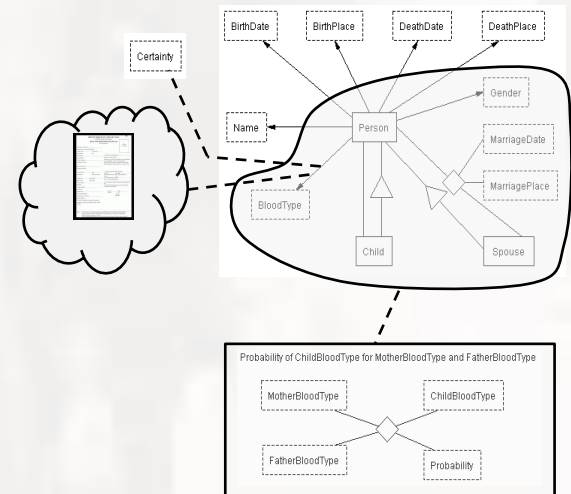


# A Superstructure for Organizing Family History Information

David W. Embley

Scott N. Woodfield



Often a computer is little more than an electronic filing clerk.

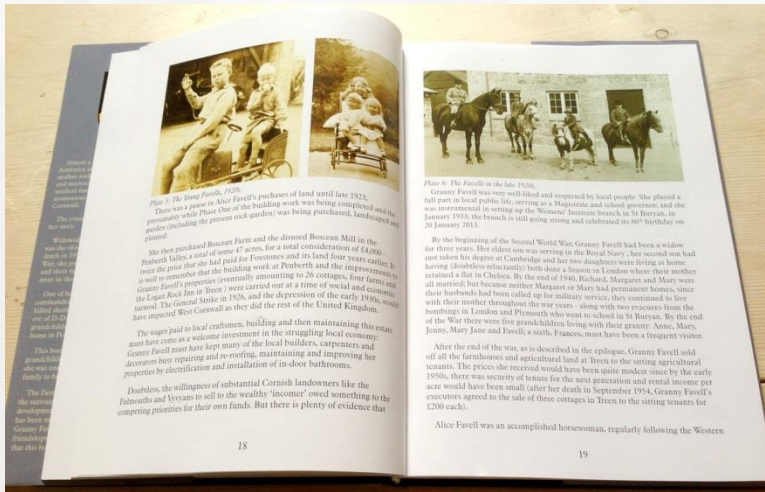


To make computers do more (especially for family history), they must:

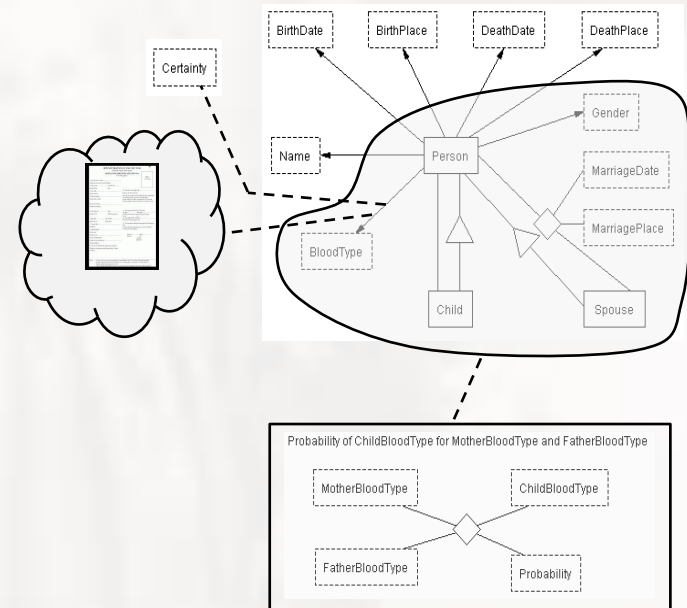
- Automatically process
  - Certainty information
  - Conflicting information
- Support
  - Evidence-based family history research
  - Automated collaboration
- Provide automated research guidance

# Our solution is inspired by how people think.

gather information

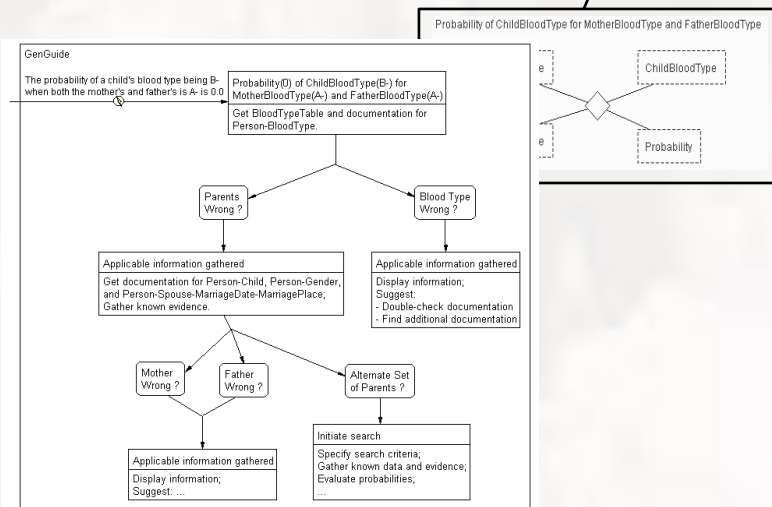
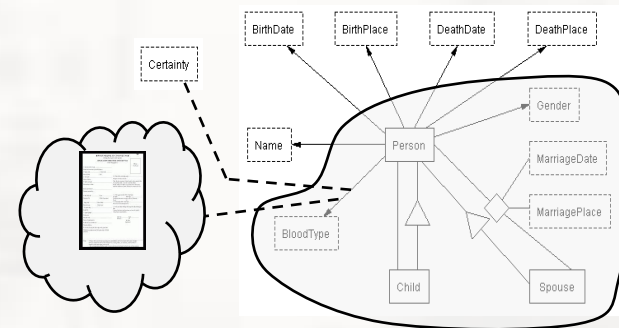


conceptualize



# A Proposed Superstructure

- Seven Layers\*
  - Symbol
  - Class
  - Information
  - Knowledge
  - Evidence
  - Communication
  - Action
- Wisdom

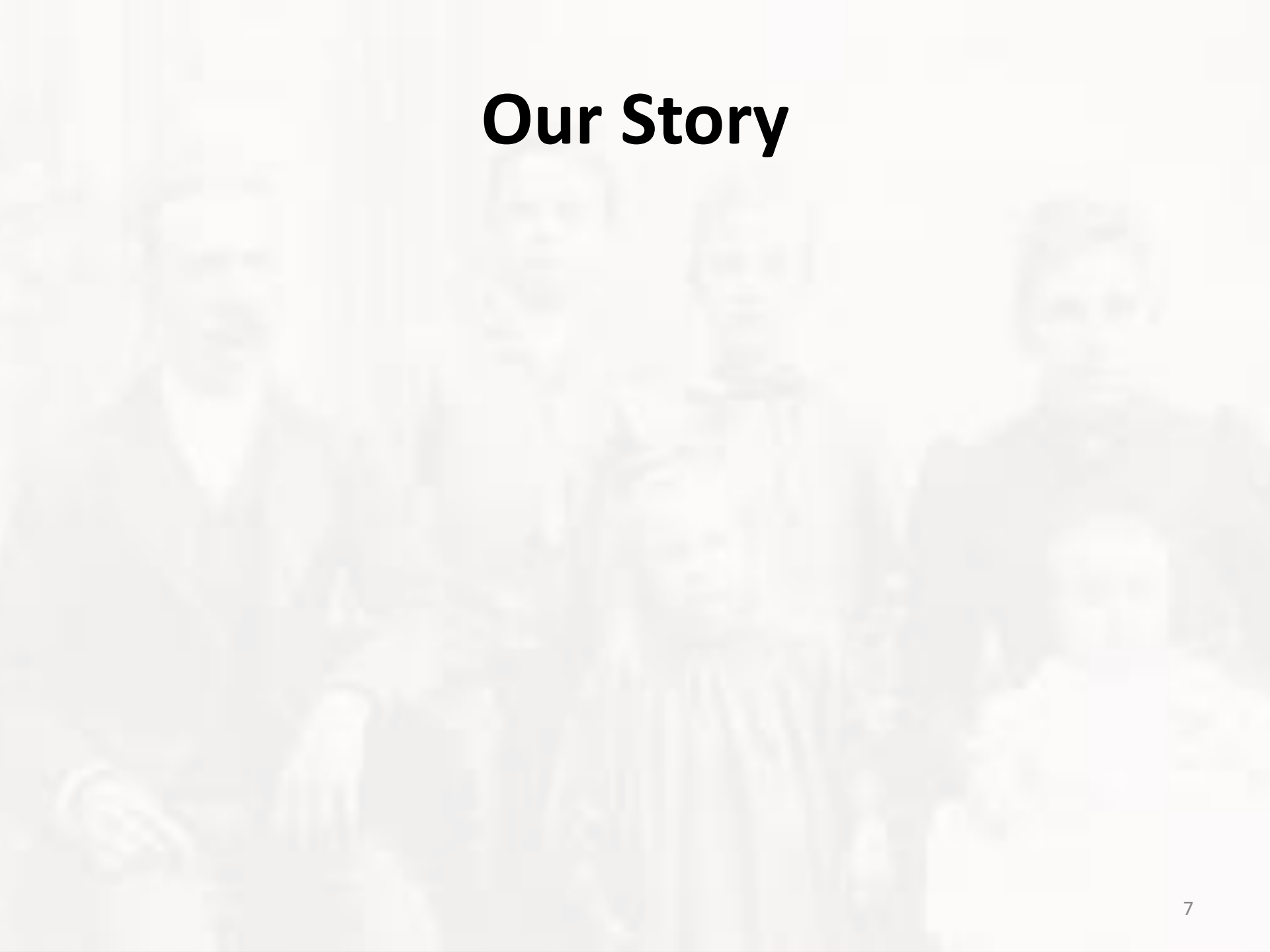


\* Charles T. Meadow and others

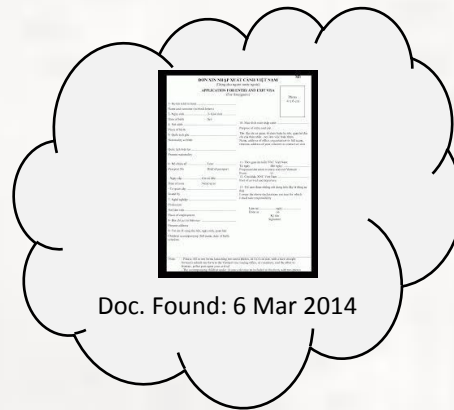
# Our Story



# Our Story

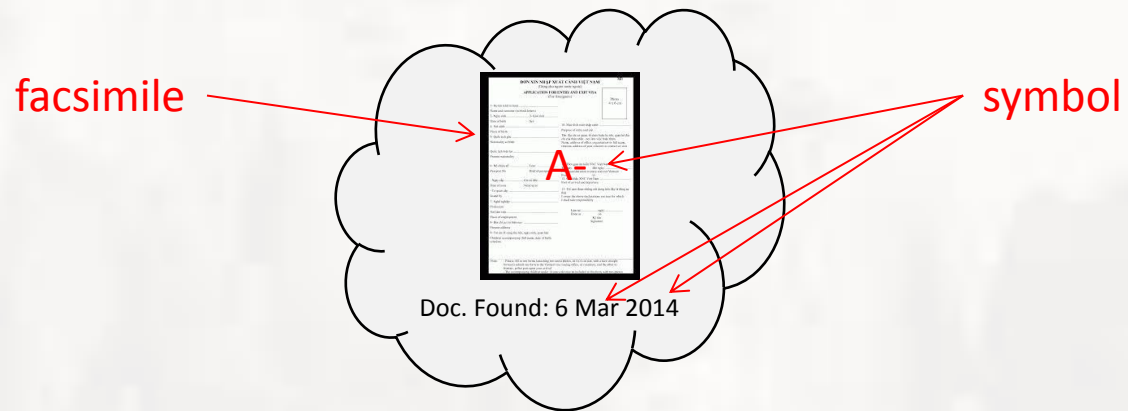


# Symbol





# Symbol



# Class

BloodType

BloodType

**external representation:**

\b(A+|A-|B+|B-|AB+|AB-|O+|O-)\b

**context keywords:** \b[Bb]lood\s[Tt]ype\b

**input method:** BloodTypeToString

**output method:** StringToBloodType

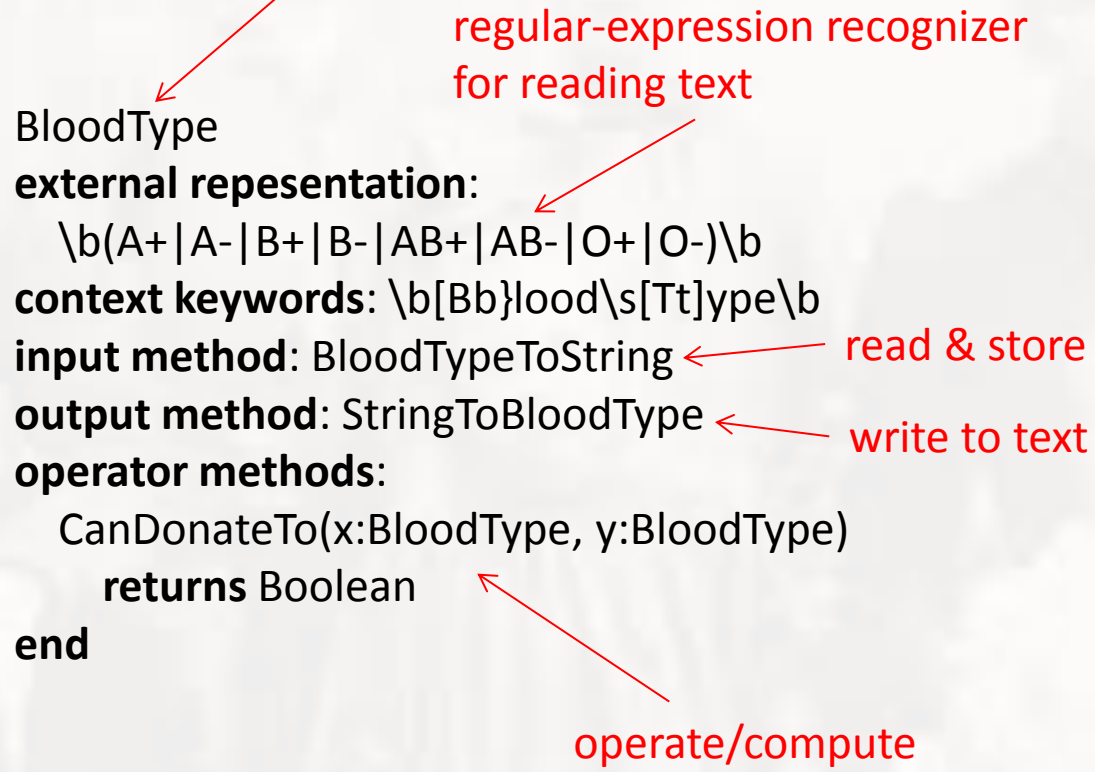
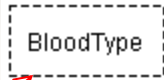
**operator methods:**

CanDonateTo(x:BloodType, y:BloodType)

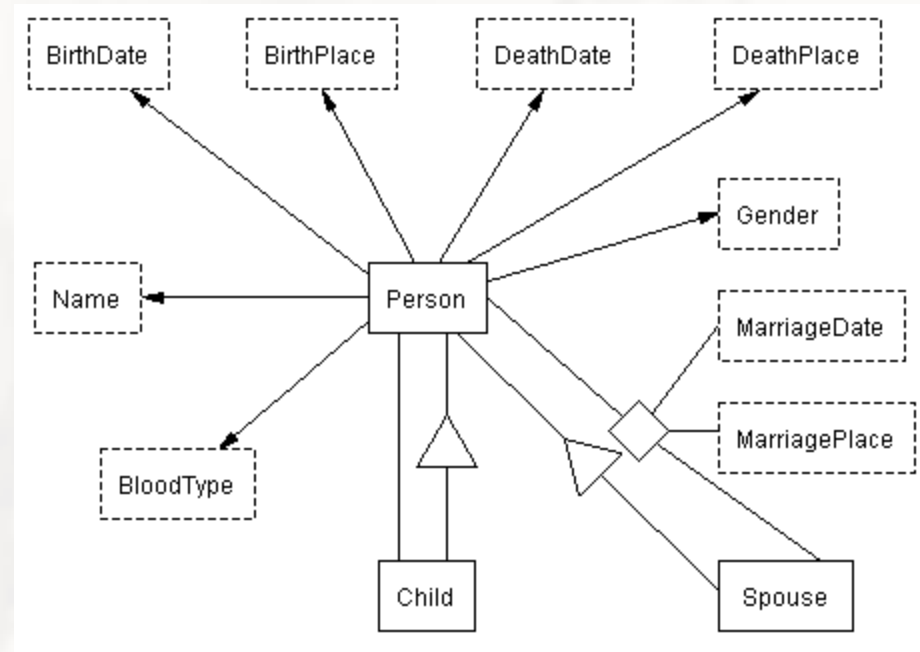
**returns** Boolean

**end**

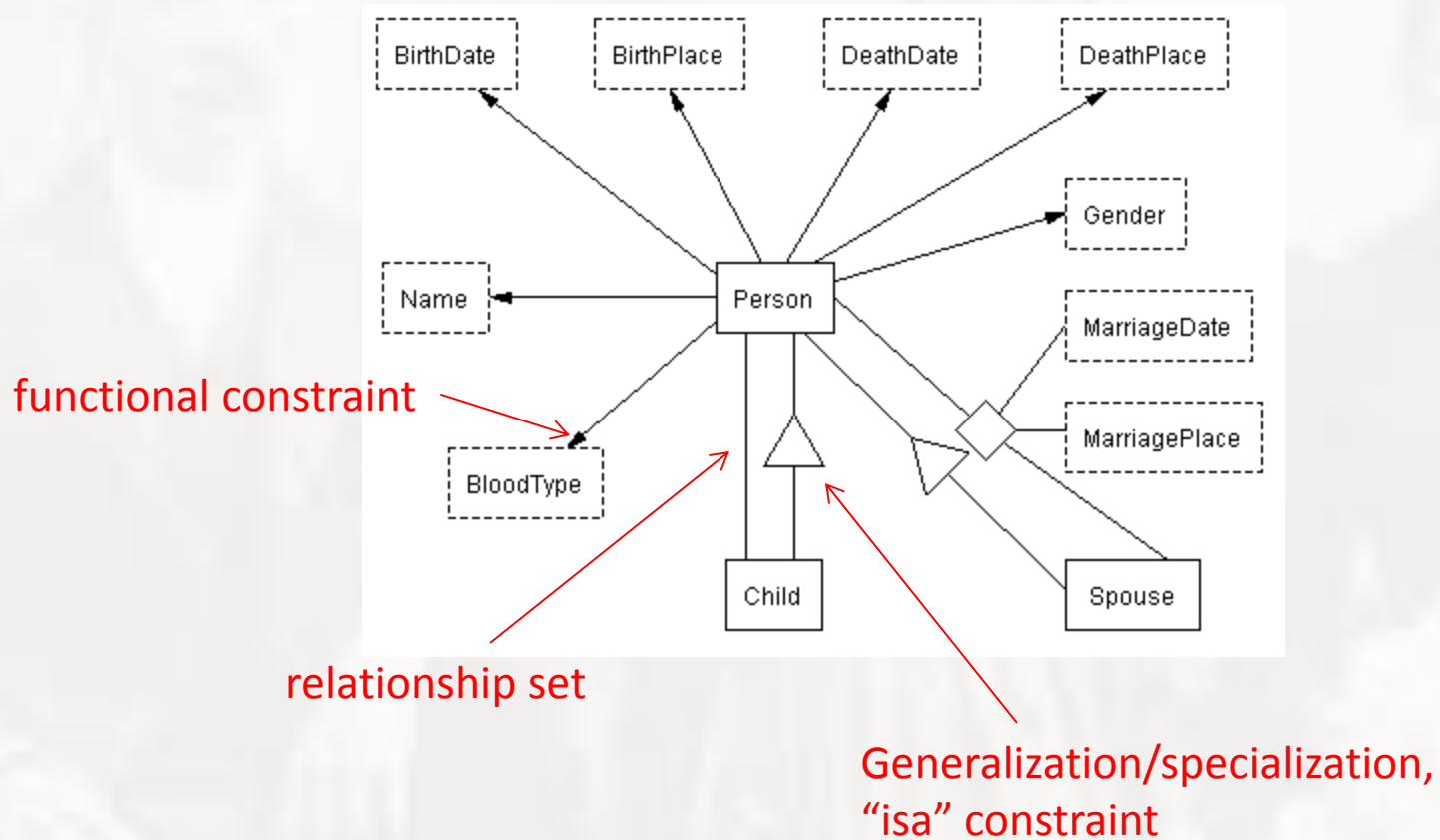
# Class



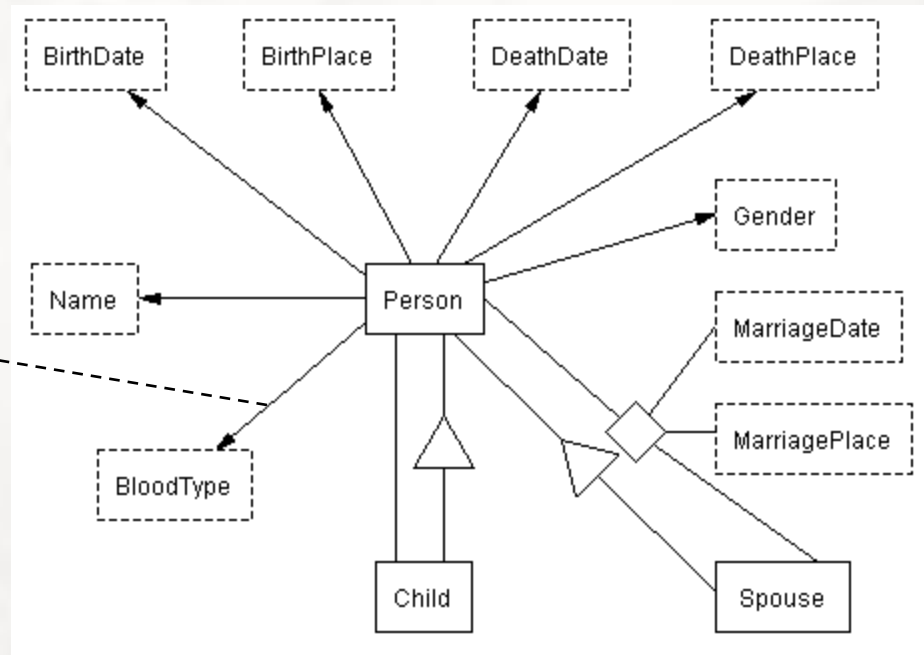
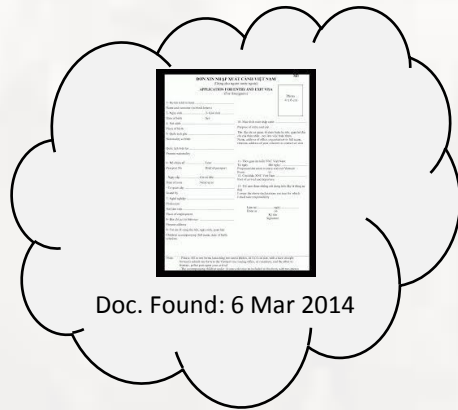
# Information



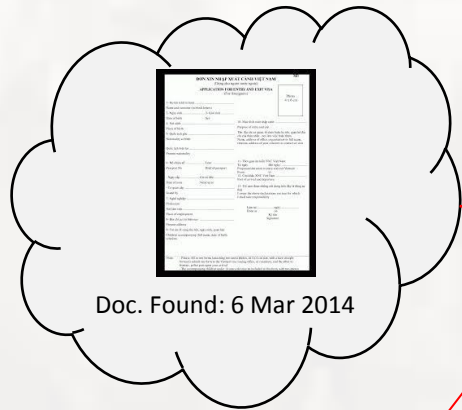
# Information



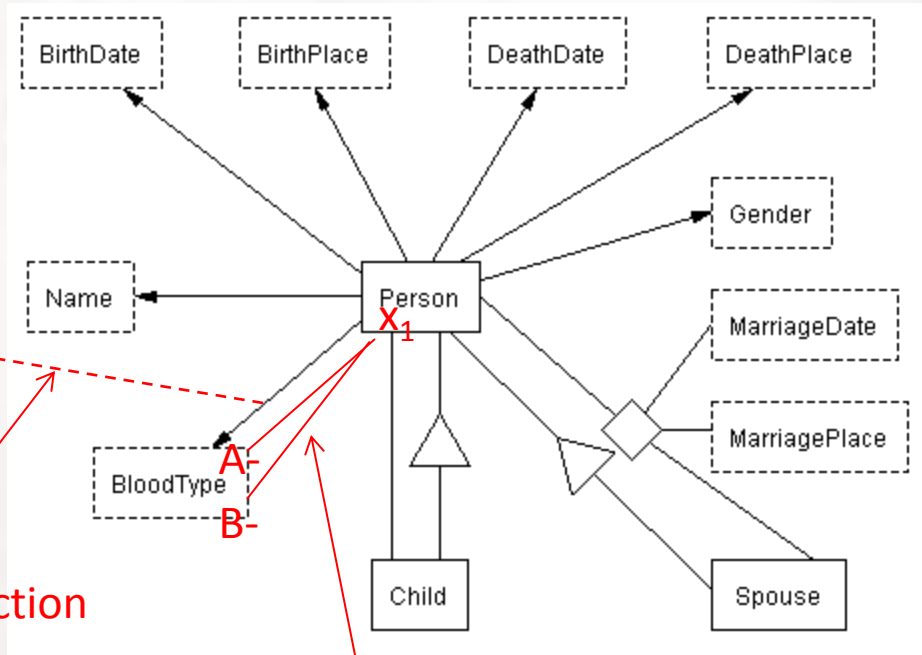
# Knowledge



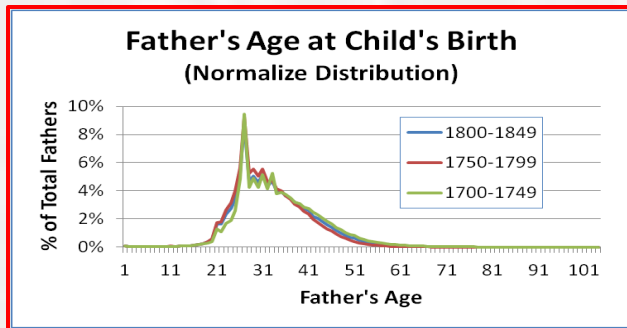
# Knowledge



meta-information connection

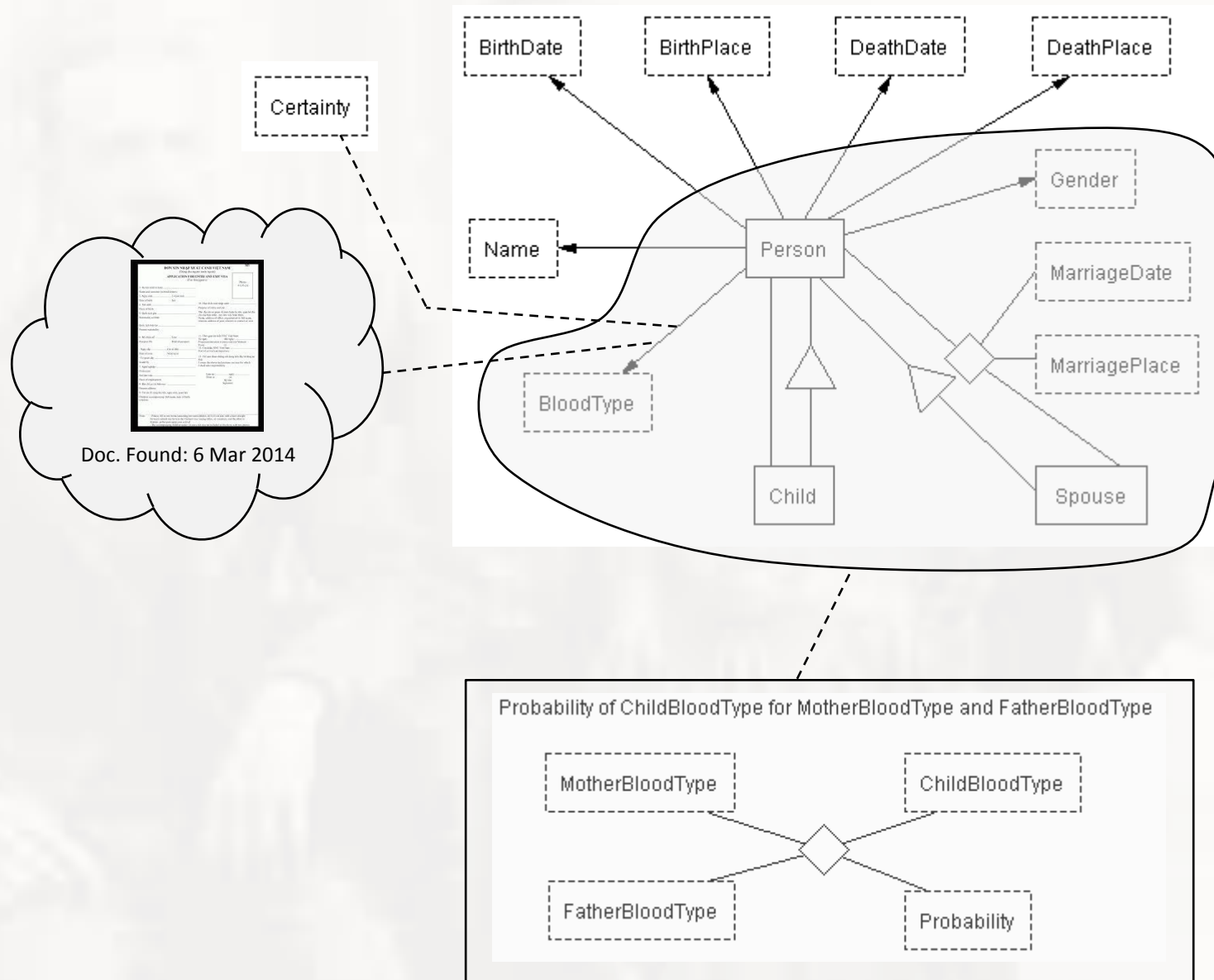


constraint violation



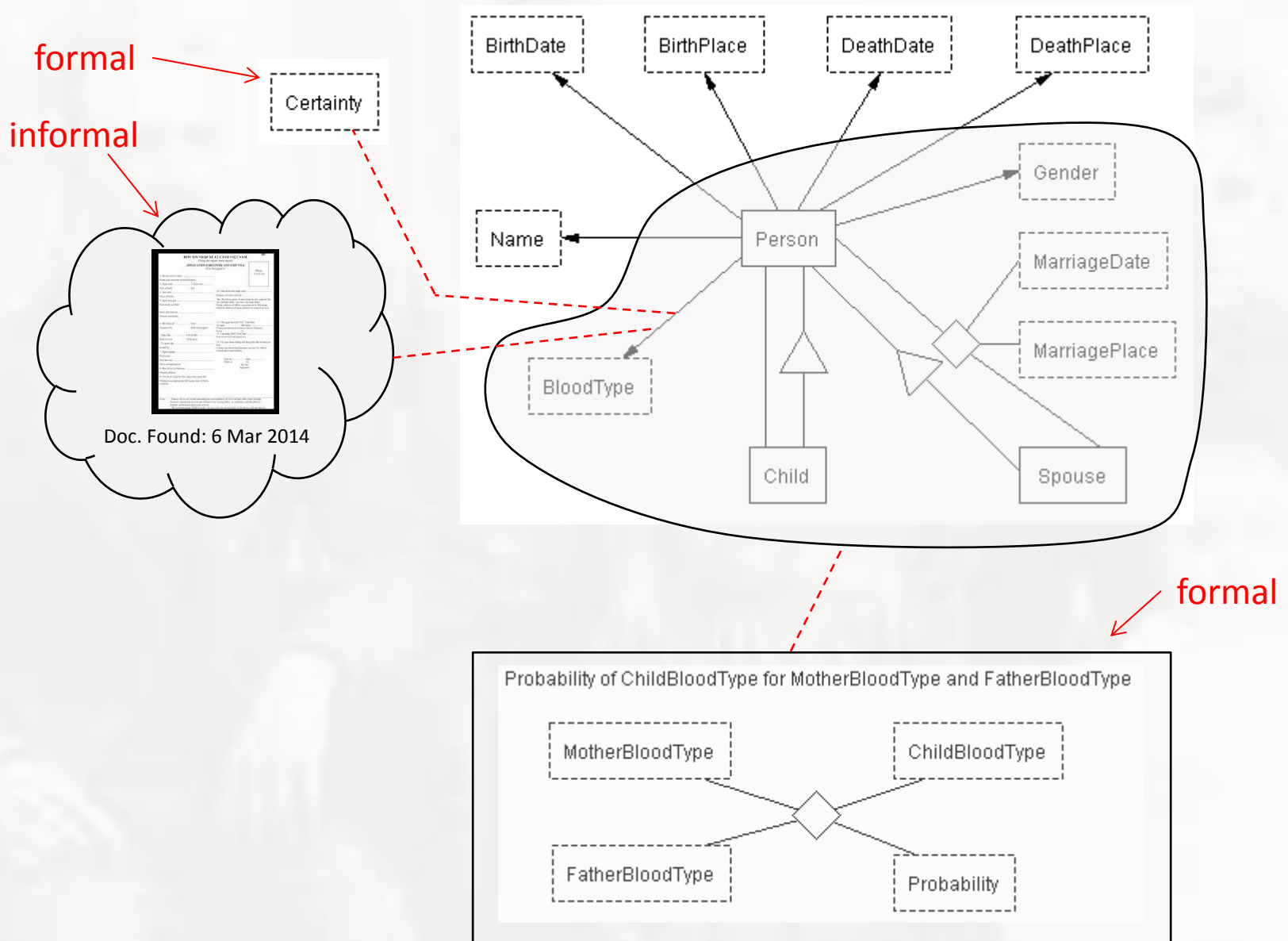
soft constraint

# Evidence

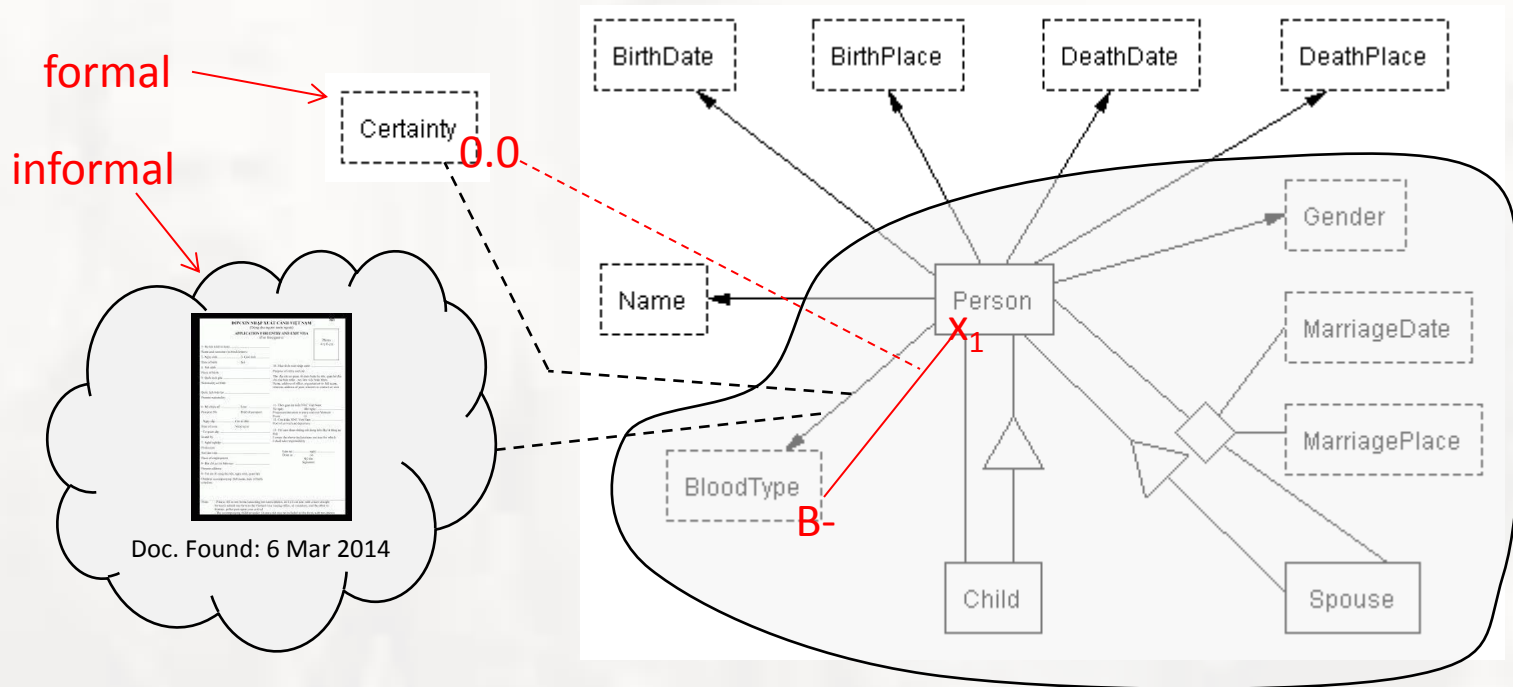




# Evidence

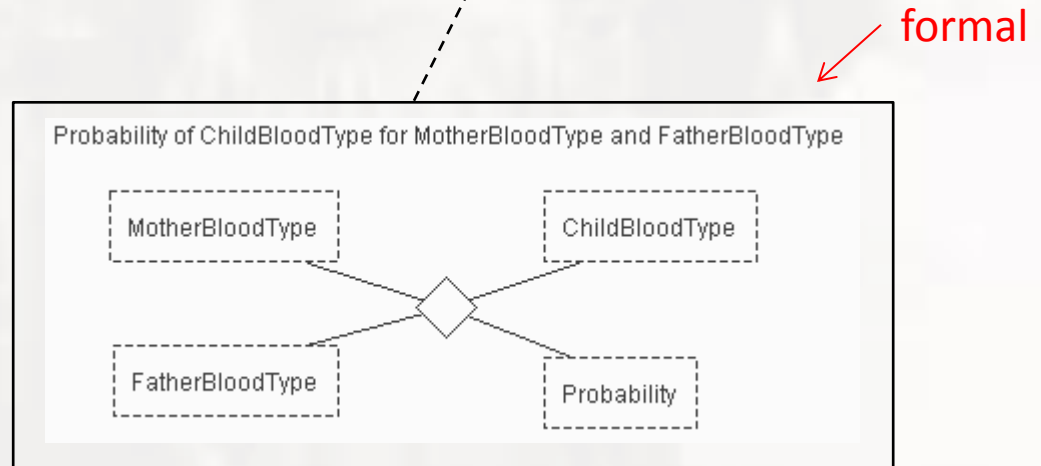


# Evidence



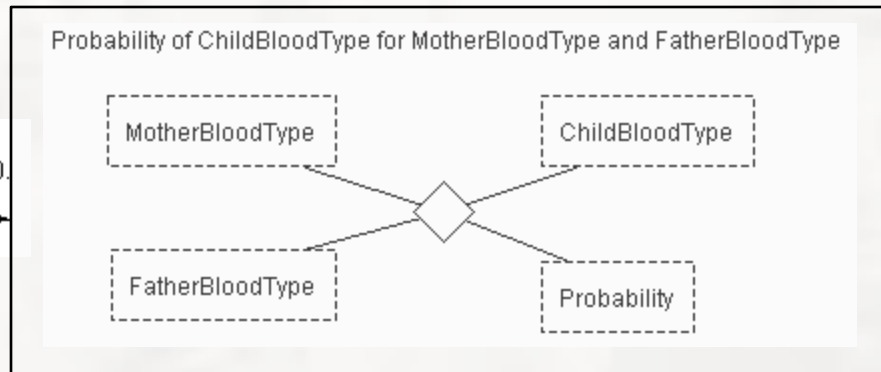
## Reasoning with the evidence:

$Person(x_1)-BloodType(x_2)$ ,  
 $Person(x_3)-BloodType(x_4)$ ,  $Person(x_5)-BloodType(x_6)$ ,  
 $Child(x_1)-Person(x_3)$ ,  $Person(x_3)-Gender('F')$ ,  
 $Child(x_1)-Person(x_4)$ ,  $Person(x_4)-Gender('M')$ ,  
 $Probability(x_7)-of-ChildBloodType(x_2)-and-$   
 $MotherBloodType(x_4)-FatherBloodType(x_6)$ ,  
 $\rightarrow$   
 $Certainty(x_7)---Person(x_1)-BloodType(x_2)$



# Communication

The probability of a child's blood type being B- when both the mother's and father's is A- is 0.0



Dr.Q

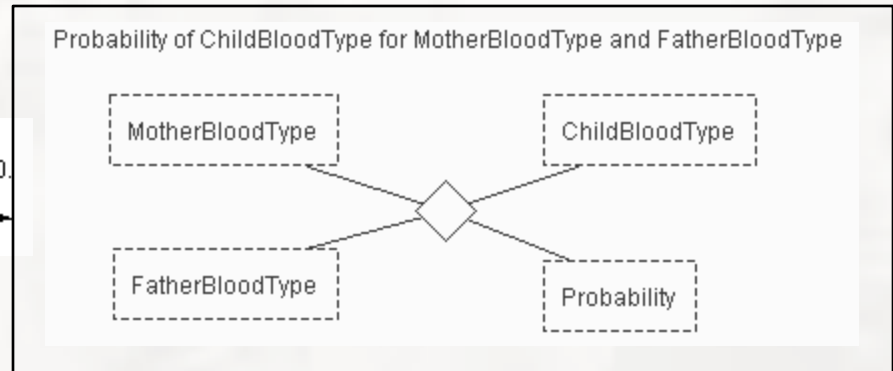


GenGuide

# Communication

The probability of a child's blood type being B- when both the mother's and father's is A- is 0.0.

receive & read

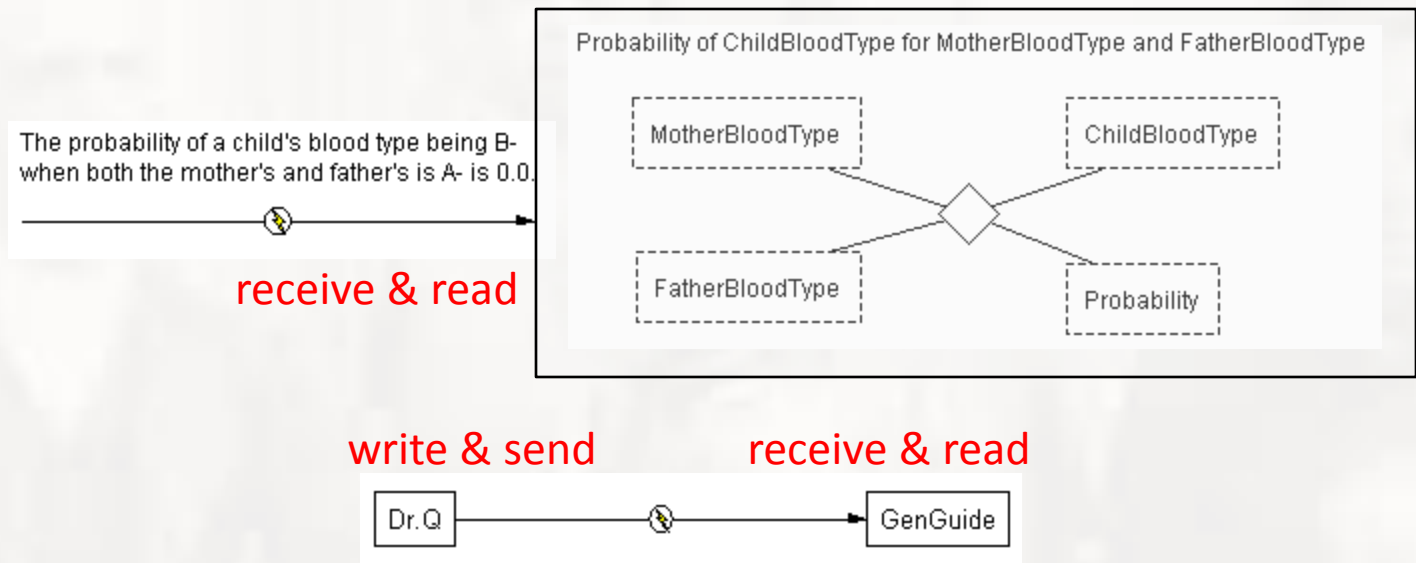


write & send

receive & read



# Communication



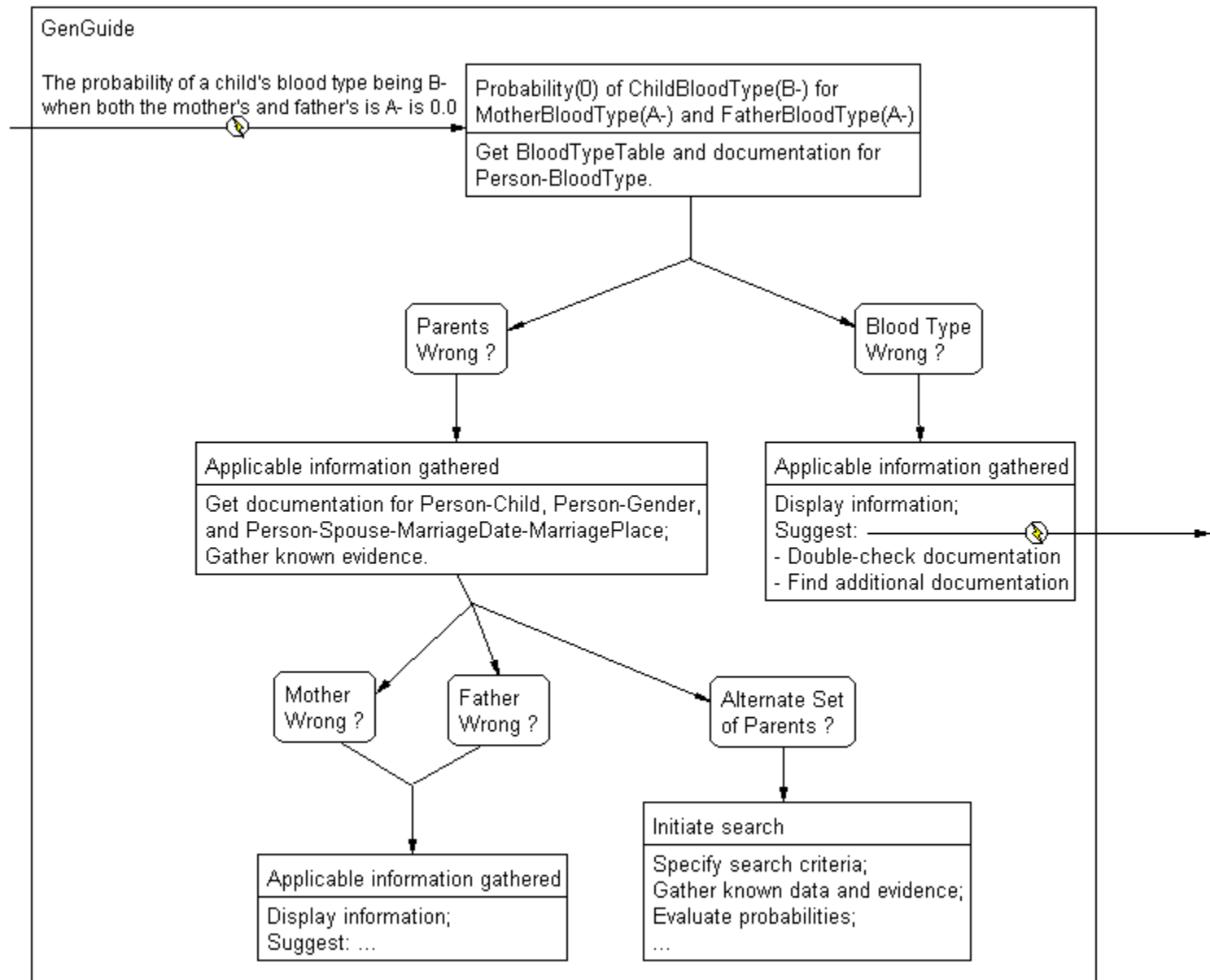
## model structure:

Probability[1:~] of ChildBloodType[1:~] for MotherBloodType[1:~] and FatherBloodType[1:~]  
end;

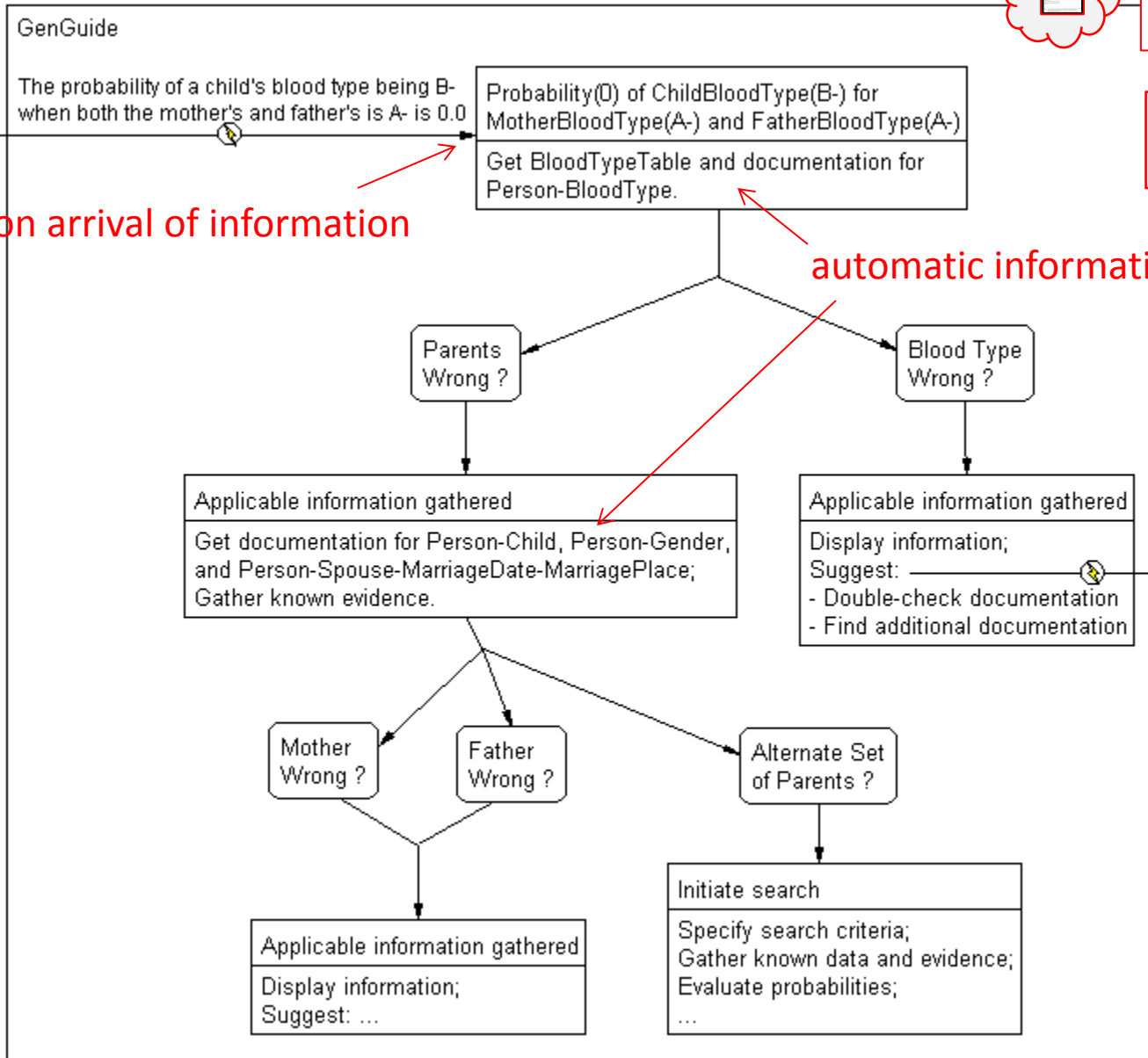
## model instance:

Probability(93.75%) of ChildBloodType(A-) for MotherBloodType(A-) and FatherBloodType(A-);  
Probability(6.25%) of ChildBloodType(O-) for MotherBloodType(A-) and FatherBloodType(A-);  
...  
end;

# Action

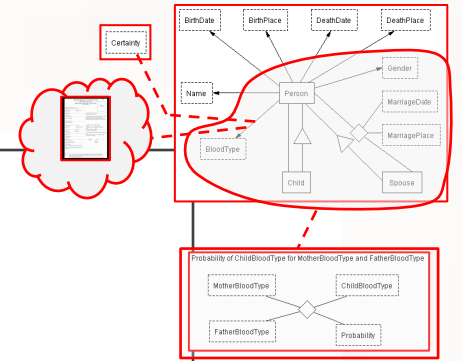


# Action



triggered on arrival of information

automatic information gathering



# Wisdom

- The proper application of
    - Knowledge
    - Evidence (Truth)
    - Communication
    - Action
- } Upper 4 superstructure layers
- When Properly Applied
    - Record and process richer information
    - Perform evidence-based reasoning
    - Collaborate effectively
    - Semi-automate family history research