ASSIGNMENT AIR-2

Roll No: 41205

Problem Statement:

Implement any one of the following Expert System:

1. Medical Diagnosis of 10 diseases based on adequate symptoms.
2. Identifying birds of India based on characteristics.

Objective:

1. Understand the disease classification problem
2. Create an expert system to classify diseases

Outcome: One will be able to write an expert system for classification problems

Pre-requisites:

1. 64-bit Linux OS
2. Programming Languages: Python

Hardware Specification:

1. x86_64 bit
2. 2/4 GB DDR RAM
3. 80 - 500 GB SATA HD
4. 1GB NIDIA TITAN X Graphics Card

Software Specification:

1. Ubuntu 14.04

Theory:

- Artificial Intelligence is a piece of software that simulates the behaviour and judgement of a human or an organization that has experts in a particular domain is known as an expert system.
- It does this by acquiring relevant knowledge from its knowledge base and interpreting it according to the user's problem.
- The data in the knowledge base is added by humans that are expert in a particular domain and this software is used by a non-expert user to acquire some information.
- It is widely used in many areas such as medical diagnosis, accounting, coding, games etc.

- An expert system is AI software that uses knowledge stored in a knowledge base to solve problems that would usually require a human expert thus preserving a human expert's knowledge in its knowledge base.

- They can advise users as well as provide explanations to them about how they reached a particular conclusion or advice. Knowledge Engineering is the term used to define the process of building an Expert System and its practitioners are called Knowledge Engineers.

- The primary role of a knowledge engineer is to make sure that the computer possesses all the knowledge required to solve a problem.

- The knowledge engineer must choose one or more forms in which to represent the required knowledge as a symbolic pattern in the memory of the computer.
- Characteristics of an Expert System:
    - Human experts are perishable, but an expert system is permanent.
    - It helps to distribute the expertise of a human.
    - One expert system may contain knowledge from more than one human experts thus making the solutions more efficient.
    - It decreases the cost of consulting an expert for various domains such as medical diagnosis.
    - They use a knowledge base and inference engine.
    - Expert systems can solve complex problems by deducing new facts through existing facts of knowledge, represented mostly as if-then rules rather than through conventional procedural code.
    - Expert systems were among the first truly successful forms of artificial intelligence (AI) software.
- The expert system used for the purpose was a neural network.

Output:

Symptom severity

	Symptom	weight
0	itching	1
1	skin_rash	3
2	nodal_skin_eruptions	4
3	continuous_sneezing	4
4	shivering	5

Sample dataset

	Disease	Symptom_1	Symptom_2	Symptom_3	Symptom_4	Symptom_5	Symptom_6	Symptom_7	Symptom_8	Symptom_9	Symptom_10	Symptom_
0	Fungal infection	itching	skin_rash	nodal_skin_eruptions	dischromic _patches	NaN	NaN	NaN	NaN	NaN	NaN	N
1	Fungal infection	skin_rash	nodal_skin_eruptions	dischromic _patches	NaN	NaN	NaN	NaN	NaN	NaN	NaN	N
2	Fungal infection	itching	nodal_skin_eruptions	dischromic _patches	NaN	NaN	NaN	NaN	NaN	NaN	NaN	N
3	Fungal infection	itching	skin_rash	dischromic _patches	NaN	NaN	NaN	NaN	NaN	NaN	NaN	N
4	Fungal infection	itching	skin_rash	nodal_skin_eruptions	NaN	NaN	NaN	NaN	NaN	NaN	NaN	N
...	...	...	...	...	...	...	...	...	...	...	...	
4915	(vertigo) Paroymsal Positional Vertigo	vomiting	headache	nausea	spinning_movements	loss_of_balance	unsteadiness	NaN	NaN	NaN	NaN	N
4916	Acne	skin_rash	pus_filled_pimples	blackheads	scurring	NaN	NaN	NaN	NaN	NaN	NaN	N
4917	Urinary tract infection	burning_micturition	bladder_discomfort	foul_smell_of urine	continuous_feel_of_urine	NaN	NaN	NaN	NaN	NaN	NaN	N
4918	Psoriasis	skin_rash	joint_pain	skin_peeling	silver_like_dusting	small_dents_in_nails	inflammatory_nails	NaN	NaN	NaN	NaN	N
4919	Impetigo	skin_rash	high_fever	blister	red_sore_around_nose	yellow_crust_ooze	NaN	NaN	NaN	NaN	NaN	N

4920 rows × 18 columns

Training process

```
Epoch 1/5
139/139 [==============================] - 1s 3ms/step - loss: 1.6042 - accuracy: 0.6317
Epoch 2/5
139/139 [==============================] - 0s 3ms/step - loss: 0.0091 - accuracy: 0.9998
Epoch 3/5
139/139 [==============================] - 0s 3ms/step - loss: 0.0022 - accuracy: 1.0000
Epoch 4/5
139/139 [==============================] - 0s 3ms/step - loss: 0.0011 - accuracy: 1.0000
Epoch 5/5
139/139 [==============================] - 0s 3ms/step - loss: 6.3466e-04 - accuracy: 1.0000
<keras.callbacks.History at 0x7ff9b37aa7d0>
```

Final accuracy

```
Accuracy: 1.0
```

Conclusion: We have implemented an expert system to classify diseases.