Book Review on the Master Algorithm

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Before starting off with this book review, I would like to take this opportunity to thank my professor Prof. Anthony Rhodes for providing me with a chance to explore my interests in the fields of Machine Learning and its principles by virtue of this book titled, “The Master Algorithm”. Additionally, I would also like to thank the original author of this book Pedro Domingo for providing me with the means to perform some additional research on his work.

The author starts off the book by mentioning that machine learning algorithms dominate every aspect of our life today. Today’s algorithms are described by the author as learners because of their ability to make inferences from data and then present users what they intend to see rather than showing them random samples of data. The author then claims that algorithms in general today are woven into the fabric of the society. He goes on to explain this point by mentioning the examples of music apps as well as shopping apps which collect data and predict what we will like by looking at the data patterns and giving results.

The author then talks about what an algorithm is. According to the author, an algorithm is a set of instructions which tells a computer what to do and how to do. He goes on to explain what an algorithm should be. An algorithm should not be vague, it should be precise and accurate. An algorithm should provide the same results when provided with

the same set of inputs. Speaking of inputs, the author also talks about the fact that an algorithm should take an input and provide an output based on the input. The author then defines a machine learning algorithm as an algorithm taking a set of inputs and providing an algorithm as an output. When a machine algorithm is provided with a set of inputs, it should learn from the input and then provide the output. The author then poses the question whether there could be a master algorithm that could govern all the things.

Moving forward in the book, the author then talks about the fact that the machine learning community is divided into two major tribes namely symbolists and Bayesians. Symbolists are the oldest “tribe” of the machine learning community who rely on the logical methods of predictions. The author explains that symbolists believe that any machine learning algorithm cannot learn from scratch and there needs to be some existing knowledge (in the form of data) from which the algorithm can start learning over a period of time and then start recognising the patterns used for making predictions. But this can also lead to the problem of overfitting/ hallucinating pattern recognition where an algorithm starts recognizing patterns which make no sense.This overfitting is explained by the example of “BIBLE CODE”. The author then emphasizes on the fact that there needs to be a balance between the predicting capabilities of the algorithm so that it stops at the correct point, which in turn leads to the need of test and training data. To address the problem of overfitting, symbolists often rely on inverse deduction methods. But this is very expensive, has massive datasets and is inefficient to work with. The author then describes how decision trees can be used to prevent overfitting. Apart from preventing overfitting, decision trees are far more accurate and also is more quiker.

In the next section, the author focuses on the second major tribe called “Bayesians”. They are called Bayesians because they use empirical methods for predictions and believe that all knowledge must come from experimentation and observation.For explaining this point, the author also gives the example of diseases and their testing and how doctors use these multiple tests to determine the result with surety. The author then explains the problem of noisy, contradictory information which can creep in the empirical methods used by Bayesians. Bayesians solved this using Bayes theorem for predictions. The example for the same being Siri and its functionality. It is also widely used in the medical industry for diagnosis of diseases without having to take unnecessary multiple tests.

Apart from these two major tribes, some other tribes are also explained by the author such as Connectionists, Evolutionaries and Analogizers. While Connectionists have identified the problem of Credit Assignment, they use BackPropagation to solve it. Similarly, Evolutionaries identified the problem of structure discovery and used genetic programming to solve it. Analogiezers on the other hand solve the problem of uncertainty and use kernel machines to solve it. In order to have a true master algorithm at our disposal, the author suggests that it should solve all these problems solved by these different tribes of people deploying different methods at the same time.

The author then explains how organising the world in the form of objects and categories can lead us closer to the “Master Algorithm”. He emphasizes on the need of a master algorithm which will grow simultaneously with the objects it is handling/ predicting.The author then moves on the topic of neural networks and its layered architecture with hidden layers embedded in it. He stresses on the importance of neural networks

emulating our own brain in the future to help create one and true master algorithm. He then goes on to comment on the fact that neural networks and other algorithms will and do rely on good datasets available to us to learn and then predict results.

The author then starts to focus on the importance of data in today's day and age and even goes on to say that data is the most important commodity. He explains this fact by stating the examples of big companies like google and amazon and how they use our data stacked up over the time to influence our decisions in almost every aspect of our life. He goes on to say that there is an undeclared data war going on between these companies because they profit on the one thing which uses a ton of user data and that is advertisements. He explains that how any company does not have a complete picture of you which is a good and bad thing. If someone knows everything about you, that is a bad thing as it would mean it could have a lot of power on you. But this would also mean that there would never really be a 360-degree model for you.

He then goes on to say that having our data stored in these companies is not the best idea due to their conflict of interests: targeted ads. Therefore, it is necessary to have secure data banks for data handling. The author also states that there should be data unions just like normal employee unions so as to have an equal deal with the companies using our data. All this makes it incredibly important that there should be awareness about data protection and data in general among common people so as to protect their own interests from these companies who utilize our data and reap profit from it.

The author during the end of the book concentrates on the fact that no user has access to all our data, but if he/she/it did, then they could be able to create a digital image of us which in turn could lead us to the true “Master Algorithm”. This master algorithm could be our digital self which would know everything about us and will be able to predict everything about us. If this is achieved, it could make our lives a lot more easier and efficient.

In my personal opinion, this is a great book for anyone who wants to study or is studying machine learning at any level. The way the author has expressed the text is truly amazing. I really liked how the author transitioned into the topics of machine learning without deviating from the original topic of forming a master algorithm. For me, I got to learn some very insightful stuff about the “tribes” of the machine learning community along with the techniques they use. What I also liked about this book is how the author has described everything he wanted by the use of the examples which is great for understanding some of the very complex processes/ techniques. I also liked the part where the author expressed the issues with the data and how companies are using it to affect our everyday lives and decisions. I never really thought about the fact that there could be data unions, very similar to employee unions as well.

All the text and examples came together at the end when the author delved into “THE MASTER ALGORITHM”, the digital image and how it can revolutionize everyday life of humans. The concept of mirroring humans and their thoughts was really well put and it has definitely motivated me to look more into it in the future. “The master algorithm” is very insightful and has definitely motivated me to read more books like it.