Machine Learning Architecture - Part I

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1 Introduction

Machine Learning Architecture has developed in the recent decades from a concept to proof of reality. What developed from a fundamental approach towards pattern recognition is laying foundations for the developement of a biggest artificial intelligence platform. The fundamental idea was to determine if the machines have the capability to learning from the data received of the input and become able to create repeatable actions with higher reliability and efficient decision making.

Thus we can explain machine learning as a branch of artificial intelligence which trains algorithms to learn patterns. The Machine's ability to learn makes a system capable of performing decision making without explicit inputs from users. This skill is builded into the system based on a sample space of data called training data.

The Machine Learning is used nowadays in every technologial advancement be its ability for the mobile systems to make suggestion choices about apps the users can install in them smartphone based on previous installed apps of each user.

In the big picture context the technique can be considered as an application for predictive analytics. The Machine Learning Architecture can be summarized on the basis of the algorithm used in training.

2 Algorithms Training Types

2.1 Supervised Learning

In supervised learning, a mathematical model that consists of both inputs and expected outputs is used as a training data. Each input has a corresponding output, which is also known as a supervisory signal. With the available training matrix the system is able to determine the relationship between the input and output, and applied the same in next inputs post-training to stipulate the corresponding output.

The supervised learning could build into classification and regression analysis based on the output criteria. Classification analysis is presented when the outputs are limited to a group of values. However, regression analysis defines a numerical range of values for the output. Some examples of this type of learning are seen in face detection and speaker verification systems.

2.2 Unsupervised Learning

Opposite the supervised learning, unsupervised learning uses training data without an output determined. The unsupervised learning finds relation input based on shared features and the output is determined on the basis of presence/absence of such features in the input analysed.

2.3 Reinforcement Training

This method is utilised in training the system to take a decision based on a particular relevance context using several algorithms to determine the right approach in the context of the present state. These structures are mainly used in training gaming portals to work on inputs given by the user.

3 The Architecture of Machine Learning Process

3.1 Data Acquisition

As machine learnig is based on disponible data for the system to present a result hence the first step, obiviuosly, is define the architecture of data acquisition. This involves data collection, preparing and segregating the case scenarios based on certain features related with the decision making cycle and pass forward the data to the processing unit for carrying out further categorization.

The data model expects reliable, fast and elastic data which could be discrete or continuous. The data is then passed into stream processing systems, if the data is continuous, and stored in batch data warehouses, if the data is discrete, before being passed on to data modeling or processing stages.

3.2 Data Processing

The received data in the data acquisition step is then sent forward to the next step, data processing, where it is content to advanced integratio and processing and involves normalization of the data, data cleaning, transformation, and encoding. The data processing is a step that is directly related to the type of

learning being used. For e.g., if supervised learning is being used the data shall be needed to be separate into multiple steps of sample data required for training of the machine and the data thus created is called training data.

Also, the data processing is related to the kind of processing required and can involve choices ranging from action upon continuous data which will involve the utilization of specific function based on the architecture. Also, it might involve action upon discrete data which can require memory bound processing. The memory processing is defined based on the data processing stage that show if the memory shall be done with data in transit or at rest.

3.3 Data Modeling

This architecture stage involves the selection of different algorithms that might adapt the system to deal with the problem for which the machine is being devised. These algorithms are being developed or being inherited from a group of libraries. The algorithms are used to model the data accordingly, this stage makes the system prepared for execution step.

3.4 Execution

This layer in machine learning is where the calculation is done, testing is included and tunings are performed. The mainly goal behind being to optimize the algorithm with the principle to extract the required machine outcome and maximize the performance. The step output is a refined solution with the capability of providing the required data for the machine takes a decision.

3.5 Deployment

Likewise, any other software output, ML output needs to be operationalized or be passed forward to further interpretation processing. The output may be considered as a non-deterministic query which needs to be further driven to the decision-making system. It is advised to seamlessly move the ML output to production where it will give the capability for machine to take a decision based on the output and reduce the dependency on the further interpretation step.