

# AI Systems Work1

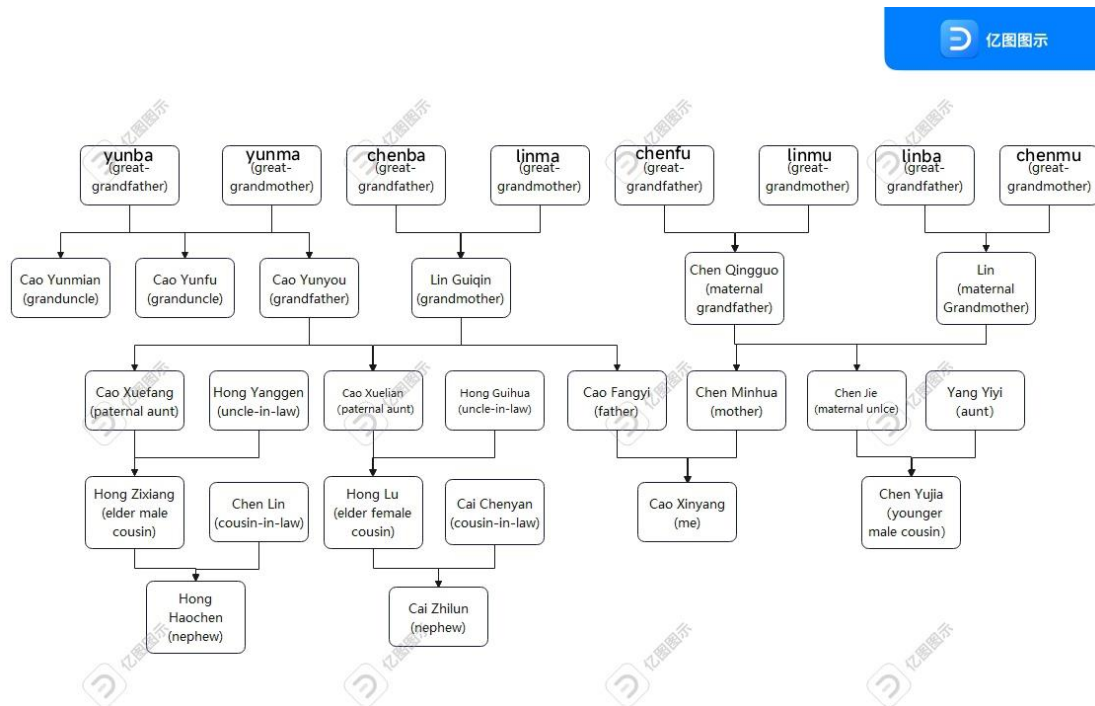
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**Job issue for the work:**

Draw a family tree and write the corresponding code.

**Graph of the family tree:**



**My Code:**

%facts

%birth(father,mother,child,gender,year)

birth(yunba,yunma,yunmian,male,1939).

birth(yunba,yunma,yunyou,male,1941).

birth(yunba,yunma,yunfu,male,1943).

birth(chenba,linma,guiqin,female,1943).

birth(chenfu,linmu,qingguo,male,1944).

birth(linba,chenmu,lin,female,1946).

birth(yunyou,guiqin,xuelian,female,1965).

birth(yunyou,guiqin,xuefang,female,1967).

birth(yunyou,guiqin,fangyi,male,1971).

birth(qingguo,lin,minhua,female,1973).  
birth(qingguo,lin,chenjie,male,1976).  
birth(guihua,xuelian,honglu,female,1988).  
birth(yanggen,xuefang,zixiang,male,1995).  
birth(fangyi,minhua,xinyang,male,2001).  
birth(chenjie,yiyi,yujia,male,2003).  
birth(chenyan,honglu,zhilun,male,2012).  
birth(zixiang,chenlin,haochen,male,2015).

%marriage(husband,wife,year)

marriage(yunba,yunma,1938).  
marriage(chenba,linma,1940).  
marriage(chenfu,linmu,1941).  
marriage(linba,chenmu,1943).  
marriage(yunyou,guiqin,1961).  
marriage(qingguo,lin,1965).  
marriage(guihua,xuelian,1986).  
marriage(yanggen,xuefang,1990).  
marriage(fangyi,minhua,1999).  
marriage(chenjie,yiyi,2000).  
marriage(chenyan,honglu,2010).  
marriage(zixiang,chenlin,2013).

%divorce(husband,wife,year)

divorce(chenfu,linmu,1976).

%death(X,year)

death(chenfu,1990).  
death(yunba,1994).  
death(chenba,1999).  
death(linba,2003).  
death(yunma,2009).  
death(chenmu,2013).

%like(name,hobby1,hobby2,hobby3,hobby4)

like(xinyang,singing,dancing,rap,basketball).  
like(fangyi,apple,cooking,eating,running).  
like(minhua,reading,walking,video,orange).  
like(zixiang,driving,running,coke,climbing).  
like(yujia,games,video,movies,singing).

like(honglu,reading,music,milk,dancing).  
like(zhilun,games,swimming,basketball,milk).  
like(haochen,running,jumping,hiking,video).

%rules

father(X,Y) :- birth(X,\_,Y,\_,\_).  
mother(X,Y) :- birth(\_,X,Y,\_,\_).  
male(X) :- birth(\_,\_,X,male,\_).  
female(X) :- birth(\_,\_,X,female,\_).  
son(X,Y) :- father(Y,X),male(X),!.  
son(X,Y) :- mother(Y,X),male(X).  
daughter(X,Y) :- father(Y,X),female(X),!.  
daughter(X,Y) :- mother(Y,X),female(X).  
brother(X,Y) :- father(Z,X), father(Z,Y), male(X), X\=Y,!.  
brother(X,Y) :- mother(Z,X), mother(Z,Y), male(X), X\=Y.  
sister(X,Y) :- father(Z,X), father(Z,Y), female(X), X\=Y,!.  
sister(X,Y) :- mother(Z,X), mother(Z,Y), female(X), X\=Y.  
younger\_brother(X,Y) :- brother(X,Y), birth(\_,\_,X,\_,Y1), birth(\_,\_,Y,\_,Y2), Y1 < Y2.  
elder\_brother(X,Y) :- brother(X,Y), birth(\_,\_,X,\_,Y1), birth(\_,\_,Y,\_,Y2), Y1 > Y2.  
younger\_sister(X,Y) :- sister(X,Y), birth(\_,\_,X,\_,Y1), birth(\_,\_,Y,\_,Y2), Y1 < Y2.  
elder\_sister(X,Y) :- sister(X,Y), birth(\_,\_,X,\_,Y1), birth(\_,\_,Y,\_,Y2), Y1 > Y2.  
grandfather(X,Y) :- father(X,Z), father(Z,Y),!.  
grandfather(X,Y) :- father(X,Z), mother(Z,Y).  
grandmother(X,Y) :- mother(X,Z), father(Z,Y),!.  
grandmother(X,Y) :- mother(X,Z), mother(Z,Y).  
cousin(X,Y) :- grandfather(Z,X), grandfather(Z,Y), X\=Y,!.  
cousin(X,Y) :- grandmother(Z,X), grandmother(Z,Y), X\=Y.  
uncle(X,Y) :- brother(Z,X), father(Z,Y),!.  
uncle(X,Y) :- brother(Z,X), mother(Z,Y).  
aunt(X,Y) :- sister(Z,X), father(Z,Y),!.  
aunt(X,Y) :- sister(Z,X), mother(Z,Y).  
nephew(X,Y) :- uncle(Y,X), male(X),!.  
nephew(X,Y) :- aunt(Y,X), male(X).  
niece(X,Y) :- uncle(Y,X), female(X),!.  
niece(X,Y) :- aunt(Y,X), female(X).  
granduncle(X,Y) :- uncle(X,Z),father(Z,Y),!.  
granduncle(X,Y) :- uncle(X,Z),mother(Z,Y).  
married(X, Year) :- marriage(X,Y,YofMarriage), Year > YofMarriage,  
not(divorce(X,Y, \_)), not(death(Y,\_)).

## Goal resolutions:

The screenshot displays the SWISH Prolog IDE interface. On the left, the 'Program' window contains a family database with rules for relationships like birth, father, mother, brother, sister, etc. On the right, the 'Query Results' window shows the results of several queries, all returning 'true' except for one that returns 'false'.

**Program Rules:**

```
57 like(zhang, games, swimming, basketball, music).
58 like(haochen, running, jumping, hiking, video).
59
60 #rules
61
62 father(X, Y) :- birth(X, _, Y, _).
63 mother(X, Y) :- birth(X, Y, _, _).
64 male(X) :- birth(X, _, Y, male).
65 female(X) :- birth(X, Y, _, female).
66 son(X, Y) :- father(Y, X), male(X).
67 daughter(X, Y) :- mother(Y, X), female(X).
68 daughter(X, Y) :- father(Y, X), female(X).
69 daughter(X, Y) :- mother(Y, X), female(X).
70 brother(X, Y) :- father(Z, X), father(Z, Y), male(X), X \= Y.
71 brother(X, Y) :- mother(Z, X), mother(Z, Y), male(X), X \= Y.
72 sister(X, Y) :- father(Z, X), father(Z, Y), female(X), X \= Y.
73 sister(X, Y) :- mother(Z, X), mother(Z, Y), female(X), X \= Y.
74 younger_brother(X, Y) :- brother(X, Y), birth(X, _, Y1, _), birth(Y, _, Y2, _), Y1 < Y2.
75 elder_brother(X, Y) :- brother(X, Y), birth(X, _, Y1, _), birth(Y, _, Y2, _), Y1 > Y2.
76 younger_sister(X, Y) :- sister(X, Y), birth(X, _, Y1, _), birth(Y, _, Y2, _), Y1 < Y2.
77 elder_sister(X, Y) :- sister(X, Y), birth(X, _, Y1, _), birth(Y, _, Y2, _), Y1 > Y2.
78 grandfather(X, Y) :- father(X, Z), father(Z, Y).
79 grandfather(X, Y) :- father(X, Z), mother(Z, Y).
80 grandmother(X, Y) :- mother(X, Z), father(Z, Y).
81 grandmother(X, Y) :- mother(X, Z), mother(Z, Y).
82 cousin(X, Y) :- grandfather(Z, X), grandfather(Z, Y), X \= Y.
83 cousin(X, Y) :- grandmother(Z, X), grandmother(Z, Y), X \= Y.
84 uncle(X, Y) :- brother(Z, X), father(Z, Y).
85 uncle(X, Y) :- brother(Z, X), mother(Z, Y).
86 aunt(X, Y) :- sister(Z, X), father(Z, Y).
87 aunt(X, Y) :- sister(Z, X), mother(Z, Y).
88 nephew(X, Y) :- uncle(Y, X), male(X).
89 nephew(X, Y) :- aunt(Y, X), male(X).
90 niece(X, Y) :- uncle(Y, X), female(X).
91 niece(X, Y) :- aunt(Y, X), female(X).
92 granduncle(X, Y) :- uncle(X, Z), father(Z, Y).
93 granduncle(X, Y) :- uncle(X, Z), mother(Z, Y).
94 married(X, Year) :- marriage(X, Y, Year), Year > YearMarriage.
95 not(divorce(X, Y, _)), not(death(Y, _)).
```

**Query Results:**

Query	Result
male(xinyang).	true
father(fangyi, xinyang).	true
son(xinyang, fangyi).	true
cousin(zixiang, hongliu).	true
married(fangyi, 1990).	false
married(fangyi, 2001).	true
grandfather(yunyou, zixiang).	true
brother(yunmian, yunyou).	true
uncle(yunmian, fangyi).	true
niece(hongliu, fangyi).	true
brother(fangyi, xuefang).	true

## Summary:

By writing Prolog code, we can clearly understand the relationship between the roles, which is very useful.