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A REVIEW PAPER ON DESIGNING A ML SYSTEM

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ABSTRACT

Machine learning is a type of artificial intelligence, focused on building computer systems that learn from data. The broad range of techniques it encompasses enables software applications to improve their performance over time. It is a subfield of artificial intelligence, which is defined as the capability of a machine to imitate intelligent human behaviour. AI systems are used to perform complex tasks that is similar to how humans solve the problems.

Keywords: Machine Learning, Artificial Intelligence, Performance, Capability, Human Behaviour, Complex tasks.

1. INTRODUCTION

The Machine learning (ML) is defined as an integration of various computational approaches that utilize data to make predictions and the accuracy of algorithms. It is widely used in material design, analysis and detection.

The Machine learning models adopt the algorithm of using underlying relationships, and patterns in data to develop new predictions, speech recognition, image recognition. Machine learning involves numerous generic tasks, of modelling by some feature reduction, data clustering, data classification, probability distribution functions, regression analysis, for each generic task, and diverse approaches exist.

2. BACKGROUND

Over the years, machine learning has radically evolved argue that machine learning was suggested in 1959. Since then, it has been used widely in bioinformatics, data mining, game playing, and computer vision.

Therefore, data-driven science has offered significant opportunities to understand machine learning in material design and structure.

Big data-driven science is the game changer in machine learning due to the popularization of artificial intelligence methods, data mining, and statistical learning approaches. Since, the discovery of data-driven science, there has been an increase in the number of published works on data-driven and big-data concepts.

Application of Machine Learning in Designing a System:

- Image Recognition
- Speech Recognition
- Predict Traffic Patterns
- Self-Driving Cars
- Catching Email Spam

Image Recognition:

One of the most notable machine learning applications is image recognition. It is a method for cataloging and detecting an object or feature in a digital image. In addition, this technique is used for further analysis.

Example: Pattern recognition, Face detection and Face recognition.

Speech Recognition:

ML software can make measurements of words spoken using a collection of numbers that represent the speech signal. Popular applications that employ speech recognition.

Example: Amazon's Alexa, Apple's Siri, and Google Maps.

Predict Traffic Patterns:

Let's consider the example of Google maps. When we enter our location on the map, the application collects massive amounts of data about the present traffic to generate predictions regarding the upcoming traffic and identify the fastest route to our destination.

Example: In Gmaps, Identifying the fastest route to the destination that we requested.

E-commerce Product Recommendations:

One of the prominent elements of typically any e-commerce website is product recommendation. It involves the sophisticated use of machine learning algorithms. Websites track customer behaviour based on past purchases, browsing habits, cart history and then recommend products using machine learning and Artificial Intelligence.

Example: Tracking the Cart history

Self-Driving Cars:

Self-driving cars use an unsupervised learning algorithm that heavily relies on machine learning techniques. This algorithm enables the vehicle to collect information from cameras ,and sensors about its surroundings ,and understand it, and choose what actions to perform.

Example: Non-driver cars

Catching Email Spam:

One of the most popular applications of machine learning that everyone is familiar with is in detecting email spam. Email service providers build applications with spam filters that use an Machine Learning algorithm that classifies the incoming email as spam and direct it to the spam folder.

Example: Gmail – Spam folder

3. LIMITATIONS OF MACHINE LEARNING

Advancements in technology have labeled machine learning as an answer to all problems. But sometimes, it's really not the answer. Failed experiment should be reported so as to evaluate the success degree of the accuracy and precision. Biasness and uncertainty in the design process are quite common.

Error propagation and uncertainty quantification are other limitations of machine learning. Physical laws are not used in machine learning and therefore it becomes difficult to identify the key domains of applicability for predictions in the new systems of machine learning.Machine learning (ML) limits the featurization of those materials that require tensional representation, including materi als that require heat conduction tensors and susceptibility tensors for determining electronic and magnetic properties.

4. FUTURE RECOMMENDATION

Automated Machine Learning (AutoML) is the future of ML. Auto Ml will aid in simplifying the processes of material design. Data reprocessing will be enhanced such that it will improve the quality of data ,and data cleaning through the transformation of unstructured data into data reduction and structured data.

The future of machine learning is creating an approach to data. Machine learning relies on data to come up with solutions and therefore, accurate, large scale and reproducible is vital in ensuring that accurate results are acquired .

Maximum optimization enhancement is vital for machine learning. Enhancing optimization allows the creation of a gradient line search based on an ordered list of variable findings.

5. CONCLUSION

Machine Learning has evolved in terms of its usage and other related techniques for material design, as well as the development that has led to the maturity of the mainstream field. Machine learning is a transformative approach to rationalizing material design. It brings forward its significance, in material design through experiments and simulations. ML-based designs are significant in incorporating mechanical features, and materials essential in the process of exploring mechanical and material structures.

In conclusion, machine learning continues to provide a powerful and new approach to acquiring information from various materials using data and algorithms. In comparison to the traditional ways, the machine learning method is cheaper and faster and opens up new opportunities for dealing with material design systems. However, as a data-driven technique, its superiority and performance are dependent on the quality and quantity of data given.

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