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**BANGLADESH UNIVERSITY OF
BUSINESS AND TECHNOLOGY**

Assignment on
The Applications of ML in Real World Problems

Course Code: CSE 465

Course Title: Machine Learning

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- 1) **Introduction:** Machine learning brings out the power of data in new ways, such as Facebook suggesting articles in our feed. Machine learning is actively being used today, perhaps in many more places than one would expect. When we ask Alexa to play our favorite music station on Amazon Echo, she will go to the station we played most often. We can further improve and refine our listening experience by telling Alexa to skip songs, adjust the volume, and many more possible commands.

➔ **What is Machine Learning?**

Arthur Samuel, a pioneer in the field of artificial intelligence and computer gaming, coined the term “**Machine Learning**”. He defined machine learning as – “**Field of study that gives computers the capability to learn without being explicitly programmed**”. Machine Learning is the field of study that gives computers the capability to learn without being explicitly programmed. It is an exciting branch of Artificial Intelligence, and it's all around us. Machine Learning (ML) can be explained as automating and improving the learning process of computers based on their experiences without being actually programmed i.e. without any human assistance. The process starts with feeding good quality data and then training our machines (computers) by building machine learning models using the data and different algorithms. The choice of algorithms depends on what type of data do we have and what kind of task we are trying to automate.

Example: Training of students during exam.

While preparing for the exams students don't actually cram the subject but try to learn it with complete understanding. Before the examination, they feed their machine (brain) with a good amount of high-quality data (questions and answers from different books or teachers notes or online video lectures). Actually, they are training their brain with input as well as output i.e. what kind of approach or logic do they have to solve a different kind of questions. Each time they solve practice test papers and find the performance (accuracy /score) by comparing answers with answer key given. Gradually, the performance keeps on increasing, gaining more confidence with the adopted approach. That's how actually models are built, train machine with data (both inputs and outputs are given to model) and when the time

comes test on data (with input only) and achieves our model scores by comparing its answer with the actual output which has not been fed while training.

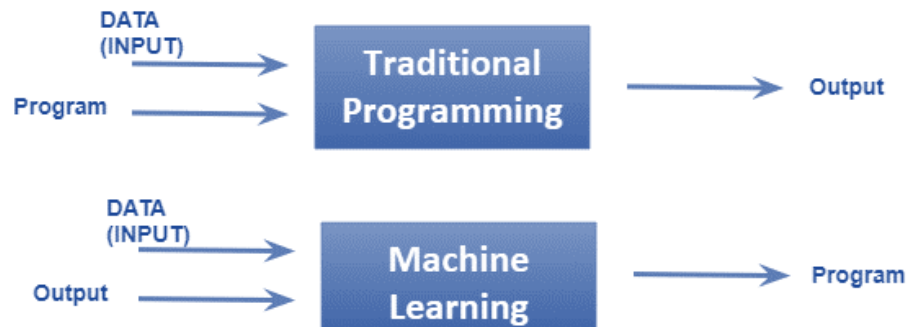


Figure1: ML model example.

Basic Difference in ML and Traditional Programming:

- **Traditional Programming:** We feed in DATA (Input) + PROGRAM (logic), run it on machine and get output.
- **Machine Learning:** We feed in DATA(Input) + Output, run it on machine during training and the machine creates its own program(logic), which can be evaluated while testing.

➔ How Does Machine Learning Work?

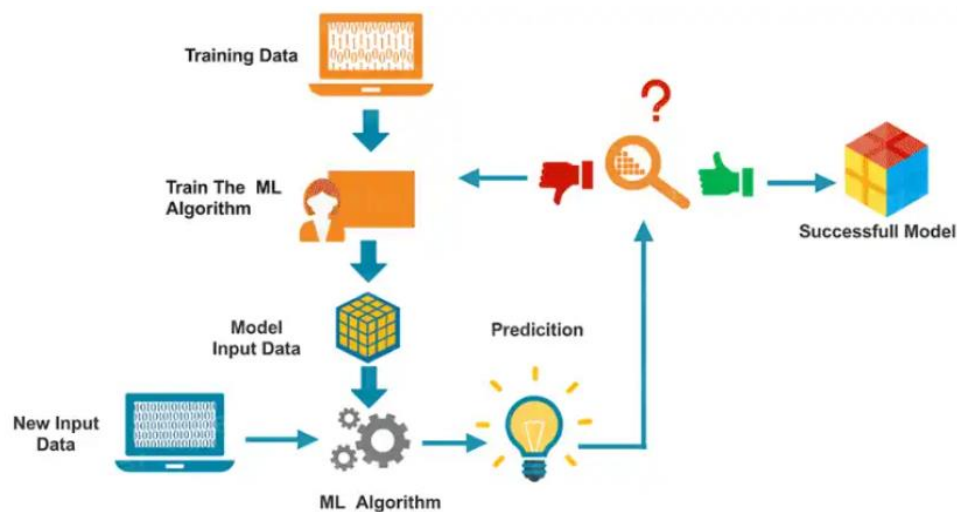


Figure2: The machine learning process

The machine learning process includes the following steps:

Data Collection – The primary step of a Machine Learning process is gathering relevant information from various sources.

Data Preparation – Once all the data is collected, it needs to be identified, sorted, and classified before analyzing it. The techniques of data preparation depend on the kind of task that is to be done by the Machine Learning application.

Training – This stage involves training the machine to self-learn from the analyzed data. Learning algorithms are created based on various parameters and expected outcomes of the application.

Evaluation – In this step, the Machine Learning application is tested to evaluate its performance and also identify bugs and find areas of improvement.

Fine Tuning – Creating Machine Learning applications is a continuous process. As data preparation and analyzing techniques evolve, the algorithms and the Machine Learning application model need to be fine-tuned.

Machine Learning Techniques:

There are 4 major Machine Learning techniques:

Supervised Learning-

Supervised learning is the types of machine learning in which machines are trained using well "labelled" training data, and on basis of that data, machines predict the output.

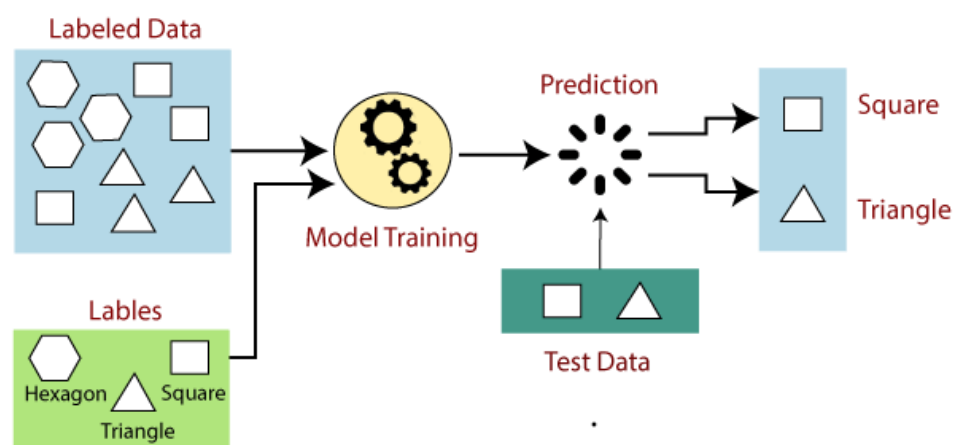


Figure3: Supervised Learning

Unsupervised Learning-

Unsupervised learning is the training of a machine using information that is neither classified nor labeled and allowing the algorithm to act on that information without guidance.

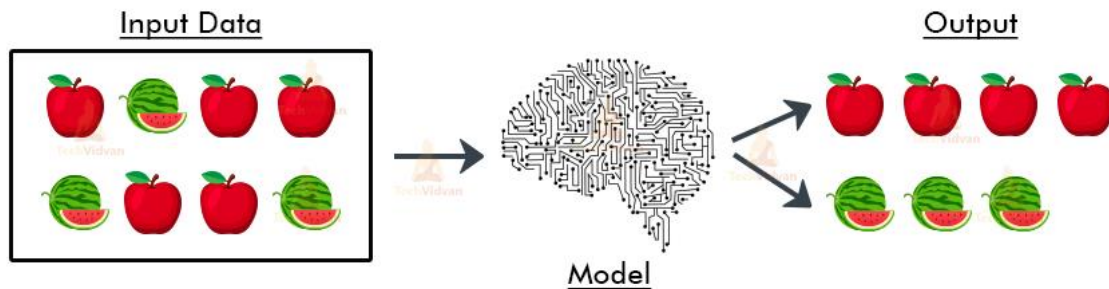


Figure4: Unsupervised Learning

Semi-Supervised Learning-

This technique is a hybrid of supervised and unsupervised learning. Inputs are provided to all labelled data, but specified outputs are not provided to all the labelled data. This method reduces the need to have all data labelled, and gives the machine the flexibility to deliver different outputs. Generator and discriminator are two neural networks used in Semi-supervised learning.

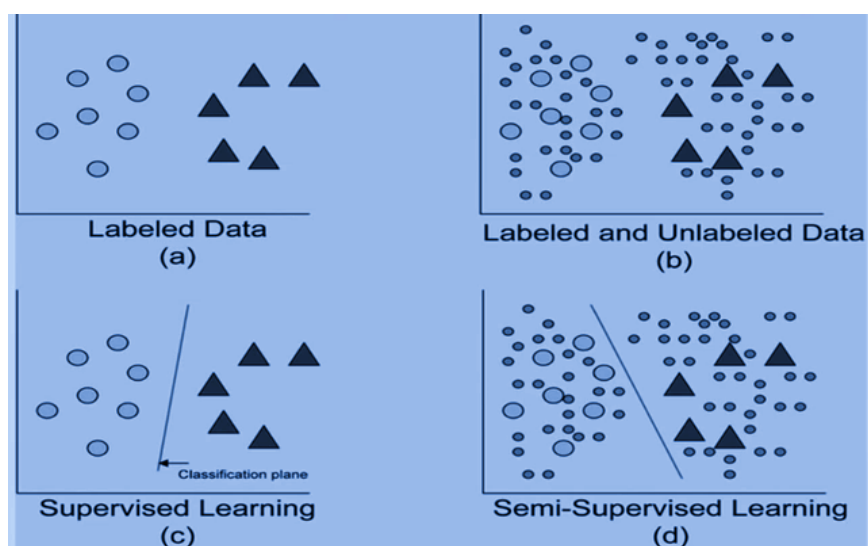


Figure5: Semi-Supervised Learning

Reinforcement Learning-

This Machine Learning technique is a little complex and is based on the psychological rule of using positive and negative feedback to reinforce behavior. It is suitable for use in rich data environments like that in video games.

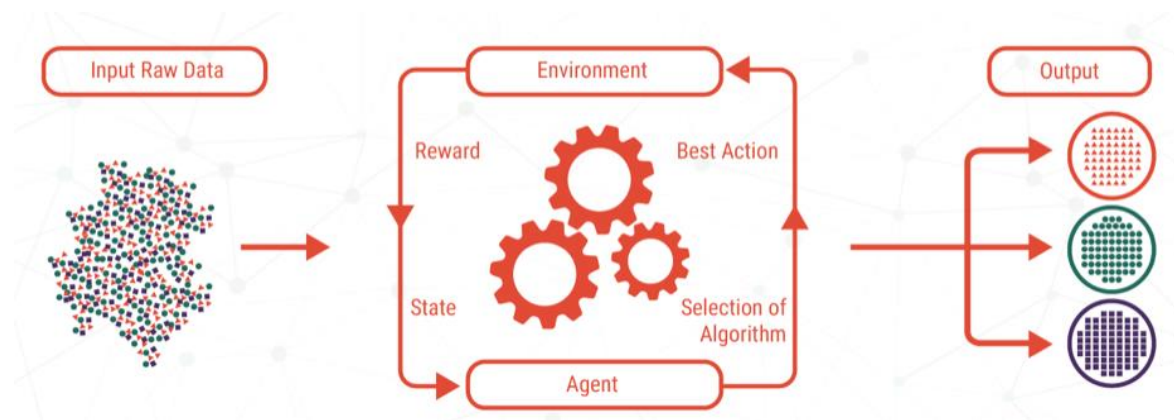


Figure6: Reinforcement Learning

2) Machine learning applications in real world problems:

There are a lot of day-to-day scenarios that involve the use of ML in our lives; perhaps we do not pay attention to it. Let us now see how we come across Machine Learning in our real-life.

1. Healthcare and Medical Diagnosis:

Machine Learning involves a variety of tools and techniques that helps solve diagnostic and prognostic problems in a variety of medical domains. Prediction of disease progression, for extraction of medical knowledge for outcomes research, for therapy and planning and support, and overall patient management are some examples where we use machine learning for the analysis of clinical parameters. We also use ML for the data analysis of medical records such as detecting regularities in data, dealing with incomplete data interpreting continuous data produced by the Intensive Care Unit, and also for intelligent alarming resulting in efficient and effective monitoring.

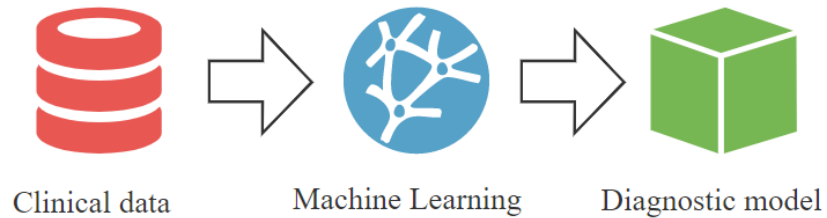


Figure7: Use of ML in Healthcare

2. Social Media:

Most of us are addicted to social media these days because social media is fun and engaging. ML technology plays a crucial role in developing user-friendly social media websites and applications.

- **Suggesting Friends:** Social networking sites like Facebook keep track of the friends that we connect with, profiles we visit frequently, shared groups, interests, and workplace. Based on continuous learning, Facebook suggests people with whom we can be friends.
- **Face Recognition:** Social websites and applications like Facebook and Instagram immediately recognize our friends the moment we upload the picture on media and start giving notifications to tag them.

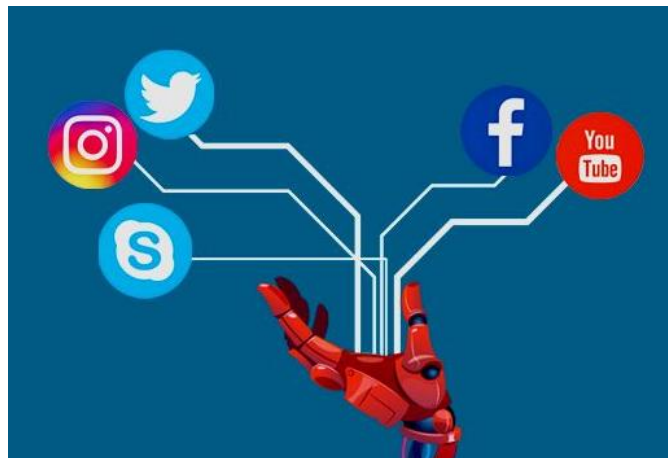


Figure8: Use of ML in Social Media

3. Smart Assistants:

Using smart assistants is what we do round the clock. We all have used Siri, Google Assistants, Alexa, and many more on our smartphones and smart speakers like Echo and Google Home. In addition to this, Samsung is also in the run of launching a smart TV with its virtual assistant called Bixby. As “assistants,” their job is to assist us in our day-to-day routine, all that is required from our end is to activate them. The significant use of assistants in our everyday lives involves activities like setting alarms and reminders, updating the user with live news through notifications. Answering questions like “How is the weather today in Bangladesh?” or “Any Bookstore near me?” is also handled by these smart assistants. These assistants can look for information, recall-related queries, or send a command to other resources (on the web) to collect info and answer the user’s questions.



Figure9: Use of ML in Voice Assistant

4. Cybersecurity:

Machine Learning offers a potential insight in preventing online monetary frauds, thereby making cyberspace a secure place for transactions and net banking. Applications like PayPal, GPay, Paytm have a set of tools that help them keep track of transactions and distinguish between legitimate and illegitimate transactions, thus preventing any false transactions.



Figure10: Use of ML in Cybersecurity

5. Agriculture:

Machine learning in agriculture enables precise and efficient farming with less manpower for high-quality production. Machine learning also provides invaluable insights and recommendations about crops so that farmers can minimize their losses. Using satellite imagery for Google Earth Engine (GEE) images and Jupyter, Omdena built an app for crop yield prediction in Senegal, Africa, that helps to improve food security.

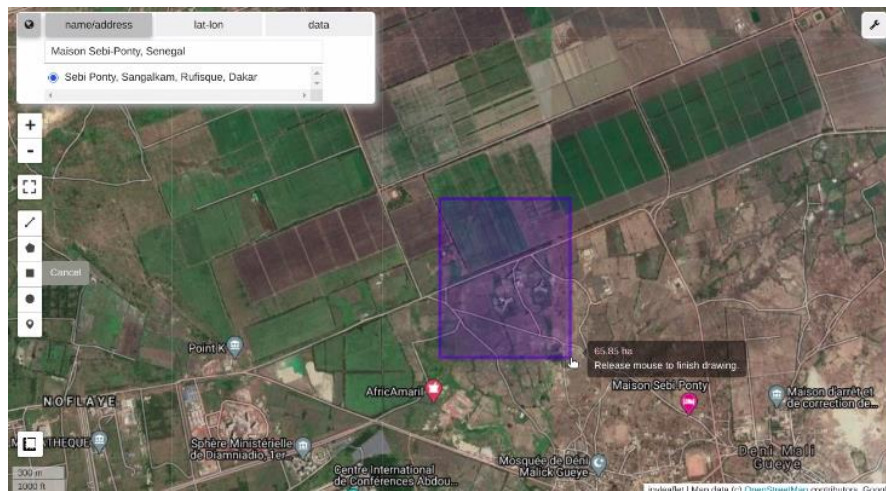


Figure11: Crop Yield Prediction, Source: Omdena

Other than this five there are lot more uses of ML in real world applications such as:

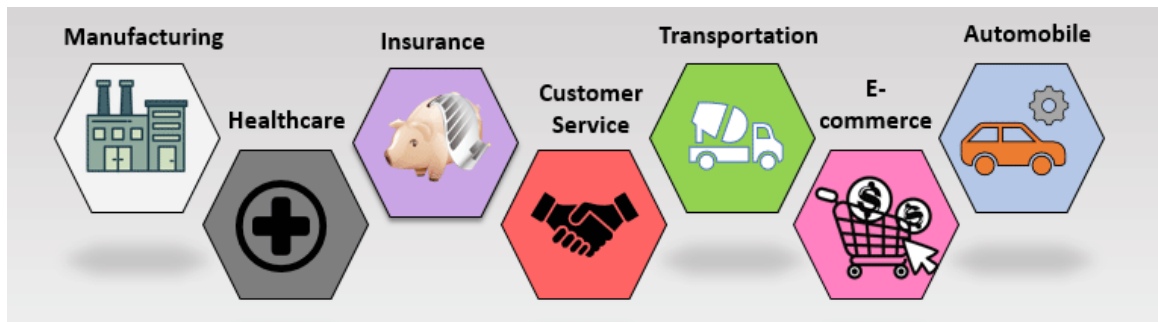


Figure12: ML Applications

And many more fields are getting advantage by machine learning.

➔ Some statistics of ML uses in real world:

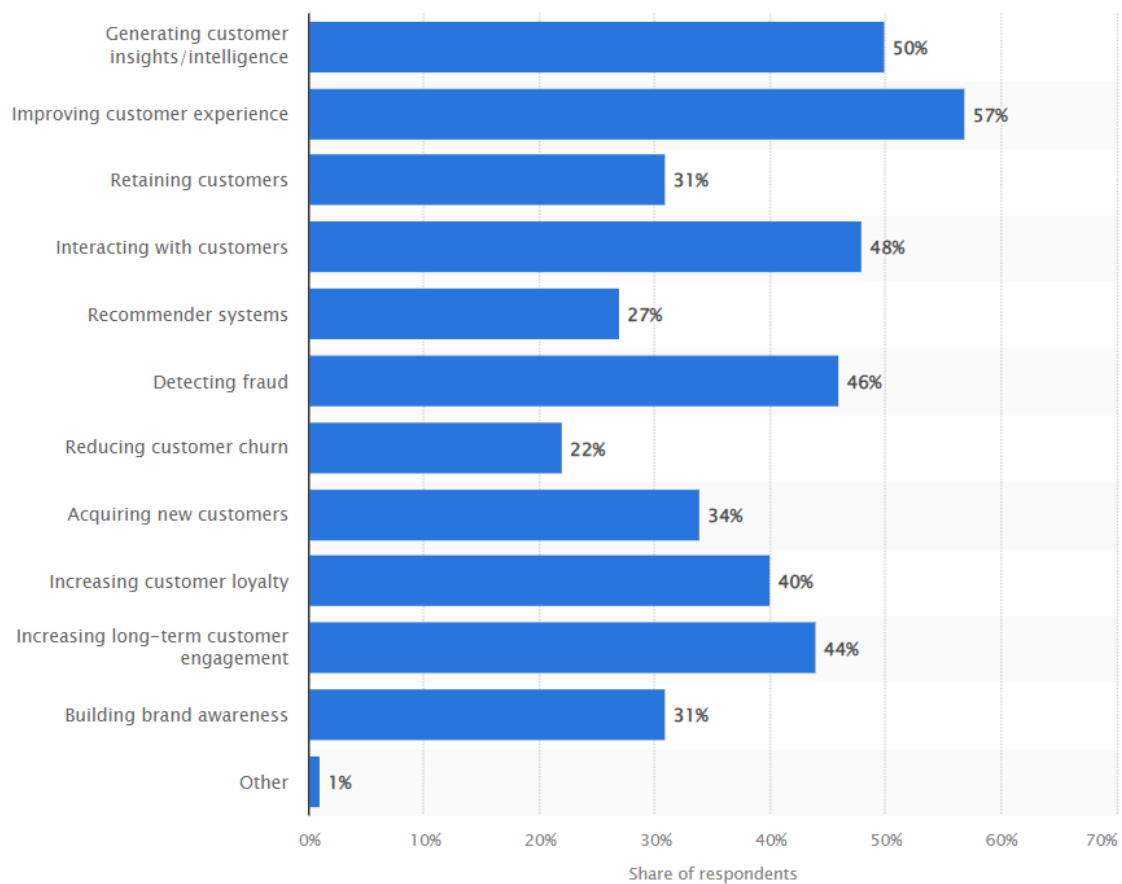


Figure13: AI and ML use cases for companies worldwide in 2021, Source: Statista

→ Some Advantages and Disadvantages of ML:

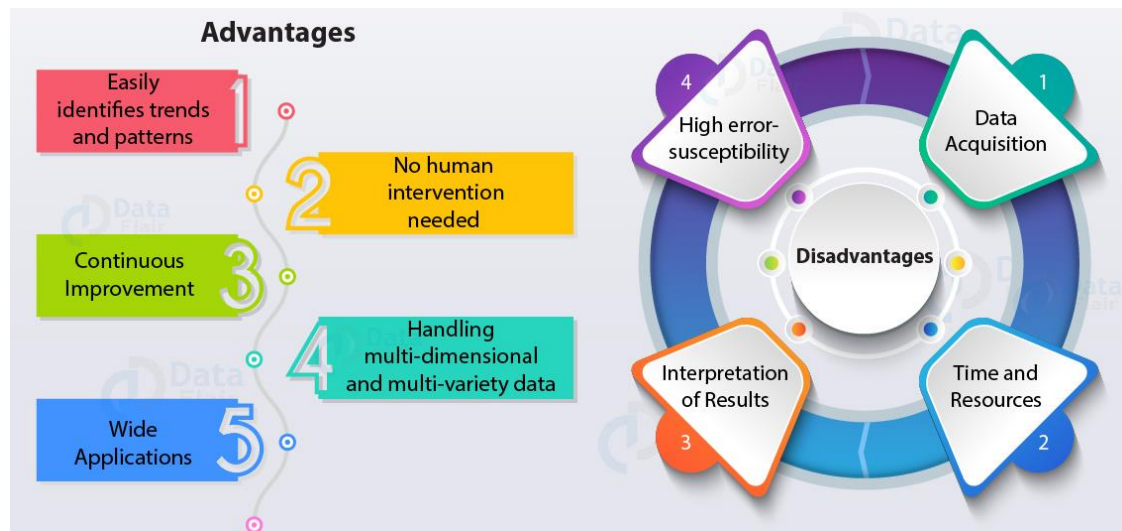


Figure14: Advantages and Disadvantages of ML, Source: DataFlair

3) Conclusion:

Uses of Machine Learning applications are increasing day by day. Here, we saw some applications of ML real world. Furthermore, there are more fields apply ML as a solution. In the near future, ML will play a vital rule in our daily life.

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