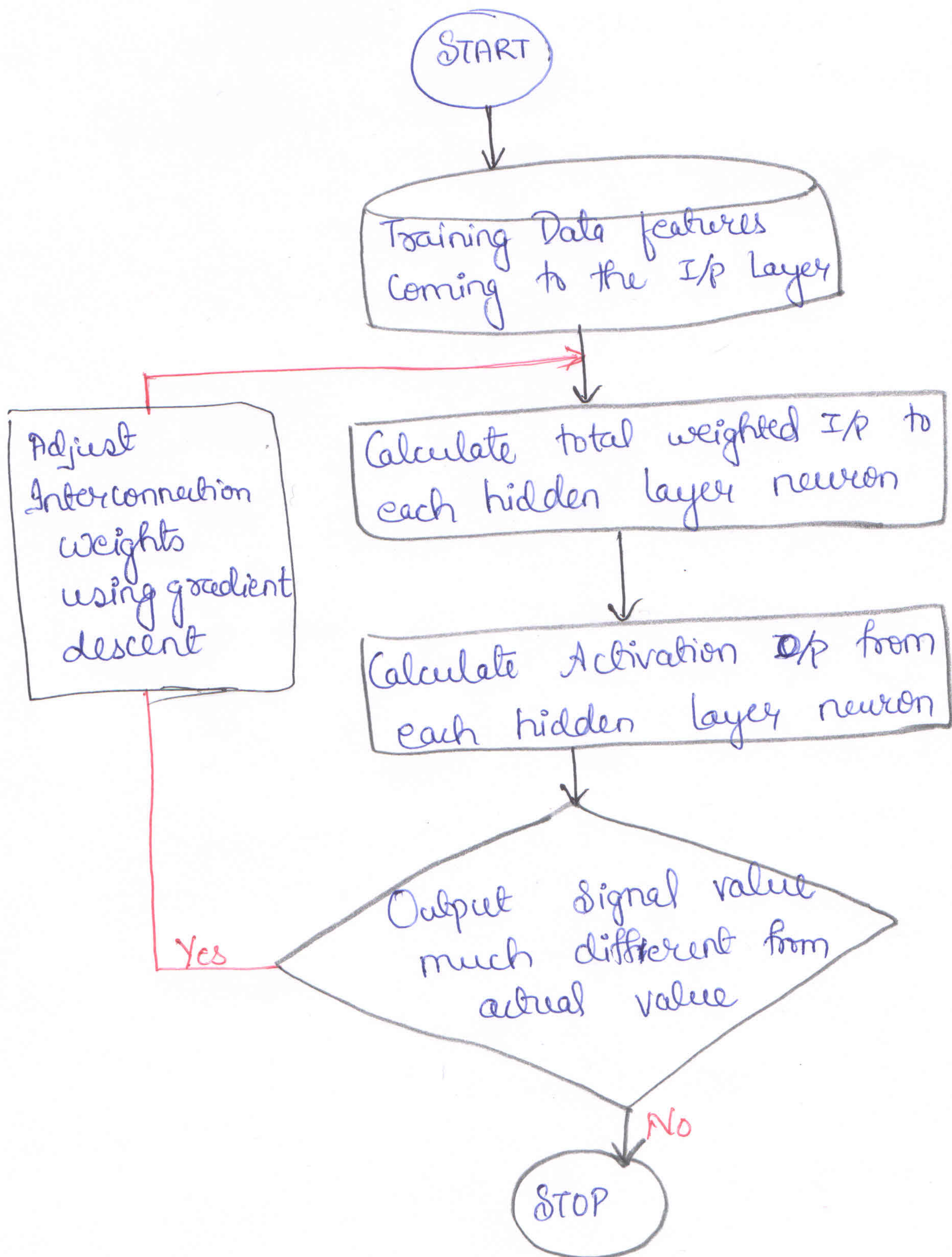


BACK - PROPAGATION ALGORITHM :-



INTRODUCTION TO DEEP-LEARNING :- (DL)

→ Deep Learning is a branch of ML, completely based on ANN, as NN is going to mimic the brain so ~~do~~ DL is also a kind of mimic of h. brain.

→ In DL, we don't need to explicitly program everything.

→ Their highly flexible architectures can learn directly from raw data (images, video or text), without human domain knowledge & can increase their predictive accuracy when provided with more data.

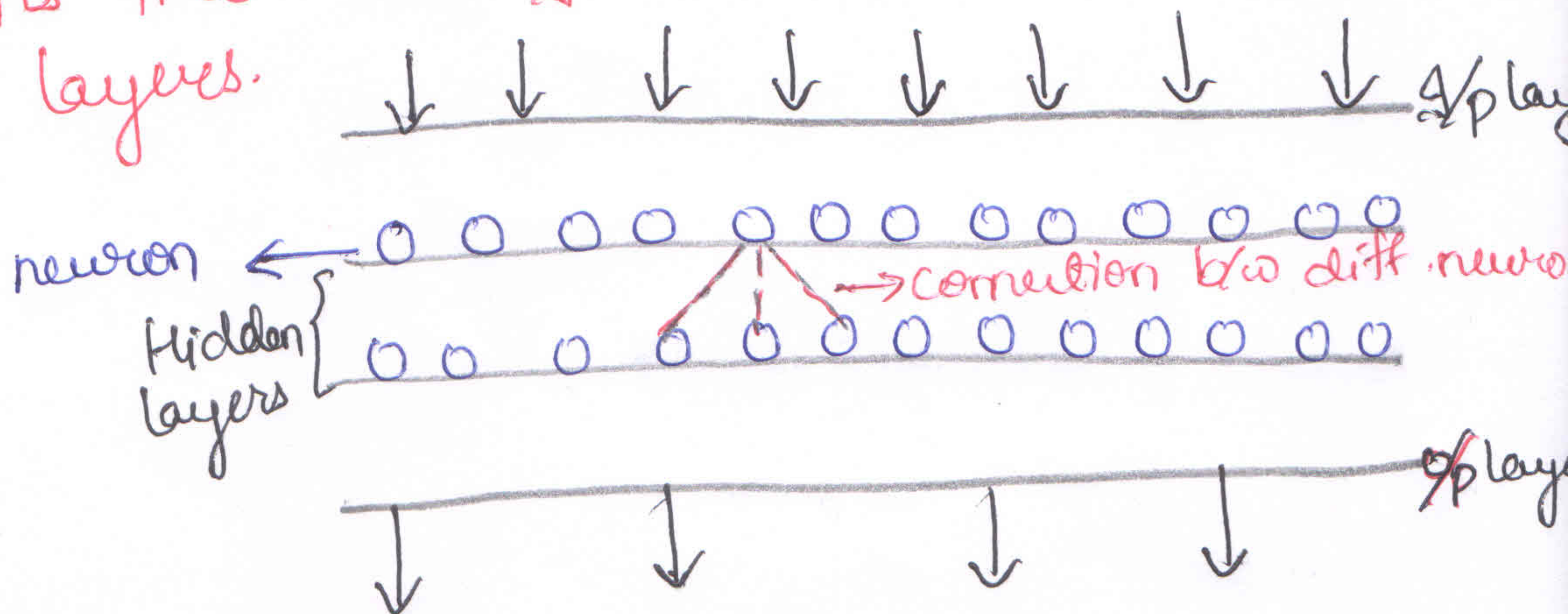
Eg In facial Recognition, how pixels in an image create lines & shapes, how those lines & shapes create facial features & how these facial features are arranged into a face.

④ Deep Learning algo. are constructed with connected layers

① First layer is I/p layer.

② Last layer is O/p layer

③ All layers in b/w c/d hidden layers. The word deep means the n/w join neurons in more than 2 layers.



Architectures :-

⑤ Deep NN :- It is a NN with certain level of complexity (having multiple hidden layers in b/w I/p & O/p layers). They are capable of processing & modelling non-linear relationships.

⑥ Deep Belief N/w (DBN) :- It is a class of DNN. It is multi-layer belief n/w.

Steps for performing DBN

a) Learn a layer of features from visible units using

Contrastive Divergence Algorithm.

b) Treat activations of previously trained features as visible units and then learn features of features.

c) Finally, the whole DBN is trained when learning for final hidden layer is achieved.

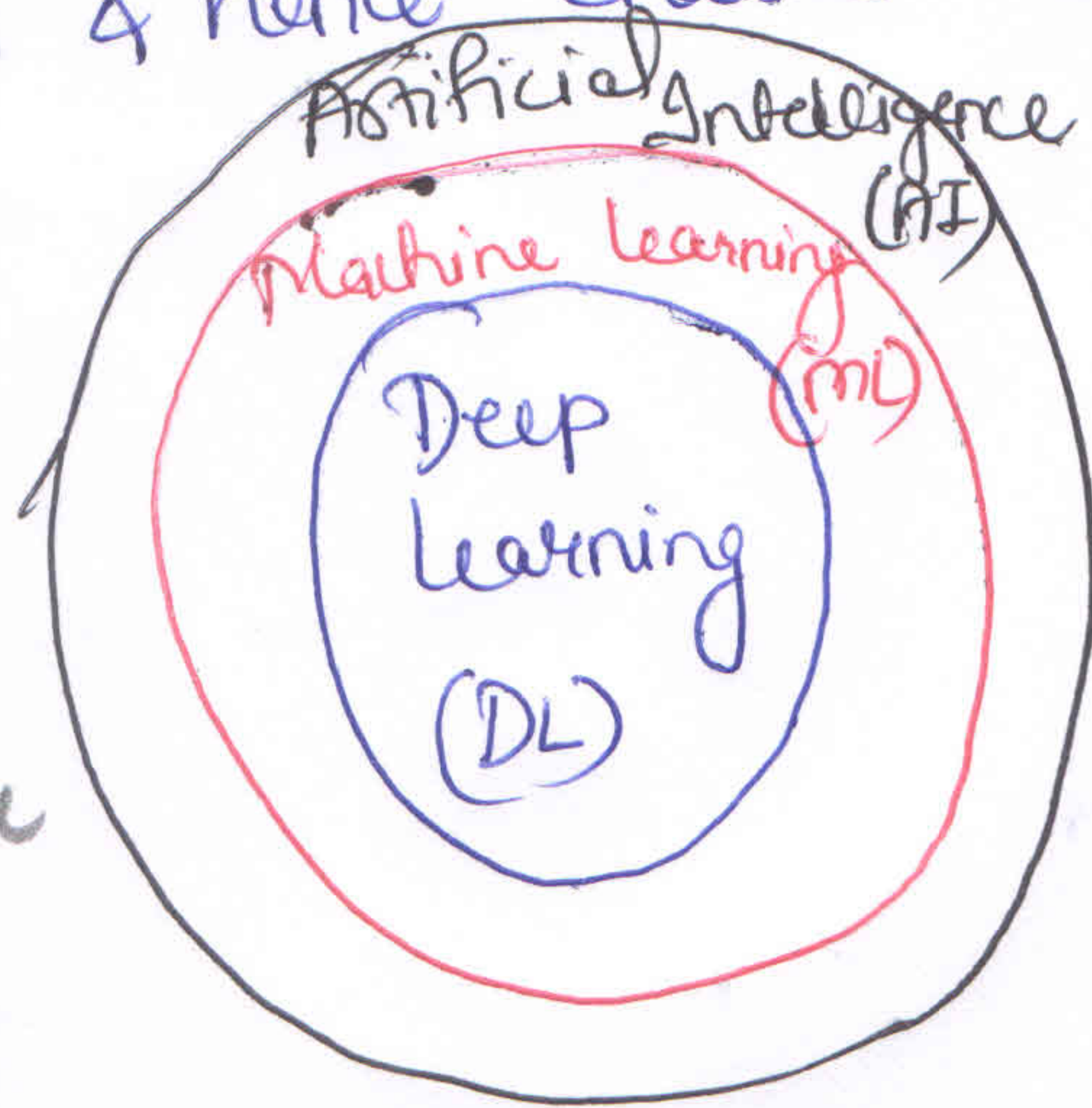
⑦ Recurrent NN :- (perform same task for every element of sequence)

→ Allows for parallel & sequential computation.

→ Similar to human brain (large feedback network of connected neurons).

→ They are able to remember important things about the i/p they received & hence enables them to be more precise.

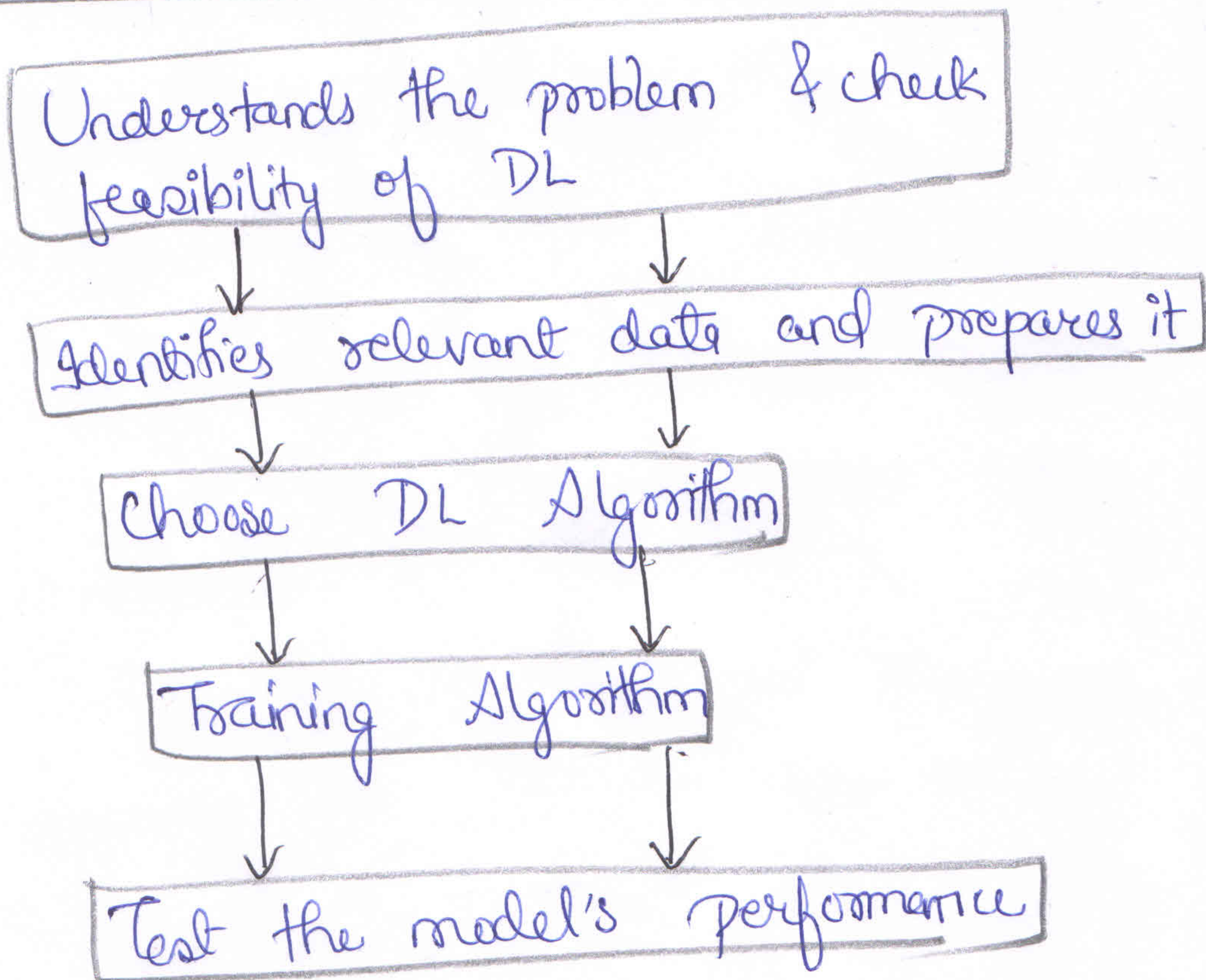
Hierarchy of Artificial Intelligence



Difference between Machine Learning & Deep Learning

| <u>Machine Learning</u> | <u>Deep Learning</u> |
|--|--|
| <ul style="list-style-type: none">① Works on small amount of Dataset for accuracy② Dependent on low-end Machine.③ Divides the tasks into subtasks, solves them individually & finally combine the results.④ Takes less time to train⑤ Testing time may increase. | <ul style="list-style-type: none">① Works on large amount of Dataset② Heavily dependent on high-end machine.③ Solves problem end to end.④ Takes longer time to train.⑤ Less time to test the data. |

Working



Real Life Examples:-

① How to recognize square from other shapes?

a) Check the four lines.

b) Is it a closed figure?

c) Does the sides are perpendicular from each other?

d) Does all sides are equal?

So, DL is a complex task of identifying the shape & broken down into simpler tasks at a larger scale.

② Recognizing an Animal! (Is it a Cat/Dog)

→ Defining facial features which are important for classification and system will then identify this automatically. (Whereas ML will manually give out these features for classification)

Advantages:-

- ① Best in-class performance on problems.

- ② Reduces need for feature engineering.

- ③ Eliminates unnecessary costs.

- ④ Identifies defects easily that are difficult to detect.

Disadvantages:-

- ① Large amount of data required

- ② Computationally expensive to train

- ③ No strong theoretical foundation.

Limitations of DL :-

① Data Labelling :- Most current AI models are trained through "supervised learning" i.e. data must be labelled through humans, which can be error prone.
(categorised)

② Obtain huge training Data :-

→ Some DL techniques like CNN can imitate the knowledge of experts in medicine & other fields.

→ For this, it requires training data that are not only labelled but also sufficiently broad & universal.

③ Explain a problem :- Large & complex models can be difficult to explain.

→ For instance, why a particular decision was obtained.

→ Bcoz of this, some AI tools are slow in applications where interpretability is useful or indeed required.

Applications :-

① Automatic Text Generation

② Healthcare

③ Automatic Machine Translation

④ Image Recognition

⑤ Predicting Earthquakes.