1. Do you think DL is going to replace ML in the near future? Why?

2. Pros and cons of various types of learning.

Answer 1 :

Deep learning will not replace all other models and algorithms. Opinion from Jacob Steinhart received the most upvotes. He writes

1. For many applications, far simpler algorithms like logistic regression or support vector machine will work just fine, and using a deep belief network will only complicate things.

2. While deep belief networks are one of the best domain-agnostic algorithms, if one has domain knowledge then many other algorithms (such as HMMs for speech recognition, wavelets for images, etc.) can outperform them. There is some work being done to incorporate such domain knowledge into neural network models, but it is certainly not yet enough to fully replace all other models and algorithms.

Answer 2 :

SUPERVISED LEARNING

Pros

* You will have an exact idea about the classes in the training data.
* Supervised learning is a simple process for you to understand. In the case of unsupervised learning, we don’t easily understand what is happening inside the machine, how it is learning, etc.
* You can find out exactly how many classes are there before giving the data for training.
* It is possible for you to be very specific about the definition of the classes, that is, you can train the classifier in a way which has a perfect decision boundary to distinguish different classes accurately.
* After the entire training is completed, you don’t necessarily need to keep the training data in your memory. Instead, you can keep the decision boundary as a mathematical formula.
* Supervised learning can be very helpful in classification problems.
* Another typical task of supervised machine learning is to predict a target numerical value from some given data and labels.

**Cons**

* Supervised learning is limited in a variety of senses so that it can’t handle some of the complex tasks in machine learning.
* Supervised learning cannot give you unknown information from the training data like unsupervised learning does.
* It cannot cluster or classify data by discovering its features on its own, unlike unsupervised learning.
* In the case of classification, if we give an input that is not from any of the classes in the training data, then the output may be a wrong class label. For example, let’s say you trained an image classifier with cats and dogs data. Then if you give the image of a giraffe, the output may be either cat or dog, which is not correct.
* Similarly, let’s say your training set does not include some examples that you want to have in a class. Then, when you use those examples after training, you might not get the correct class label as the output.
* While you are training the classifier, you need to select a lot of good examples from each class. Otherwise, the accuracy of your model will be very less. This is difficult when you deal with a large amount of training data.
* Usually, training needs a lot of computation time, so do the classification, especially if the data set is very large. This will test your machine’s efficiency and your patience as well.
* We can not always give lots of information with supervision. A lot of the time, the machine needs to learn by itself from the training data.

UNSUPERVISED LEARNING

Pros

* Unsupervised machine learning finds all kinds of unknown patterns in data.
* Unsupervised methods help you to find features which can be useful for categorization.
* It takes place in real time, so all the input data to be analyzed and labeled in the presence of learners.
* It is easier to get unlabeled data from a computer than labeled data, which needs manual intervention.

Cons

* You cannot get precise information regarding data sorting, and the output as data used in unsupervised learning is labeled and not known
* Less accuracy of the results is because the input data is not known and not labeled by people in advance. This means that the machine requires to do this itself.
* The spectral classes do not always correspond to informational classes.
* The user needs to spend time interpreting and label the classes which follow that classification.
* Spectral properties of classes can also change over time so you can't have the same class information while moving from one image to another.

REINFORCEMENT LEARNING

Pros

* Reinforcement learning can be used to solve very complex problems that cannot be solved by conventional techniques.
* This technique is preferred to achieve long-term results which are very difficult to achieve.
* This learning model is very similar to the learning of human beings. Hence, it is close to achieving perfection.
* The model can correct the errors that occurred during the training process.
* Once an error is corrected by the model, the chances of occurring the same error are very less.
* It can create the perfect model to solve a particular problem.
* Robots can implement reinforcement learning algorithms to learn how to walk.
* In the absence of a training dataset, it is bound to learn from its experience.
* Reinforcement learning models can outperform humans in many tasks.
* Reinforcement learning is intended to achieve the ideal behavior of a model within a specific context, to maximize its performance.
* It can be useful when the only way to collect information about the environment is to interact with it.
* Reinforcement learning algorithms maintain a balance between exploration and exploitation. Exploration is the process of trying different things to see if they are better than what has been tried before. Exploitation is the process of trying the things that have worked best in the past. Other learning algorithms do not perform this balance.

**Cons**

* Too much reinforcement learning can lead to an overload of states which can diminish the results.
* Reinforcement learning is not preferable to use for solving simple problems.
* Reinforcement learning needs a lot of data and a lot of computation. It is data-hungry. That is why it works really well in video games because one can play the game again and again and again, so getting lots of data seems feasible.
* Reinforcement learning assumes the world is Markovian, which it is not. The Markovian model describes a sequence of possible events in which the probability of each event depends only on the state attained in the previous event.
* The curse of dimensionality limits reinforcement learning heavily for real physical systems. According to Wikipedia, the curse of dimensionality refers to various phenomena that arise when analyzing and organizing data in high-dimensional spaces that do not occur in low-dimensional settings such as the three-dimensional physical space of everyday experience.
* Another disadvantage is the curse of real-world samples. For example, consider the case of learning by robots. The robot hardware is usually very expensive, suffers from wear and tear, and requires careful maintenance. Repairing a robot system costs a lot.