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DEVELOPMENT OF NEW WAVE OF AUTOMATIC MACHINE LEARNING

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ABSTRACT:

With the explosion in the use of machine learning in various domains, the need for an efficient pipeline for the development of machine learning models has never been more critical. However, the task of forming and training models largely remains traditional with a dependency on domain experts and time-consuming data manipulation operations, which impedes the development of machine learning models in both academia as well as industry. This demand advocates the new research era concerned with fitting machine learning models fully automatically i.e., AutoML. Automated Machine Learning(AutoML) is an end-to-end process that aims at automating this model development pipeline without any external assistance. First, we provide an insights of AutoML. Second, we delve into the individual segments in the AutoML pipeline and cover their approaches in brief. We also provide a case study on the industrial use and impact of AutoML with a focus on practical applicability in a business context. At last, we conclude with the open research issues, and future research directions.

Keywords: AutoML, Detection, Encryption.

1. INTRODUCTION:

Data analysis is a powerful tool for learning insights on how to improve the decision making, business model and even products. This involves the construction and training of a machine learning model which faces several challenges due to lack of expert knowledge [1]. This challenges can be overcomed by using automated machine learning(AutoML) field. AutoML refers to the process of studying a traditional machine learning model development pipeline to segment it into modules and automate each of those to accelerate workflow. With the advent of deeper models, such as the ones used in image processing [2], Natural Language Processing [3], etc., there is an increasing need for tailored models that can be crafted for specific workloads. However, such specific models require immense resources such as high capacity memory, strong GPUs, domain experts to help during the development and long wait times during training. The task gets critical as there is not much work done for creating a formal framework for deciding model parameters without the need for trial and error. These nuances emphasized the need for AutoML where automation can reduce turnaround times and also increase the accuracy of the derived models by removing human errors. In recent years, several tools and models have been proposed in the domain of AutoML. Some of these focus on particular segments of AutoML such as feature engineering or model selection, whereas some models attempt to optimize the complete pipeline. These tools have matured enough to be able to compare with human experts on Kaggle competitions and at times have beat them as well, showcasing their veracity. There are wide variety of applications based on AutoML such as autonomic cloud computing [4] [5], Intelligent Vehicular networks, Block Chain [6],Software Defined Networking [7] [8], among others. This paper aims at providing an overview of the advances seen in the realm of AutoML in recent years. We focus on individual aspects of AutoML and summarize the improvements achieved in recent years. The motivation of this paper stems from the unavailability of a compact study of the current state of AutoML. While we acknowledge the existence of other surveys [9] [10] [11], their motive is to either provide an in-depth understanding of a particular segment of AutoML, provide just an experimental comparison of various tools used or are fixated towards deep learning models. The primary contributions of this paper are threefold:

1) We segment the AutoML pipeline into parts and review the contributions in each of these segments.

2) We explore the various state-of-the-art tools currently available for AutoML and evaluate them.

3) We also incorporate the advancements seen in machine learning which seems to be overshadowed by deep learning in recent years.

2 RELATED STUDY

Machine learning (ML) has a quickly expanding nearness across enterprises. Top innovation organizations, for example, Amazon, Google, and Microsoft absolutely rambled about ML's huge effect on fueling applications and administrations in 2017. At that point after a ton of research, we come at one additionally energizing end which is Auto Machine learning (Auto ML). AlphaD3M is a customized AI system whose focus is to learn visa self-learning. This principally centers around gaining from the picture engraves and the chronicled content information in such a way, that the machine consequently learns the examples and gives bits of knowledge from it. The D3M implies the Data-Driven Discovery of Models program. It impelled AI towards illuminating any client explicit errand for the given dataset. Computerized Artificial intelligence is the way

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toward robotizing the start to finish procedure of applying AI to genuine issues. Auto Machine learning makes AI accessible in a genuine sense, even to individuals with no significant skill right now. A significant contrast between Typical Artificial Intelligence and Auto Machine gaining is from ingesting information to pre-handling, improvement, and afterward anticipating results. Each progression is controlled and performed by people. Auto Machine adopting basically centers around two significant viewpoints — information obtaining/assortment and expectation. The various advances that happen in the middle can be effortlessly computerized while conveying a model that is improved well and prepared to make forecasts. Mercari is a standard shopping application in Japan that has been using AutoML Vision (Google's AutoML answer) for portraying pictures. According to Mercari, they've been "developing their own ML model that proposes a brand name from 12 noteworthy brands in the photo moving user interface." Automated Machine learning makes it workable for organizations in each industry – human services, monetary markets, fintech, banking, the open division, showcasing, retail, sports, assembling, and that's just the beginning – to use AI and AI innovation — innovation already just accessible to associations with tremendous assets available to them via mechanizing the vast majority of the displaying undertakings so as to create and convey AI models, robotized AI empowers business clients to actualize AI arrangements easily, in this way permitting an association's information researchers to concentrate on progressively complex issues. The end for this innovation is to make it accessible to everybody instead of a couple people.

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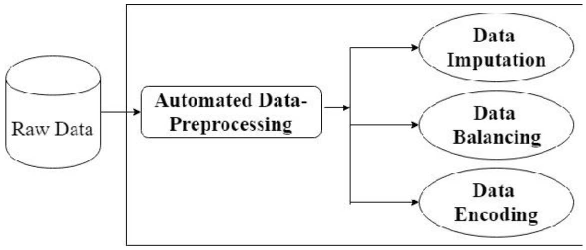

3. PROPOSED SYSTEM:

Even though data pre-processing consumes a large chunk of time in an ML pipeline, it is astonishing to see the inadequate amount of work done to automate it. For data preprocessing, it can be noted that while the existing approaches are adequate for structured and semi-structured data, work still needs to be done to assimilate unstructured data. We suggest the incorporation of data-mining methods as they can deal with such unformed data. This can allow AutoML pipelines to create models capable of learning from Internet sources. In feature engineering, it should be noted that most methods used until now adhere to supervised learning. However, dataset specificity is high, and therefore, AutoML pipelines should be as generic as possible to accommodate the diverse datasets. Therefore, a gradual paradigm shift towards unsupervised learning is required to increase the ability of AutoML. To replace domain experts, feature generation should be able to work flexibly(such as the introduction of non-standard transforms) with the original feature sets. Reinforcement learning is a step in the right direction and needs to be inculcated further with feature engineering. Hyperparameter optimization has seen large improvements over the years, especially with the introduction of Bayesian optimization strategies such as SMBO. However, the use of a continuously integrating metalearning framework needs to be researched as its performance gain is high. Transfer learning has also been successfully used in the context of AutoML to show promising results. With the increase in the availability of task-specific pre-trained models, it should

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be expected to see an increase in the usage of transfer learning.

RESULTS:

GNP(Grupo Nacional Provincial) is one of the largest insurance companies in Mexico. Like any large and well-established company, GNP is undergoing a profound transformation for modernizing information systems and operations. To achieve this, the company is utilizing the cloud resources to centralize the generalized computations. GNP is making significant efforts to organize and utilize all the operational information of the company in the central Data Lake. To extract value from Data lake, the company has begun to apply machine learning for getting intuitions as well as predicting and improving the company's performance based on their domainspecific factors. For such a data-driven approach, a team of highly trained data scientists is required, which is financially taxing. In the earlier stages, the company's data scientists built and trained various models manually and thus achieved moderate accuracy for the prediction problem. To improve accuracy and reduce the amount of time and expenses, GNP adopted the tool called AutoML Tables provided by Google Cloud to simplify and speed up the creation of ML models and migrate the scarcity of highly trained data scientists. The company utilizes the provided tool to solve problems like Car claim risk, Detection of fraudulent healthcare claims, and Gender Labeling, which are discussed in detail below.

4. CONCLUSION:

In this paper, we provide insights to the readers about the various segments of AutoML with a conceptual perspective. Each of these segments has various approaches that have been briefly explained to provide a concise overview. We also discuss the various trends seen in recent years including suggestions of thirsty research areas which need attention. We also put forward some future directions that can be explored to extend the research in the domain of AutoML. We suggest that the research exploration can be done in the direction of a generalized AutoML pipeline, which can accept datasets of a wide range and a central meta-learning framework be established that acts as a central brain for approximating the pipelines for all future problems statements.

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