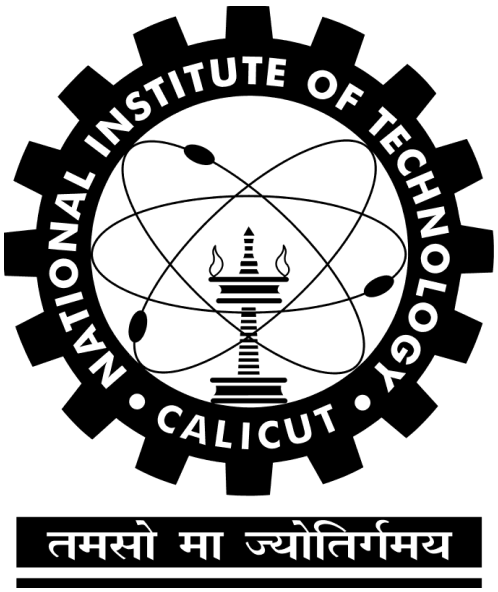
PROLOG ASSIGNMENT

Computational Intelligence

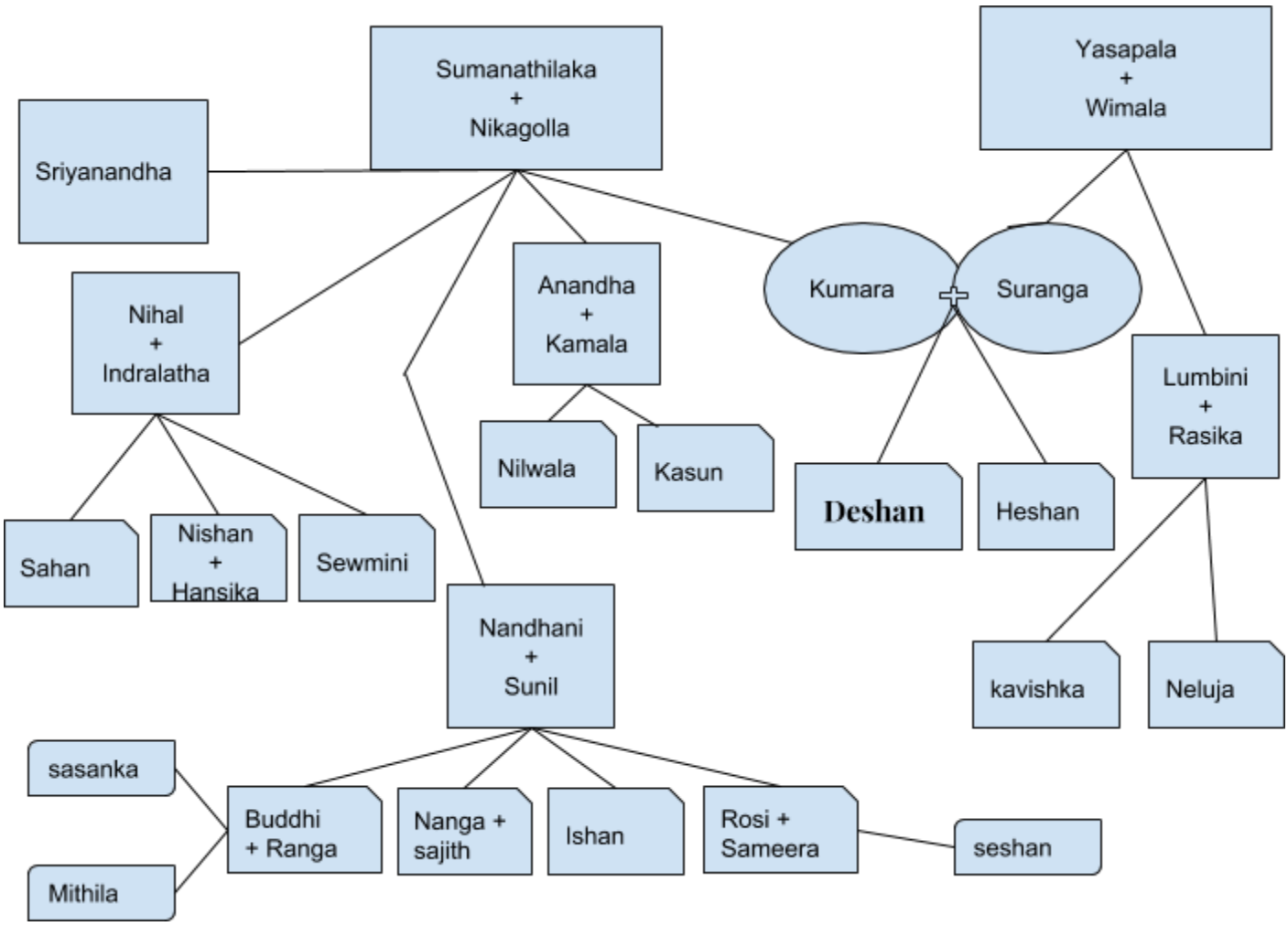


Submitted by

TGDK Sumanathilaka (B150413CS)

Department of Computer Science and Engineering
National Institute of Technology Calicut
Calicut, Kerala, India - 673 601
September 20, 2018

Family Tree


Sumanathilaka
+
Nikagolla
Yasapala
+
Wimala
Sriyanandha
Nihal
+
Indralatha
Anandha
+
Kamala
Kumara
Suranga
Lumbini
+
Rasika
Nilwala
Kasun
Deshan
Heshan
Sahan
Nishan
+
Hansika
Sewmini
Nandhani
+
Sunil
kavishka
Neluja
sasanka
Mithila
Buddhi
+ Ranga
Nanga +
sajith
Ishan
Rosi +
Sameera
seshan

Prolog Code

facts

```
parent(sumanathilaka, nihal).
parent(sumanathilaka, nandhani).
parent(sumanathilaka, anandha).
parent(sumanathilaka, sriyanandha).
parent(sumanathilaka, kumaranandha).
parent(nikagolla, nihal).
parent(nikagolla, nandhani).
parent(nikagolla, anandha).
parent(nikagolla, sriyanandha).
parent(nikagolla, kumaranandha).
parent(yasapala, suranga).
parent(yasapala, lumbini).
parent(wimala, suranga).
parent(wimala, lumbini).
parent(nihal, sahan).
parent(nihal, nishan).
parent(nihal, sewmini).
parent(indralatha, sahan).
parent(indralatha, nishan).
parent(indralatha, sewmini).
parent(nandhani, buddhi).
parent(nandhani, nanga).
parent(nandhani, rosi).
parent(nandhani, ishan).
parent(sunil, buddhi).
parent(sunil, nanga).
parent(sunil, rosi).
parent(sunil, ishan).
parent(anandha, nilwala).
parent(anandha, kasun).
parent(kamala, nilwala).
parent(kamala, kasun).
parent(buddhi, sasanka).
parent(buddhi, mithila).
parent(ranga, sasanka).
parent(ranga, mithila).
parent(rosi, seshan).
parent(sameera, seshan).
parent(kumaranandha, deshan).
parent(kumaranandha, heshan).
parent(suranga, deshan).
parent(suranga, heshan).
parent(lumbini, kavishka).
parent(lumbini, neluja).
parent(rasika, kavishka).
parent(rasika, neluja).

couple(sumanathilaka, nikagolla).
couple(yasapala, wimala).
couple(nihal, indralatha).
couple(kumaranandha, suranga).
couple(anandha, kamala).
couple(nandhini, sunil).
couple(lumbini, rasika).
couple(nishan, hansika).
couple(buddhi, ranga).
couple(nanga, sajith).
couple(rosi, sameera).
```

male(sumanathilaka).
male(nihal).
male(sriyanandha).
male(anandha).
male(sunil).
male(kumaranandha).
male(yasapala).
male(rasika).
male(sahan).
male(nishan).
male(ranga).
male(sasanka).
male(mithila).
male(sameera).
male(seshan).
male(ishan).
male(deshan).
male(heshan).
male(neluja).
male(kasun).
male(sajith).

female(nikagolla).
female(wimala).
female(indralatha).
female(nandhani).
female(kamala).
female(suranga).
female(lumbini).
female(sewmini).
female(buddhi).
female(nanga).
female(rosi).
female(kavishka).
female(hansika).

Rules

1. mother(X, Y) :-
    parent(X, Y),
    female(X).

2. father(X, Y) :-
    parent(X, Y),
    male(X).

3. sister(X, Y) :-
    sibling(X, Y),
    female(X),
    X \= Y.

4. brother(X, Y) :-
    sibling(X, Y),
    male(X),
    X \= Y.

5. sibling(X, Y) :-
    parent(Z, X),
    parent(Z, Y),
    X \= Y.

6. uncle(X, Y) :-
    brother(X, Z),
    child(Y, Z).

7. aunt(X, Y) :-
    sister(X, Z),
    child(Y, Z).

8. cousin(X, Y) :-
    grandparent(Z, X),
    grandparent(Z, Y),
    \+sibling(X, Y),
    X \= Y.

cousin(X, Y) :-
    aunt(Z, Y),mother(Z, X) ;
    uncle(Z, Y),father(Z, X).

9. maternalgrandfather(X, Y) :-
    father(X, Z),
    mother(Z, Y).

10. paternalgrandparents(X, Y) :-
    mother(X, Z),
    father(Z, Y);father(X, Z),
    father(Z, Y).

11. ancestor(X, Y) :-
    parent(X, Y).

ancestor(X, Y) :-
    parent(Z, Y),
    ancestor(X, Z).

12. descendant(X, Y) :-
    ancestor(Y, X).

Other Important Rules

1. son(X, Y) :- child(X, Y),male(X).
2. daughter(X, Y) :-child(X, Y),female(X).
3. granddaughter(X, Y) :-grandchild(X, Y),female(X).
4. grandson(X, Y) :-grandchild(X, Y),male(X).
5. grandchild(X, Y) :-grandparent(Y, X).
6. grandfather(X, Y) :-grandparent(X, Y),male(X).
7. grandmother(X, Y) :-grandparent(X, Y),female(X).
8. child(X, Y) :-parent(Y, X).
9. partner(X, Y) :-child(Z, X),child(Z, Y),X \= Y.
10. grandparent(X, Y) :- parent(X, Z),parent(Z, Y).

First-order predicate calculus

- One's mother is one's female parent.
  - ∀x,y mother(x,y) -> (female(x) ∧ parent(x,y))

- One's Father is one's male parent.
  - ∀x,y father(x,y) -> (male(x) ∧ parent(x,y))

- Siblings has same parent.
  - ∀ x,y siblings (x,y) -> ∃z (parent(z,x) ∧ parent(z,y) ∧ ¬(x=y))

- Siblings are symmetric
  - ∀ x,y siblings (x,y) -> Sibling (y,x)

- Sister is a female sibling.
  - ∀ x,y siblings (x,y) -> sibling(x,y) ∧ female(x) ∧ ¬(x=y)

- Brother is a male sibling.
  - ∀ x,y siblings (x,y) -> sibling(x,y) ∧ male(x) ∧ ¬(x=y)

- Uncle is the brother of parents.
  - ∀x,y uncle(x,y) -> ∃z (brother(x,z) ∧ child(y,z))

- Aunty is the sister of parents.
  - ∀x,y aunty(x,y) -> ∃z (sister(x,z) ∧ child(y,z))

- One's maternalgrandfather is one's mother's father.
  - ∀x,y maternalgrandfather (x,y) -> ∃z (mother(z,y) ∧ father(x,z))

- One's paternal grandparents are one's father's parents.
  - ∀x,y paternalgrandparents (x,y) -> ∃z father(z,y) ∧ (mother(x,z) v father(x,z))

- One's cousin is child of aunt or uncle

- ∀x,y cousin (x,y) -> ∃z (aunty(z, y) ∧ mother(z, x)) v (uncle(z, y) ∧ father(z,x))

- One's ancestor is one 's upper generations.
  - ∀x,y ancestor (x,y) -> parent(x,y) v ∃z (parent(z,y) ∧ ancestor (x,z))

- One's descendant is descendant 's ancestor.
  - ∀x,y descendant(x,y) -> ancestor (y, x)