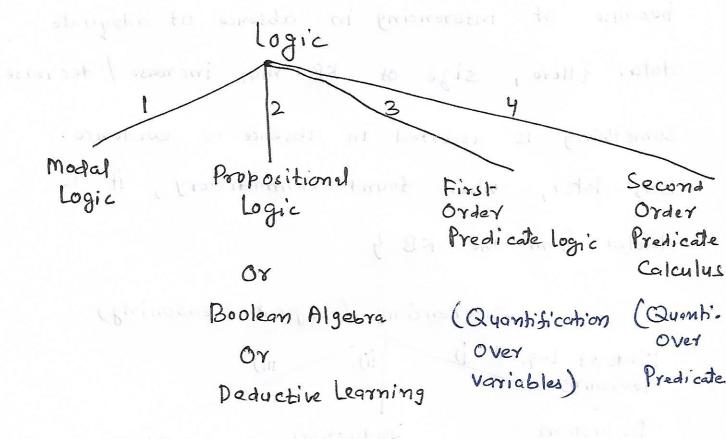
## Part II Knowledge Representation



Modal Logic includes:

- i) Assertive sentences (facts)
  - ii) Modal sentences

The a Holleton

Possibilit - e.g. It I were president ...

Belief Sentences - I suppose ...

I believe ...

MIND HI MENTAL : SITE expect ...

2,3,4 are known as "Monotonic Logic systems".

This is because the size of KB goes on increasing through interence. It never decreases.

I is a Non-Monotonic Logic system. An asserted fact may be deleted later. This is because of inferencing in absence of adequate data. [Here, size of KB may increase / decrease Something is asserted in absence of evidence. But, later, when found contradictory, it is deleted from the KB 3

Interencing (Logical Reasoning)

Kinds of Logical i)

Tecooning

Deduction

Induction

Abduction

eg. All men are mortal John is a man

John is mortal
Applications
Mathematicians
Use this reasoning
Style

(Generalizing from
finite knowledge)
i.e. learning a
rule from several
examples.

e.g. The grass has been well every time it has rained".

Rule: When it raine, the grass gets wet

Scientists use this Style of reasoning

A → B, Suppose, we do

know whether B→ A.

This is assymed to be true in absence of any knowledge.

This is Abduction

Diagnosticians and Detectives use this style of reasoning Propositional Logic

Sentences Proposition

It is raining RAINING

It is synny

SUNNY

It is windy

WINDY

of Moderate was a jourpoidal

It is raining, then RAINING > TSUNNY it is not synny

Predicate Calculus (First Order Logic)

Mo ti vation

(x) usind wod : KA men sy i) To represent relationship between Objects.

eg. Sky is blue: P

Screen is blue : Q

blue (sky). blue (screen).

ii) Handling "For All" and "There exicts" kind of sentences (Rix) along : KA : LA

## Operators in FOPL

- For All [Universal Quantifier] A There exists [Existential Quantitier]

Implication

NOT AND OR

Facts

Representation in Logic

man (Marcus) 1. Marcus was a man

pompeian (Marcus) Marcus was a Pompeian 2.

Yx: pompeian (x) All Pompeians Were -> roman(x) Romans

ruler (Caesar) Caesar was a ryler 4,

All Romans Were 5. either loyal to Caesar or hated him

Yx: Roman (x) -> loyalto (n. Genar) hate (x, Caesar) Person who is loyal

Yn: Jy: loyalto (x, y) Everyone is loyal to 6, (Kix) oflayol: xx: IFE (iii Someone

> Whome 2 6 loyal

There is someone to whom

possibilities

me well priviles of so mother degree 16

- i) \formall \alpha: \formall \alpha: \logation (\alpha)
  - 11) By: Vac: loyalto (x, y)
  - (11) Ar: BA: losalfo (71x)

LEGES OF THE STATE OF THE STATE OF THE STATE

i) matches our interpretation
We should be careful about scope of the

quantifiers and ambiguity

- 7. People only try to assassinate rulers they
  are not loyal to
  Ambiguily
- i) Only ruless people try to assassinate are those to whom they are not loyal
  - ii) Only thing people try to do is to assassinate rulers to whom they are not loyal

With interpretation i), the representation is:

∀x: ∀y: person (x) A ruler (y) A tryassassinate
(x, y)

Tloyalto (x, y)

8. Marcus tried to assassinate Caesar Vx: It: loyalto (xx) tryassa scincite (Marcus, Caesar)

(ROX) affected : JEA : LE Question: Was Marcus loyal to Caesar?

Tloyalto (Marcus, Caesar)

7, substitution

person (Marcus)

ruler (Caesar)

tryassassinate (Marcus, Caesar)

to the only stay to assess the suless then

person (Marcus)

ruler (Caesar)

person (Marcus) a person man is

9, substitution be be explicitly specified

man (Marcus) 9. Yx: man (x) ->

out i ( modertary ratio) at w

legel don 1 1 mind of asin person (x)

Consider the following sects How should a program decide whether it should try to prove loyalto (Marcus, Caesar) or

7 loyalto (Marcus, Caesar)

(The sent ) was rad out of

4. Marcas was born in

Possibilities

Substituted for each other

I. Use forward chaining, i.e. using available lenowledge, see what are the things that can be intered.

Problem: branching factor increases with the amount of knowledge

2. Use Heuristic Knowledge to decide which answer is more likely and then try to prove that.

It it can not be proved in some reasonable amount of time, then prove other thing.

3. Prove both things simultaneously and stop When one of the things is proved

It is now 2020 period Buntities can be 2005 5MOM.