

## A Study on Machine Learning and Python's Framework

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**Abstract**—The present paper is based on Machine Learning Activities using Python programming language. There are various types of Machine Learning Algorithms such as Supervised Learning, Unsupervised Learning and Reinforcement Learning. These already exist in the field of computer programming. Besides these algorithms there is another Deep Learning algorithm which plays a significant role in machine learning devices and is part of Machine Learning methods. The Deep Learning can be used to intelligently analyze the data on a large scale.

The paper explores that how Python can be applied in the ML methods? A comprehensive overview on the concerned issues has been illustrated in the study. The present research paper explores the history of machine learning, the methods used in machine learning, its application in different fields of AI. The aim of this study is to transmit the knowledge of machine learning in various fields of AI. In Machine Learning (ML) the knowledge of Artificial Intelligence (AI) is very much essential.

**Keywords**—Python, Machine Learning (ML), Machine Learning Algorithms (MLA), Artificial Intelligence (AI), Supervised Learning, Unsupervised Learning, Reinforcement Learning, Framework, Django.

### I. INTRODUCTION

Artificial Intelligence (AI) is a broad term which is used very frequently in social media, medical fields, agricultural fields, programming languages and other fields of automation devices. Machine learning is a science which was found and developed as a subfield of artificial intelligence. The machine learning was first introduced in the 1950s (Çelik, 2018). The first steps of machine learning were carried out in the 1950s but there were no significant researches were made on ML. The developments on ML science were slow down. But in the 1990s, the researchers restarted the researches on this field and developed significant contribution on the ML. Now it is a science that will improve more in the coming years.

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. It is an important component of the growing field of data science.

### II. LITERATURE REVIEW

A Literature Review is a systematic and comprehensive analysis of books, scholarly articles, and other sources relevant to a particular topic providing a base of knowledge on a topic. A literature review is an overview of the previously published works on a particular topic. Literature reviews are designed to identify and critique the existing literature on a topic to justify your research by exposing gaps in current research.

The concept of Machine Learning is not new for us. There are several studies has been made so far. The process of

Machine Learning is a multidimensional problem so there are several facets available for designing and analyzing the web based applications in machine learning using Python. Some of the selected studies are explained hereunder:

**Iqbal H. Sarker (2021)** made a study on machine learning with special reference to algorithms, real world applications and research directions. A comprehensive overview of machine learning algorithms for intelligent data analysis and applications is given in the study. How various types of machine learning methods can be used for making solutions to various real-world issues briefly discussed. A successful machine learning model depends on both the data and the performance of the learning algorithms. This study is a part of the topical collection “Advances in Computational Approaches for Artificial Intelligence, Image Processing, IoT and Cloud Applications” guest edited by Bhanu Prakash K. N. and M. Shivakumar.

**Sebastian Raschka, Joshua Patterson and Corey Nolet (2020)** have reviewed Machine Learning in Python. The developments and technology trends in data science, machine learning and artificial intelligence explained in the study. The study also reveals some important insight into the field of machine learning with Python, taking a tour through important topics to identify some of the core hardware and software paradigms that have enabled it. Widely-used libraries and concepts, collected together for holistic comparison, with the goal of educating the reader and driving the field of Python machine learning forward covered in the study.

**Jan Kossmann and Rainer Schlosser (2019)** have made a study on “A Framework for Self-Managing Database

Systems” and explored that database systems that autonomously manage their configuration and physical database design face numerous challenges: They need to anticipate future workloads, find satisfactory and robust configurations efficiently, and learn from recent actions. We describe a component-based framework for self-managed database systems to facilitate development and database integration with low overhead by relying on a clear separation of concerns. Our framework results in exchangeable and reusable components, which simplify experiments and promote further research. Furthermore, we propose an LP-based algorithm to find an efficient order to tune multiple dependent features in a recursive way.(Kossmann & Schlosser, 2019)

**Shweta J. Patil (2019)** written a research paper on Python Using Database and SQL. She mentioned that Python is a general-purpose, high-level programming language whose design philosophy emphasizes code readability. Python claims to combine "remarkable power with very clear syntax", and its standard library is large and comprehensive. Python is a programming language that lets you work more quickly and integrate your systems more effectively. In this paper we reviews available resources and basic information about database modules that are known to be used with Python and also how to make the connection between python and database. This paper features about different database systems with their standard commands implemented with python also result best suitable to implement database engine using python. She concluded that during the work on project, tried to analyze all the database servers in order to find the most suitable one. After a careful consideration MySQL Server is chosen since it has many 14 appropriate characteristics to be implemented in Python. Python is one of the most known advanced programming languages, which owns mainly to its own natural expressiveness as well as to the bunch of support modules that helps extend its advantages, that's why Python fits perfectly well when it comes to developing a stable connection between the program and the database.(Patil, 2019)

**Özer Çelik and Serthan Salih Altunaydin (2018)** have made a study on a research on machine learning methods and its applications. The conceptual and historical background of the machine learning illustrated in their study. They described the machine learning algorithms, artificial neural networks, decision trees, single layer and multilayer artificial neural networks, some decision making algorithms and machine learning application areas like education, health, finance, energy, meteorology, cyber security in their study. They have made a suggestion that the power of information technology and machines must be strictly taken into consideration in such an environment. **Amir Mosavi, Pinar Ozturk and Kwok-wing Chau (2018)** have made a study on flood prediction using machine learning models. They have presented an overview of machine learning models used in flood prediction, and develops a classification scheme to analyze the existing literature. The survey represents the

performance analysis and investigation of more than 6000 articles. Among them, they identified 180 original and influential articles where the performance and accuracy of at least two machine learning models were compared. To do so, the prediction models were classified into two categories according to lead time, and further divided into categories of hybrid and single methods. The state of the art of these classes was discussed and analyzed in detail, considering the performance comparison of the methods available in the literature. The performance of the methods was evaluated in terms of R<sup>2</sup> and RMSE, in addition to the generalization ability, robustness, computation cost, and speed. Despite the promising results already reported in implementing the most popular machine learning methods, e.g., ANNs, SVM, SVR, ANFIS, WNN, and DTs, there was important research and experimentation for further improvement and advancement. In this context, there were four major trends reported in the literature for improving the quality of prediction.

**Ahmed Othman Eltahawey (2016)** made a tutorial on Database Using Python. In python file, you have to first establish a connection between your file and the database. After that, you can add, search, delete or update your database. Moreover, you can retrieve the data from the database, make any operation on it then re-add it to the database. The database operations are performed using SQL statements. In the first section of this chapter, a set of useful links is provided that could help you in downloading necessary database program and python connector. Moreover, a link to a small video describing how to create database using mysql. In the second section, a description of how to make the connection between python and database is provided. In the third section, a quick review of the basic SQL statements is presented. In the fourth section, the main database operations are performed using python.(Eltahawey, 2017)

**Bhojaraju, G. and Koganurmath, M.M. (2014)** described Database System: Concepts and Design. They expressed their views that an organization must have accurate and reliable data for effective decision making. To this end, the organization maintains records on the various facets maintaining relationships among them. Such related data are called a database. A database system is an integrated collection of related files, along with details of the interpretation of the data contained therein. Basically, database system is nothing more than a computer-based record keeping system i.e. a system whose overall purpose is to record and maintain information/data. A database management system (DBMS) is a software system that allows access to data contained in a database. The objective of the DBMS is to provide a convenient and effective method of defining, storing and retrieving the information contained in the database. The DBMS interfaces with the application programs, so that the data contained in the database can be used by multiple applications and users.(Gunjal & Koganurmath, 2014)

**Anand K. Tripathi and Monika Tripathi (2012)** have made a study on “A Framework of Distributed Database Management Systems in the Modern Organization and the Uncertainties removal”. They studied the use of distributed database management systems (DDBMSs) in the information infrastructure of modern organizations to reduce the uncertainties occurring in organization. The key purpose of the research is to determine the feasibility and applicability of DDBMSs for today's business applications. The forces which drove the selection of this topic were the improvements of distributed features in leading database management systems (DBMSs) in recent years, as well as the potential of distributed databases to provide competitive advantages for organizations for proper utilization of infrastructure to obtain the meaningful information.

They expressed their views that all of the major DBMS developers have made significant improvements to their newer products in the area of handling high loads of simultaneous OLTP and OLAP operations on the same server. Recent advances such as improved use of multiprocessor hardware, multithreading, and row-level locking have allowed this improved performance. However, there are still OLAP applications that generate such high system demands that they cannot function together effectively with OLTP applications on the same server. The replication features of today's major DBMSs fill this need nicely. Firms can use asynchronous replication to maintain an OLAP server separate from the

OLTP server and provide high performance for both applications. Future advances in individual server capabilities to simultaneously support OLTP and OLAP plus improved replication performance will mean that IT managers will not need to compromise to provide high performance in both these areas.(Anand et al., 2012)

**Subhash Bhalla, Bandreddi E. Prasad, Amar Gupta, Stuart E. Madnick (1988)** explained a FRAMEWORK AND COMPARATIVE STUDY OF DISTRIBUTED HETEROGENEOUS DATABASE MANAGEMENT SYSTEMS. The prime objective of the Distributed Heterogeneous Database Management System approach is to support database integration across organizational, application, and geographical boundaries. This is achieved by efforts that a at providing a unified global schema and common query facilities to users, without changing existing Database Management Systems or their application programs. Design methodologies for such systems differ from each other in a number of ways. The additional complexity of translating between multiple systems and data models makes Distributed Heterogeneous Database Management Systems more challenging than conventional database systems. This paper identifies critical aspects of Distributed. Heterogeneous Database Management Systems. It aims at providing a basis for the study of these systems, comparative analysis between such systems, and directions for further extensions. (Gupta & Madnick, 1988).

## 2.1 Comparison and Analysis

Papers	Objective	Technique Used	Advantages	Disadvantages
Jan Kossmann and Rainer schlosser(2019)	To explored that database systems that independently manage their arrangements and explained a components based framework for self-managed database systems to develop database integration with low overhead.	LP-based approach to find an efficient order for the recursive tuning of mutually dependent features.	Exchangeable and Reusable components. Easy and efficient database management.	Less efficient for small scale database management system.
Subhash Bhalla	The key objective of the DHDBM system approach is to contribute database integration cross organizational application and geographical boundaries.	It gives the concept of automatic mapping tools for providing component and data translation to cater to various data models, language, query structure and data structures.	This will provide higher level of performance and reliability.	According to today's world they providing less flexibility and security.
Shweta J. Patil	The aim of this is to introduce the quality about different database systems with their standard commands execute with Python.	Python is used as programming language to show best results. Suitable to implement database engine.	This will allow developers to create their database according to their requirements because they gives provide analysis of different database.	Establishing connection between field and the database might be confusing sometimes.

Ahmed Othman Eltahawy(2016)	To present a tutorial on database using Python and how to make the connection between python and database is provided.	Python with SQL database.	Easy to Understand	Connectivity is important to manage. There might be occur problem for non-programmers.
Bhojaraju G. and Koganurmath MM. (2014)	To Design database And present application of DBMS to library and information system.	Two software packages related to library and information system. Dbase III Plus and CDS/ISIS.	Eliminate Redundant data. And allow growth in database system.	Difficult to manage big database.
Anand k. Tripathi and Monika Tripathi(2012).	To Study on A framework of DDBMS in the modern organization. The main purpose of the research is to determine the feasibility and applicability of DDBMSs for today's business applications.	Analysis and determine of framework for DDBMS.	Fast execution and high performance.	Can't function together efficiently with OLTP application on the same server.
Özer Çelik and Serthan Salish Altunaydin (2018).	A study on a research on Machine Learning methods and its applications	Its gives us a knowledge techniques.	Improved workflow Increased efficiency. One of the greatest advantages of AI systems is that they enable humans to be more efficient.	High costs of creation. As AI and its techniques is updating every day the hardware and software need to get updated with time to meet the latest requirements.

### III. METHODOLOGY

Django is a high-level Python web framework that enables rapid development of secure and maintainable websites. Built by experienced developers, Django takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. Django Framework is used to build Web Applications. Django is a collection of Python libs allowing you to quickly and efficiently create a quality Web application, and is suitable for both frontend and backend.

### IV. AI TECHNIQUES

Artificial Intelligence refers to machines mostly computers working like humans. In AI, machines perform tasks like face recognition, learning and, problems-solving etc. Machines can work and act like a human if they have enough knowledge about the task. So in artificial intelligence, knowledge engineering plays a important role. The relation between objects and properties are accepted to implement knowledge engineering. One of the familiar techniques of Artificial Intelligence is explained below.

#### 4.1 Machine Learning

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. As explained, machine learning algorithms have the ability to improve themselves through

training. There is no error margin in the operations carried out by computers based an algorithm and the operation follows certain steps. Different from the commands which are written to have an output based on an input, there are some situations when the computers make decisions based upon the present sample data. In those situations, computers may make mistakes just like people in the decision-making process. That is, machine learning is the process of equipping the computers with the ability to learn by using the data and experience like a human brain (Gör, 2014). The main aim of machine learning is to create models which can train themselves to improve, perceive the complex patterns, and find solutions to the new problems by using the previous data (Tantuğ ve Türkmenoğlu, 2015). Today, ML algorithms are trained using three prominent methods. These are three types of machine learning: supervised learning, unsupervised learning, and reinforcement learning.

##### 4.1.1 Supervised learning

Supervised Learning is a process of machine learning. The Supervised learning belongs to a relatively basic learning method. This learning method refers to the establishment of corresponding learning goals by people before learning. During the initial training of the machine, the machine relies on information technology to learn the needs of learning. In order to collect basic data information, we are supposed to gradually complete the required learning content in a supervised environment. Compared with other learning methods, supervised learning can fully stimulate the generalized learning potential of the machine itself.

After completing the system learning, it can help people to solve some classification or regression problems, which is highly systematic. Currently, the classic learning methods commonly used include BN, SVN, KNN, etc. Because the entire learning process has purpose, the machine learning process presents a certain regularity, and the learning content is more systematic(Jin, 2020).

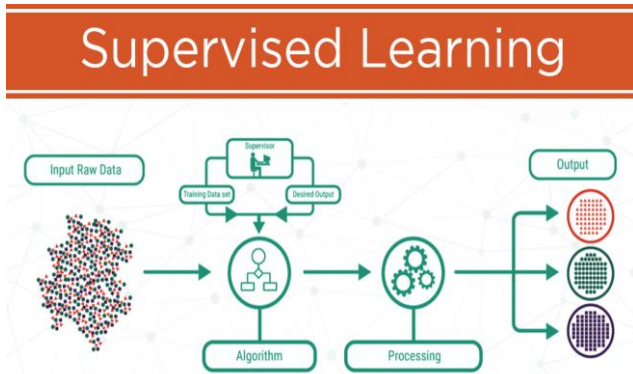


Fig.1 Supervised Learning

**4.1.2 Unsupervised learning**

Corresponding to supervised learning is called unsupervised learning. The so-called unsupervised learning means that the machine does not mark the content in a certain direction during the entire learning process, but rely on the machine itself to complete the analysis of data information. In practice, the operation method is to let the machine learn the basic concepts and content, and then give the machine enough freedom to complete a series of content learning, including concepts and content similar to the basic principles, such as tree roots. In general, the continuous improvement of learning in stages has increased the breadth of machine learning content. At present, unsupervised learning includes algorithms such as deep belief networks and auto-encoders. Such situations are conducive to the solution of clustering problems and have good applications in the development of many industries (Jin, 2020).

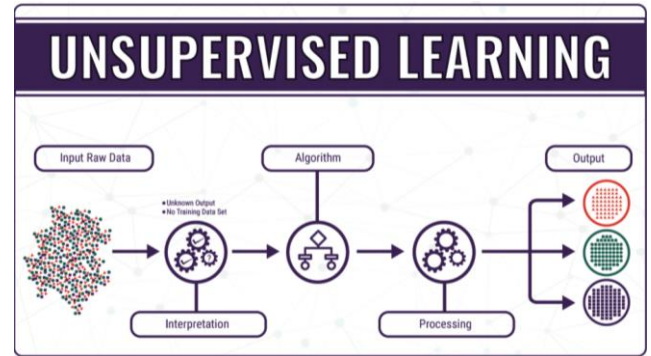


Fig. 2 Unsupervised Learning

**4.1.3 Reinforcement Learning**

In addition to supervised learning and unsupervised learning, there are also application methods of reinforcement learning in machine learning. The so-called reinforcement learning is the systematic learning of certain content. In the specific application process, the data collected in the previous period will be used. It organizes and processes the feedback information of a certain part to form a closed loop of data processing. On the whole, reinforcement learning is a type of learning method that expands data collection based on statistics and dynamic learning. Such methods are mainly used to solve the control problem of robots. Its representative learning methods include Q-learning algorithm and Temporal difference learning algorithm(Jin, 2020). Reinforcement machine learning is a behavioral machine learning model that is similar to supervised learning, but the algorithm isn't trained using sample data. This model learns as it goes by using trial and error. A sequence of successful outcomes will be reinforced to develop the best recommendation or policy for a given problem.

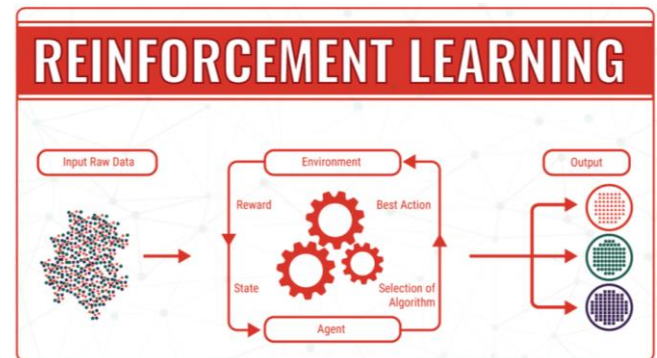


Fig. 3 Reinforcement Learning

Table 1. Comparison between Supervised Learning, Unsupervised Learning and Reinforcement Learning

Criteria	Supervised ML	Unsupervised ML	Reinforcement ML
Definition	Learns by using labelled data	Trained using unlabelled data without any guidance.	Works on interacting with the environment
Type of data	Labelled data	Unlabelled data	No – predefined data
Type of problems	Regression and classification	Association and Clustering	Exploitation or Exploration
Supervision	Extra supervision	No supervision	No supervision
Algorithms	Linear Regression, Logistic Regression, SVM, KNN etc.	K – Means, C – Means, Apriori	Q – Learning, SARSA
Aim	Calculate outcomes	Discover underlying patterns	Learn a series of action
Application	Risk Evaluation, Forecast Sales	Recommender System, Anomaly Detection	Self Driving Cars, Gaming, Healthcare

The table 1 shows a comparison between Comparison between Supervised Learning, Unsupervised Learning and Reinforcement Learning. There are six criteria illustrated in the table. It is clearly depicted in the table that all six items Definition, Type of data, Type of problems, Supervision, Algorithms, Aim, Application different in its nature and applications.

#### 4.2 Deep learning

The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural network to vast amount of data. Deep learning uses Neural networks that pass data through many processing layers to interpret data features and deep learning managed by algorithms are largely self-directed on data analysis once they are put into production.

While some deep learning algorithms are capable of accepting tabular data as input, the majority of state-of-the-art methods that are finding the best predictive performance are general-purpose and able to extract salient information from raw data in a somewhat automated way. This automatic feature extraction is an intrinsic component of their optimization task and modeling architecture. For this reason, deep learning is often described as a representation or feature learning method. However, one major downside of deep learning is that it is not well suited to smaller, tabular datasets, and parameterizing DNNs can require larger datasets, requiring between 50,000 and 15 million training examples for effective training. The following sections review early developments of GPU- and Python-based deep learning libraries focusing on computational performance through static graphs, the convergence towards dynamic graphs for improved user-friendliness, and current efforts for increasing computational efficiency and scalability, to account for increasing dataset and architecture sizes (Raschka et al., 2020).

### V. PYTHON

Python was created by Guido van Rossum, and released in the year 1991. It is a widely used in different ways for general-purpose in various activities. It is a high level significant language and one of the most popular programming languages on the global market. The Python can used in web development (server-side), development of various software, mathematics, system scripting etc. There are several activities in which Python can be used to solve various problems in a simple manner.

- Python can be used to create web applications on server.
- Python can be used in developing software for different programs.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.

- Python can be used for task automation, data analysis, and data visualization.

Python has also been adopted by many non-programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finances.

There are more and more alternatives that can be used in the programming language used in application development. Python is one of the languages that can be used in desktop and website-based programming. Python is very easy to use, especially in basic programming. This is because the python language commands are simple, neat and concise. Python is one of the most powerful languages in the use and application of scientists, especially big data, data mining, deep learning, data science to machine learning. When compared to other programming languages, commands in Python tend to be easy to learn, easy to read, and have shorter commands. Python can also be used on various operating systems such as Windows, Linux and Mac OS. (Suraya & Sholeh, 2021). Python is used for the development process taking the security issues in concern. (Shyam & Mukesh, 2020)

### VI. PYTHON FRAMEWORK

Python Web framework is a collection of packages or modules that allow developers to write web applications or services. With it, developers don't need to handle low-level details like protocols, sockets or process/thread management. There are several framework can be used in Python Programming language, like AIOHTTP, Dash, Falcon, Flask, Giotto, Django etc. one of the most popular framework in Python for Web Development is Django. Django is a high-level Python web framework application that encourages rapid development and clean, pragmatic design. It is built by experienced developers; it takes care of much of the hassle of web development, so one can focus on writing his/her app without needing to reinvent the wheel. It's free and open source so any one can make use of it. Django can work with any client-side framework, and can deliver content in almost any format (including HTML, RSS feeds, JSON, XML, etc). Django is written in Python, which runs on many platforms. That means that you are not tied to any particular server platform, and can run your applications on many flavors of Linux, Windows, and Mac OS X. Furthermore, Django is well-supported by many web hosting providers, who often provide specific infrastructure and documentation for hosting Django sites. Django Being a full stack framework, Django supports quick web application development requiring lesser core to be done. It is popularly known as "the web framework for perfectionists with deadlines". It provides ease in creating web applications with fewer lines of code and is scalable. It includes a built-in server that can be used for developing and testing the applications. The framework comes with comprehensive, well-written documentation. Features of this framework include templates, support for relational database model (Databases include MySQL, SQLite, Oracle, and PostgreSQL), comprehensive security, etc. It is well- suited for database driven applications. The

framework is based on the principle of reusability of code and non-redundancy of information (Taneja & Gupta, 2014).

The basics of web development using Django to build blog applications that have the (CRUD) Create, Read, Update, Delete functionality. Django is a widely used free, open-source, and high-level web development framework. It provides a lot of features to the developers "out of the box," so development can be rapid. However, websites built from it are secured, scalable, and maintainable at the same time (Chandiramani, 2021).

A high-level Web framework is software that eases the pain of building dynamic Web sites. It abstracts common problems of Web development and provides shortcuts for frequent programming tasks.

For clarity, a dynamic Web site is one in which pages aren't simply HTML documents sitting on a server's filesystem somewhere. In a dynamic Web site, rather, each page is generated by a computer program — a so-called "Web application" — that you, the Web developer, create. A Web application may, for instance, retrieve records from a database or take some action based on user input (Sedhain, 2007).

## VII. PYTHON IN MACHINE LEARNING

Python is one of the most popular programming languages for data science and thanks to its developer and open source community, a large number of useful libraries for scientific computing and machine learning have been developed (Ren, 2021). Python offers concise and readable code. While complex algorithms and versatile workflows stand behind machine learning i.e. Python's simply allows developers to write reliable systems. Developers get to put all their effort to solve ML problems instead of focusing on the technical nuances of the language. Additionally, Python is appealing to many developers as it's easy to learn. Python code is understandable by its users, which makes it easier to build models for machine learning. Python's extensive selection of machine learning-specific libraries and frameworks simplify the development process and cut development time. Python's simple syntax and readability promote rapid testing of complex algorithms, and make the language accessible to non-programmers.

## VIII. CONCLUSIONS

Python is playing a significant role in our day to day life. Therefore it is a need to do more and more work on its use and development. The reason behind this development is the difficulty of analyzing and processing the rapidly increasing data. Machine learning is based on the principle of finding the best model for the new data among the previous data thanks to this increasing data. Therefore,

machine learning researches will go on in parallel with the increasing data. We work with several parts of Django Framework to get this working: View, Models, Forms, and Templates.

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