# ARTIFICIAL INTELLIGENCE Assignment 2

#### U20CS005 BANSI MARAKANA

```
Use the following predicates as a knowledge base to create a family tree.
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parent(motilal,javaharlal).
parent(motilal,vijyalakshmi).
parent(motilal,krishna).
parent(swarupmati,javaharlal).
parent(swarupmati,vijyalakshmi).
parent(swarupmati,krishna).
male(motilal).
female(swarupmati).
male(javaharlal).
female(kamla).
parent(javaharlal,indira).
parent(kamla,indira).
female(indira).
male(firoz).
parent(indira,sanjay).
parent(firoz, sanjay).
parent(indira,rajiv).
parent(firoz,rajiv).
male(sanjay).
female(menka).
parent(sanjay,varun).
parent(menka, varun).
male(rajiv).
female(sonia).
parent(rajiv,rahul).
parent(rajiv,priyanka).
parent(sonia,rahul).
parent(sonia,priyanka).
male(varun).
male(rahul).
female(priyanka).
female(vijyalakshmi).
male(ranjit).
parent(vijyalakshmi,tara).
parent(vijyalakshmi,lekha).
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parent(vijyalakshmi,rita).

parent(ranjit,tara).

```
parent(ranjit,lekha).
parent(ranjit,rita).
female(tara).
female(lekha).
female(rita).
```

male(ranjit).

#### 1. Identify and remove the errors/suggestions in the given knowledge base.

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female(krishna).
Same clauses were not written together in the source file. After moving all the clauses together,
the errors get solved as shown below:
parent(motilal,javaharlal).
parent(motilal,vijyalakshmi).
parent(motilal,krishna).
parent(swarupmati,javaharlal).
parent(swarupmati,vijyalakshmi).
parent(swarupmati,krishna).
parent(javaharlal,indira).
parent(kamla,indira).
parent(indira,sanjay).
parent(firoz, sanjay).
parent(indira,rajiv).
parent(firoz,rajiv).
parent(vijyalakshmi,tara).
parent(vijyalakshmi,lekha).
parent(vijyalakshmi,rita).
parent(ranjit,tara).
parent(ranjit,lekha).
parent(ranjit,rita).
parent(sanjay,varun).
parent(menka,varun).
parent(rajiv,rahul).
parent(rajiv,priyanka).
parent(sonia,rahul).
parent(sonia,priyanka).
male(motilal).
male(javaharlal).
male(firoz).
male(sanjay).
male(rajiv).
male(varun).
male(rahul).
```

female(sonia).
female(swarupmati).
female(kamla).
female(indira).
female(menka).
female(priyanka).
female(vijyalakshmi).
female(tara).
female(lekha).
female(rita).
female(krishna).

## 2. Generate rules of following relations by considering given knowledge base: a. grandparent/2.

%X is Grandparent of Z grandparent(X,Z):-parent(X,Y),parent(Y,Z).

		$\oplus = \otimes$	
Х	Z		
motilal	indira	1	
motilal	tara	2	
motilal	lekha	3	
motilal	rita	4	
swarupmati	indira	5	
swarupmati	tara	6	
swarupmati	lekha	7	
swarupmati	rita	8	
javaharlal	sanjay	9	
javaharlal	rajiv	10	
kamla	sanjay	11	
kamla	rajiv	12	
indira	varun	13	
firoz	varun	14	
indira	rahul	15	
indira	priyanka	16	
firoz	rahul	17	
firoz	priyanka	18	

#### b. brother/2.

%X is brother of Y

brother1(X,Y):-parent(Z,X), parent(Z,Y), male(X), X = Y, not(female(Z)).

OR

 $brother(X,Y):-father(Z,X),father(Z,Y),male(X),X\=Y.$ 

		$\oplus = \otimes$
X	Υ	
javaharlal	vijyalakshmi	1
javaharlal	krishna	2
sanjay	rajiv	3
rajiv	sanjay	4
rahul	priyanka	5

#### c. sister/2.

%X is sister of Y

 $sister 1(X,Y) :- parent(Z,X), parent(Z,Y), female(X), X \\ \\ = Y, not(female(Z)).$ 

OR

 $sister(X,Y):-mother(Z,X),mother(Z,Y),female(X),X\=Y.$ 



#### d. uncle/2.

%X is uncle of Y uncle(X,Y):-parent(Z,Y),brother(X,Z).



#### e. aunt/2.

%X is aunt of Y aunt(X,Y):-parent(Z,Y),sister(X,Z).

aunt(X,Y)	
X	Y
vijyalakshmi	indira 1
krishna	indira 2
krishna	tara 3
krishna	lekha 4
krishna	rita 5

#### f. mother/2.

%X is mother of Y mother(X,Y):-parent(X,Y),female(X).

mother(X,Y)		$\oplus = \otimes$	
Х	Y		
swarupmati	javaharlal	1	
swarupmati	vijyalakshmi	2	
swarupmati	krishna	3	
kamla	indira	4	
indira	sanjay	5	
indira	rajiv	6	
vijyalakshmi	tara	7	
vijyalakshmi	lekha	8	
vijyalakshmi	rita	9	
menka	varun	10	
sonia	rahul	11	
sonia	priyanka	12	

## g. father/2.

%X is father of Y father(X,Y):-parent(X,Y),male(X).



#### h. wife/2.

%X is wife of Y wife(X,Y):-mother(X,Z),father(Y,Z).



#### i. child/2.

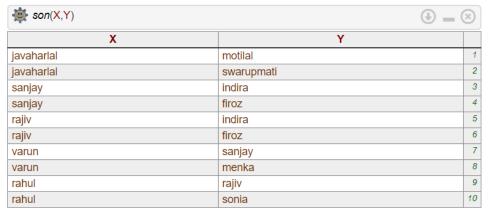
%X is child of Y child1(X,Y):-parent(Y,X). OR

child(X,Y):-son(X,Y);daughter(X,Y).

child(X,Y)		$\oplus = \otimes$
X	Y	
javaharlal	motilal	1
javaharlal	swarupmati	2
sanjay	indira	3
sanjay	firoz	4
rajiv	indira	5
rajiv	firoz	6
varun	sanjay	7
varun	menka	8
rahul	rajiv	9
rahul	sonia	10
vijyalakshmi	motilal	11
krishna	motilal	12
vijyalakshmi	swarupmati	13
krishna	swarupmati	14
indira	javaharlal	15
indira	kamla	16
tara	vijyalakshmi	17
lekha	vijyalakshmi	18
rita	vijyalakshmi	19
tara	ranjit	20
lekha	ranjit	21
rita	ranjit	22
priyanka	rajiv	23
priyanka	sonia	24

#### j. son/2.

%X is son of Y son(X,Y):-parent(Y,X),male(X).



### k. daughter/2.

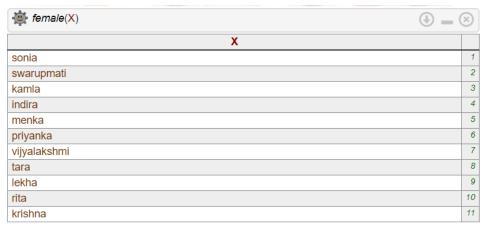
%X is daughter of Y daughter(X,Y):-parent(Y,X),female(X).



#### 3. Answer the following queries

### a. Find all females in the given tree

female(X)



## b. How many grandchildren do motilal have?

grandparent(motilal,Z)



#### c. Who is/are sister of lekha?

sister(X,lekha)



#### d. Who are the parents of tara?

parent(X,tara)



#### e. Who are cousins of rajiv?

cousin(X,Y):-grandparent(Z,X),grandparent(Z,Y),X\=Y,parent(W,X),not(parent(W,Y)).

