ISSN: 1832-5505

Applied GIS

Vol-8 Issue-02 April 2020

MACHINE LEARNING: A BASIC OVERVIEW

R.Sowjanya[1] T.Kiran kumar [2]S.Srihari [3]
Assistant Professor[1,2,3],
CK College Of Engineering & Technology
Cuddalore

Abstract

I. Machine learning is the concept of allowing computers to learn from data and experience rather than being pre-programmed. Instead of creating code, you may just feed the generic algorithm data, and it will construct logic automatically. A classification algorithm is one kind of algorithm. It may classify information into several categories. Emails may be sorted into the spam and not-spam categories using the same classification method that recognizes handwritten alphabets. Machine learning is one of the most intriguing technologies that one would have ever come across. The capacity to learn, as the term suggests, is what most closely aligns computers with humans. Today, machine learning is employed in a variety of contexts, some of which may surprise you. There are likely hundreds of times a day when we use a learning algorithm without even realizing it.

II. Classification of Machine Learning

Machine learning implementations are classified into three major categories, depending on the nature of the learning "signal" or "response" available to a learning system which are as follows:-

III. First, there is supervised learning, which describes the process by which an algorithm learns from data examples and their corresponding target responses, which can be either numerical values or string labels (e.g., classes or tags), in order to then predict the correct response when presented with new examples. This method is quite a lot like how people learn while they're in school. The learner learns via rote memorization of particular instances provided by the instructor, who in turn helps them to understand more basic principles.

IV. In contrast, unsupervised learning occurs when an algorithm is given unlabeled instances from which to draw its own conclusions about the underlying data patterns. This class of algorithms often reorganizes the data into something different, such a new set of characteristics that can represent a class or a new set of values with no correlation. They're great for feeding fresh information into supervised machine learning algorithms and helping people better understand the data they're working with. It's a kind of learning that's analogous to how people figure out that things or occurrences belong to the same category, such as by comparing their levels of resemblance. Some recommendation systems that you find on the web in the form of marketing automation are based on this sort of learning.

V. In unsu-pervised learning, when labels are not provided to the algorithm, reinforcement learning comes into play. Reinforcement learning, on the other hand, is associated with applications in which the algorithm must make decisions (so the product is prescriptive, not just descriptive, as in unsupervised learning) and the consequences of those decisions can be either positive or negative. It's quite similar to the way people learn in the real world, via trial and error.

VI. When you make a mistake, you pay the price for it (in terms of money, time, regret, suffering, etc.), and this teaches you that your choice of action was not the best one. Computers that learn to play

ISSN: 1832-5505

Vol-8 Issue-02 April 2020

video games autonomously are a fascinating use of reinforcement learning. In this instance, the algorithm is presented with examples of real-world scenarios, such as being trapped in a labyrinth while trying to escape from an opponent. The algorithm learns from its mistakes as it tries to avoid and succeed in survival situations, and the application feeds back to it on the results of its activities. Google DeepMind, a tech firm, has developed a reinforcement learning software that can beat the original Atari videogames. Throughout the movie, keep an eye out for how the program goes from being awkward and inexperienced at the start to polished and proficient at the end.

VII.

VIII. Fourth, semi-supervised learning is used when just a portion of the training signal is available, such as when the target outputs are absent from the training set. In the particular scenario of Transduction, when the whole collection of issue instances is known at learning time except that some of the targets are absent, this concept holds true.

IX. Categorizing on the basis of required Output

Another categorization of machine learning tasks arises when one considers the desired output ofa machine-learned system:

1. **Classification :** When inputs are divided into two or more classes, and the learner must produce a model that assigns unseen inputs to one or more (multi-label classification) of these classes. This is typically tackled in a supervised way. Spam filtering is an example of classification, where the inputs are email (or other) messages and the classes are “spam” and “not spam”.
2. **Regression :** Which is also a supervised problem, A case when the outputs are continuous rather than discrete.
3. **Clustering :** When a set of inputs is to be divided into groups. Unlike in classification, the groups are not known beforehand, making this typically an unsupervised task.

Machine Learning comes into the picture when problems cannot be solved by means of typical approaches.

X. Machine Learning – Applications

- **Web Search Engine:** One of the reasons why search engines like google, bing etc work so well is because the system has learnt how to rank pages through a complex learningalgorithm.
- **Photo tagging Applications:** Be it facebook or any other photo tagging application, the ability to tag friends makes it even more happening. It is all possible because of a face recognition algorithm that runs behind the application.
- **Spam Detector:** Our mail agent like Gmail or Hotmail does a lot of hard work for us in classifying the mails and moving the spam mails to spam folder. This is again achieved by a spam classifier running in the back end of mail application.

Today, companies are using Machine Learning to improve business decisions,increase productivity, detect disease, forecast weather, and do many more things. With the exponential growth of technology, we not only need better tools to understand the data we currently have, but we also need to prepare ourselves for the data we will have. To achieve this goal we need to build intelligent machines. We can write a program to do simple things. But for most of times Hardwiring Intelligence in it is difficult. Best way to do it is to have some way for machines to

ISSN: 1832-5505

Vol-8 Issue-02 April 2020

learn things themselves. A mechanism for learning – if a machine can learn from input then it does the hard work for us. This is where Machine Learning comes in action. Some examples of machine learning are:

- **Database Mining for growth of automation:** Typical applications include Web-click data for better UX(User eXperience), Medical records for better automation in healthcare, biological data and many more.
- **Applications that cannot be programmed:** There are some tasks that cannot be programmed as the computers we use are not modelled that way. Examples include Autonomous Driving, Recognition tasks from unordered data (Face Recognition/ Handwriting Recognition), Natural language Processing, computer Vision etc.
- **Understanding Human Learning:** This is the closest we have understood and mimicked the human brain. It is the start of a new revolution, The real AI. Now, After a brief insight lets come to a more formal definition of Machine Learning
- **Arthur Samuel(1959):** "Machine Learning is a field of study that gives computers, the ability to learn without explicitly being programmed."Samuel wrote a Checker playing program which could learn over time. At first it could be easily won. But over time, it learnt all the board position that would eventually lead him to victory or loss and thus became a better chess player than Samuel itself. This was one of the most early attempts of defining Machine Learning and is somewhat less formal.
- **Tom Michel(1999):** "A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E." This is a more formal and mathematical definition. For the previous Chess program
  - E is number of games.
  - T is playing chess against computer.
  - P is win/loss by computer.

XI.Conclusion

This paper reviewed about machine learning, common methods and popular approaches used in the field, suitable machine learning programming languages, and also covered some things to keep in mind in terms of unconscious biases being replicated in algorithms.Because machine learning is a field that is continuously being innovated, it is important to keep in mind that algorithms, methods, and approaches will continue to change.

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[1] cs229.stanford.edu