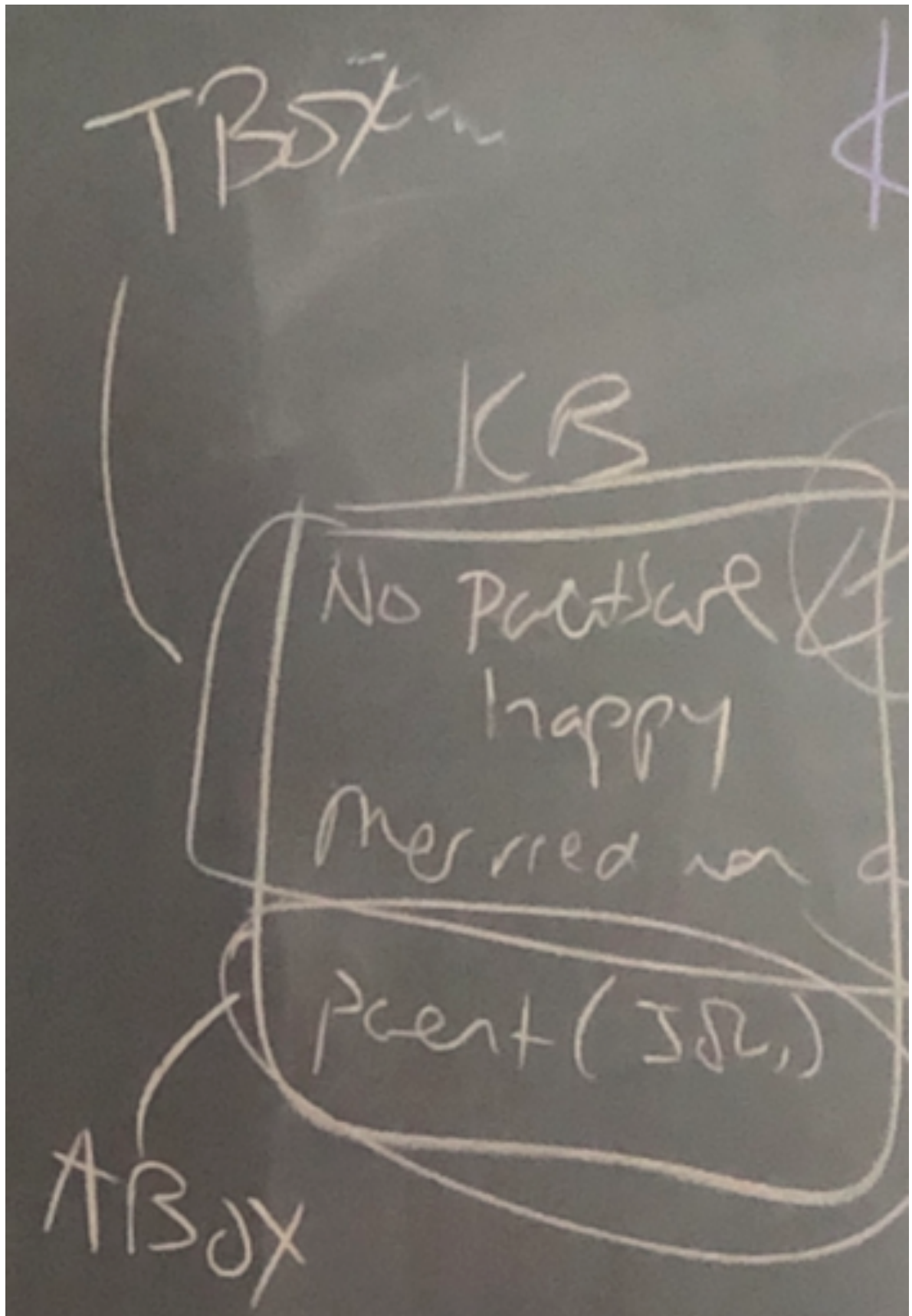
Procedure/algorithm -

The text is written on a chalkboard. A vertical line is drawn on the left. To the right of this line, the words 'procedure to find' are written. A horizontal line is drawn below 'procedure to find'. Below this horizontal line, the words 'if α follows' are written, and below that, 'from KB' is written.

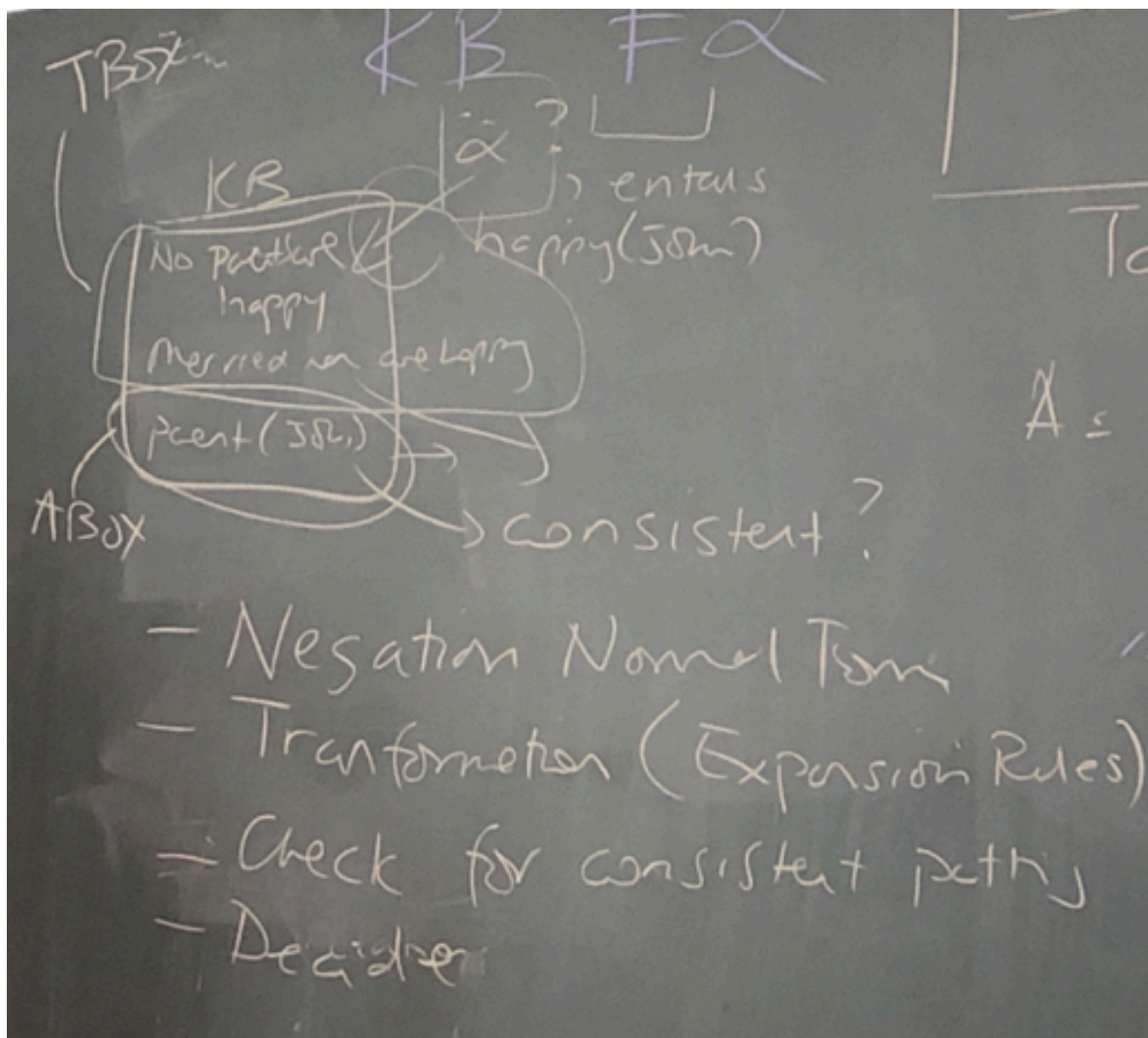
Is it a sound procedure?

Sound : if it produces an answer  
It is correct  
Complete : if it produces all the  
correct answers  
terminating; if it always stops

TBox / ABox:



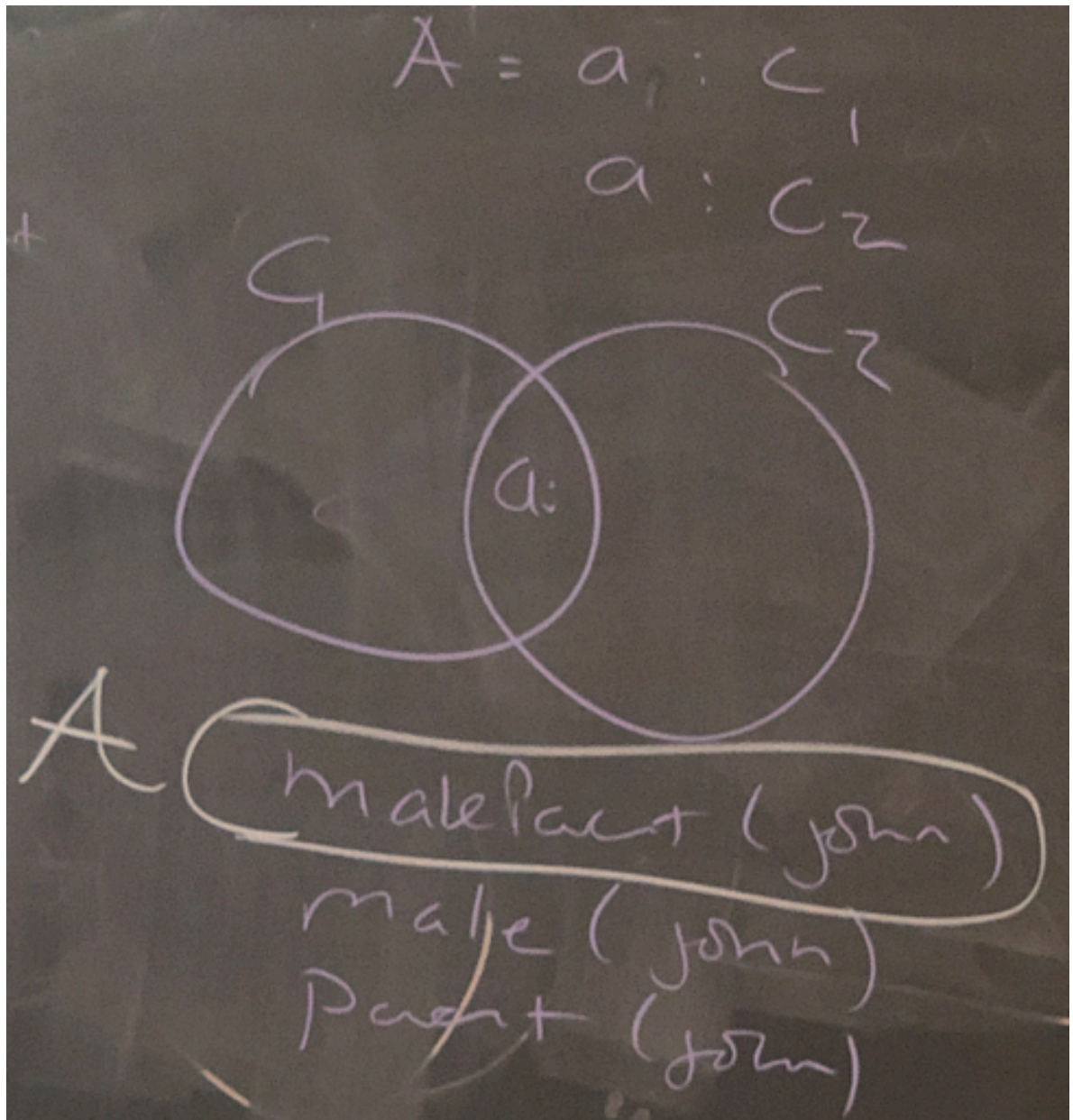
How to make sure your "model" is consistent:



Negations Normal Form (NNF)

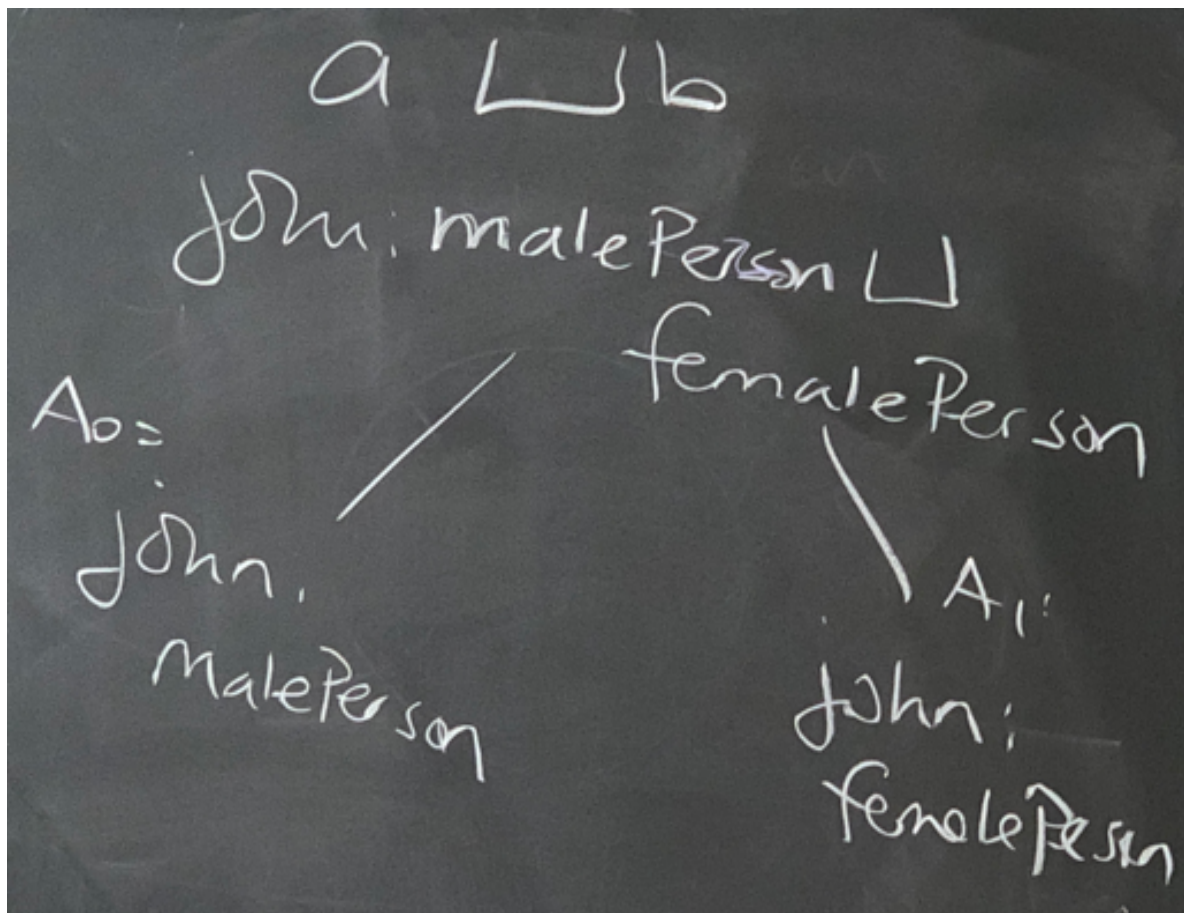
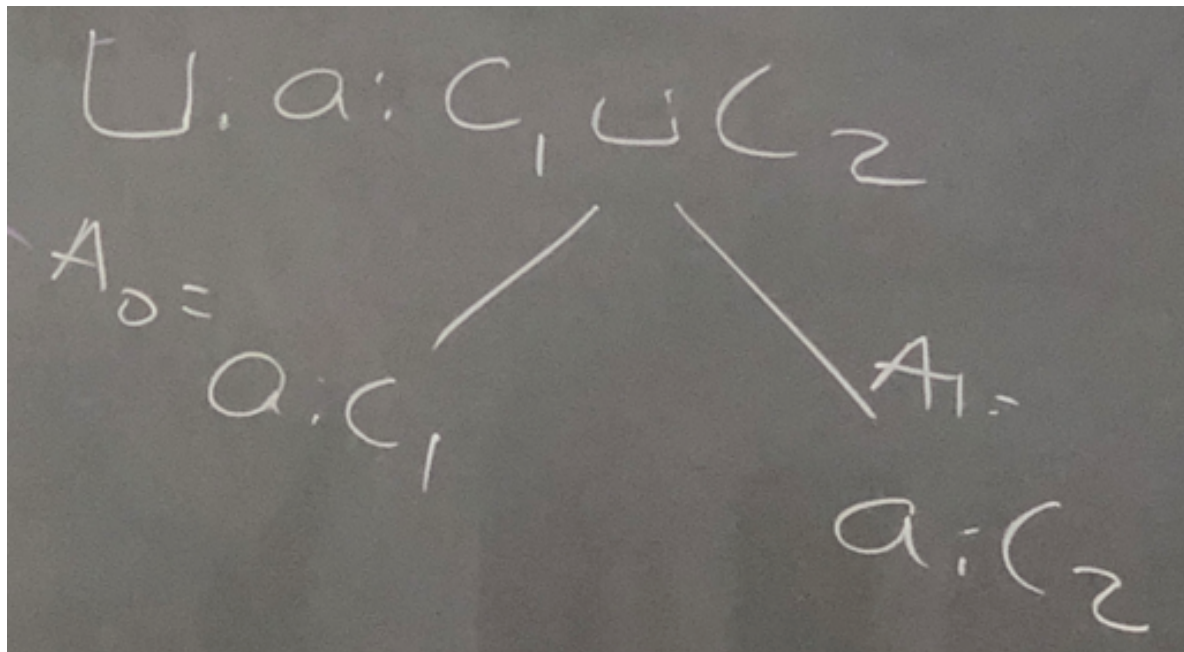
$\neg$  rule (with ABox maleParent(John))





□ rule

(branching out; one consistent branch is enough to make the conclusion)



$\exists$  rule  
(has at least one..., ie. child)



$a: \exists s. C \sqsubseteq A$   
 $\exists \text{hasChild. Person}$   
 $d$

$\text{John} : \exists \text{hasChild. Person}$   
 $\text{hasChild}(\text{john}, d)$

$\forall$  rule  
 (forAll relation)

$a: \forall s. C, (a.b). S \sqsubseteq A$   
 ~~$\text{John} : \exists \text{hasChild. Male Person}$~~   
 $\text{matt} : \text{male Person}$   
 $\text{hasChild}(\text{john}, \text{matt})$   
 $\text{John} : \exists \text{hasChild. Person}$   
 $\text{hasChild}(\text{john}, d)$

### Consistency Example

(which is not consistent as we found a clash)





$T = \text{Doctor} \sqsubseteq \text{Person}, \text{Parent} \sqsubseteq \text{Person} \sqcap \exists \text{hasChild}.\text{Person}$ 
Mary is a doctor  
 $\text{HappyParent} \sqsubseteq \text{Parent} \sqcap \forall \text{hasChild} (\text{Doctor} \sqcup \exists \text{hasChild}.\text{Doctor})$   
 A: John, HappyParent, hasChild (John, Mary), Mary, hasChild.  $\perp$   
 John: Parent, John: hasChild (Doctor  $\sqcup \exists \text{hasChild}.\text{Doctor}$ )  
 Mary: doctor, John: Person, John:  $\exists \text{hasChild}.\text{Person}$   
 Mary: Doctor  $\sqcup \exists \text{hasChild}.\text{Doctor}$   
 Mary: Doctor  $\sqcap \exists \text{hasChild}.\text{Doctor}$   
 Mary: hasChild (man, b)  
 b =  $\perp$ 
Mary is a doctor