

# Developing a Semantic based Multi Agent System Model using Machine Learning Algorithm for Predicting and Analyzing Pattern of COVID19 Attack

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## Abstract:

A novel corona virus has resulted in an ongoing outbreak of viral pneumonia in China and other countries .As we know that this time this virus make a huge noise due to this virus affect many countries go through lockdown phase. In this paper author tries to proposed a model which predict chances for spreading this diseases using S set algorithm and machine learning based software agent. apart from this author tries to build a semantic model which store that type similar pattern.

**Keywords:** Semantic web, EM algorithm, Hypothesis ,Space Hypothesis, Pattern Matcher Agents, Agility model.

## I. INTRODUCTION

In present scenario there is lot of model available to predict data pattern as well as data analytics but there is unavailability of semantic and learning matcher features so author tries to build semantic and machine learning based model which predict the data set and provide a basic solution with terms of hypothesis .here author used to EM agent which is part of machine learning and also provide a best hypothesis to predict data set. Apart from this author used S set algorithm also.

## II. Proposed Model

In this paper author proposed semantic and machine learning based model which will try to predict maximum number of chances of covid19 attack for both cases symptomatic and asymptomatic. In the given model first author provide sample data and make a parameter based ontology. Sample data contains basic information of patients like travel

history details last 3 months(foreign travel history F.I.H.) ,patent whose infected relatives due to this virus(P.I.R.),common symptoms like fever, tiredness, dry cough and contain some extra information for those patients who have already affected this virus (aches & pain ,runny nose, sore throat etc).This information formed a basic parameter ontology that pass as a input for machine learning base artificial agents. This agents uses itself S learning algorithm to finding the maximally specific hypothesis base pattern which will provide as a input to decision based semantic agents. Decision based semantic agents contains some semantic rules which will help to take a proper decision these rules fully implemented SPARQL languages. Apart from this semantic based decision agent also take a decision based on axioms & EM agent which solved process based on maximum likelihood concept after this, Decision based semantic agent provide output. this output based

results contains the information in two ways. either patient who have already Symptomatic carriers or patient who have Asymptomatic carriers.

A local ontology for both results generated by default agents and that information also shared for COVID19 database containers. Apart from this, Asymptomatic carriers information also passed Learner agent. the aim of this agent is to collect this information and extract main parameters from Asymptomatic carriers and share that parameters to again machine learning agents for further checking.

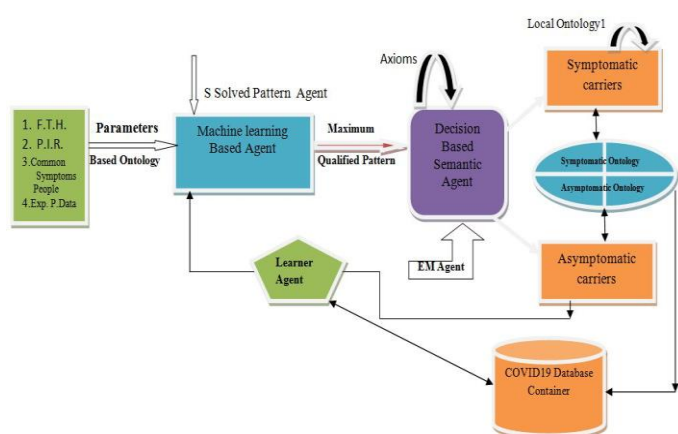


Figure 1. Machine learning based semantic agent Model

## II. Sample Data & Parameter Based Ontology

In this model first phase is basically preprocessing that means collecting data in predefined format. Here, the author collects all sample data and converts it into ontology-specific calls and passes it to the semantic agent system. As

we all know that ontology is a part of semantic web that works on meaning-based information. Here, collecting data and converting it into form of ontology, the author used a specific tool, Protégé 5.2.0. In this parameter, elements are basically patient foreign travel history, 'common symptoms' of infection, and those people's experiences who have affected the COVID19.

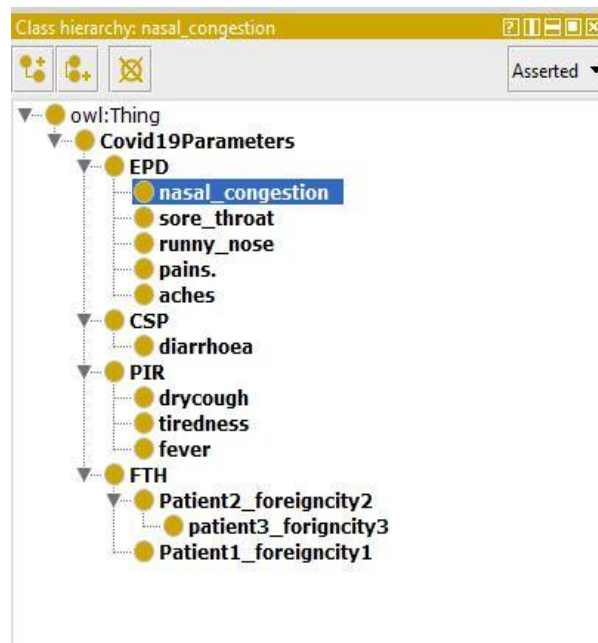


Figure 2. Parameter based ontology

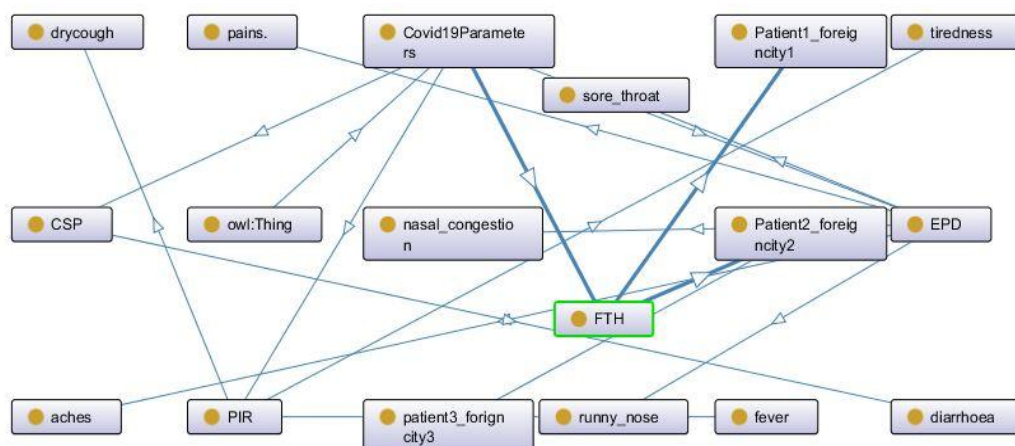


Figure 3. Parameter based ontology onto graph

#### IV.S solved Pattern based Agent

S solved pattern based agent internally works on find S algorithm which will find most specific positive pattern based data among all sample patterns. In this algorithm 2 main parameters variables are used one is {?} and another is { $\phi$ }.

{?} indicated any value based attribute accepted which will present in sample data and

{ $\phi$ } indicates no value accepted given sample data format.

here we start this algorithm for starting pattern that is  $h\{p_1, p_2, p_3, \dots, p_n\}$  format where  $p_1, p_2, p_3$  denotes number of parameters value. In starting this algorithm assumes there is no value accepted that is  $h\{\phi\}$ . In sample data S solved agent consider only positive values if any negative values occurred then no changes pattern hypothesis. Suppose attributes values of first pattern is  $\{a_1, a_2\}$  and attributes value of second pattern  $\{a_3, a_2\}$  then final pattern will be  $\{?, a_2\}$ .

P.N	F.T.H	P.I.R	C.S.P.	E.P.D.	Value
1	Yes	No	dry cough	sore throat	+
2	No	No	fever	runny nose	-
3	No	No	tirednes	pain	-
4	Yes	Yes	tirednes	pain	+
5	No	Yes	tirednes	ache	+

**Table 1. Sample Data Based on parameters attributes**

according to above data initial hypothesis based pattern is:  $h\{\phi, \phi, \phi, \phi\}$

**p1**  $h\{\text{Yes}, \text{No}, \text{dry cough}, \text{sore throat}\}$

**p2**  $h\{\text{Yes}, \text{No}, \text{dry cough}, \text{sore throat}\}$

**p3**  $h\{?, \text{No}, ?, ?\}$

**p4**  $h\{?, ?, ?, ?\}$

**p5**  $h\{?, ?, ?, ?\}$  [ here p5 maximized pattern]

after finding maximized highly qualified pattern this pattern provide as a input to the decision based semantic agent. here semantic agent take a proper

decision based on semantic axioms as well as EM agent which will internally follow the concept of maximum likelihood.

#### V.Decision based Semantic Agent

Decision base semantic agent take a proper decision based on two Subagents i.e. axioms and EM agent. here axioms is a set of rules which are predefined to predict the values & EM agent generally follow first phase machine learning algorithm .

##### Axioms

- Assume that we have two decision point **Symptomatic carriers(S)** & **Asymptomatic carriers(A)** also
- assume the bias of S is  $\alpha$  (i.e. probability of getting chances of symptoms YES with Symptomatic carriers(S))
- Assume the bias of A is  $\beta$  (i.e. probability of getting chances of symptoms YES with Asymptomatic carriers(A))
- we want to find  $\alpha, \beta$  by performing a number of experiments.

EM Agent we choose 5 times in every case & number of trials 10 times.

A	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
S	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
S	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A	Yes	No	Yes	No	Yes	Yes	Yes	No	No	Yes
S	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes

**Figure 4. trail experiment using EM Agent Calculating Point values**

$$\alpha = \frac{\text{getting chances of symptoms YES with Symptomatic carriers(S)}}{\text{total number of count Symptomatic carriers(S)}}$$

$$\beta = \frac{\text{getting chances of symptoms YES with Asymptomatic carriers(A)}}{\text{total number of count Asymptomatic carriers(A)}}$$

Asymptomatic	Symptomatic
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carriers(A)	carriers(S)
5 Yes, 5 No	
	8 Yes , 2 No
	7 Yes, 3 No
6 yes , 4 No	
	6 yes , 4 No
<b>Total =11 Yes,9 No</b>	<b>Total=21 Yes,9 No</b>

Table 2. calculating values using EM Agent

$$\alpha = \frac{21}{21+9} = 0.7$$

$$\beta = \frac{11}{11+9} = 0.55$$

Figure 5. calculating values

Based on above values author can easily said that the probability of getting chance of symptoms YES with Symptomatic carriers is 70% and probability of getting chance of symptoms YES with Asymptomatic carriers is 55% .

## VI. Role Of Learner Agent

- i. Learner agent take decision based on reinforcement learning process.
- ii. Decision of Learner agent also based on COVID19 database container results .
- iii. The main aim of Learner agent is it takes Asymptomatic carriers notation values as a input and based on these input it process the result itself using local ontology and provide that result again machine learning based agent for further result calculation.

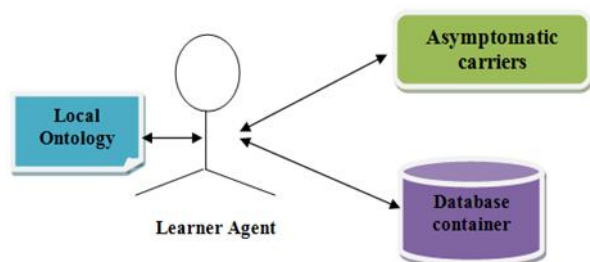


Figure 6. Learner Agent

## VII. Conclusion

In this paper author tried to proposed a model based on machine learning and multi agent system concepts which will predict approximate chances for Asymptomatic and symptomatic carriers for COVID19 virus. Here author uses local semantic web based ontology which will store information and interact with machine learning based agent directly as well as indirectly .

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