

# **LAND REAL ESTATE REGISTRATION USING BLOCKCHAIN**

**A project report Submitted to**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
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**In partial fulfillment For the award of the degree**

**BACHELOR OF TECHNOLOGY  
IN  
COMPUTER SCIENCE & ENGINEERING**

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**CERTIFICATE**

This is to certify that the project report entitled “**LAND REAL ESTATE REGISTRATION BY USING BLOCKCHAIN**” submitted by the following students to the Jawaharlal Nehru Technological University,kakinada in partial fulfillment for the Award of Degree of Bachelor of Technology in Computer Science & Engineering is a bonafide record of the project work carried out by them under my supervision during 2018-2022

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We do here by declare that the project report entitled “**Land Real Estate Registration using Blockchain** “ is an original workdone and submitted by us for partial fulfillment for the award of degree of Bachelor of Technology in COMPUTER SCIENCE & ENGINEERING

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## **ABSTRACT**

Online real estate Registration is a project which provides a friendly format for register land properties. Users can search and browse for property in this application. This application also allows users to see land details online. This application mainly concentrates on maintaining and managing the details of the property. This application deals with land details. Now-a-days all applications which require huge security are migrating their application to Blockchain as Blockchain has built-in security for data. All existing techniques were not having any facility to check whether data stored at decentralized (same data will be saved at multiple nodes and if one node is hacked or down then data will be gathered from other working nodes) server is intact or changed. To check data is intact we can use Blockchain technology to maintain land registration details as this technology maintains a tree to store each transaction (any data storage will be considered as a transaction) and while storing new data then Blockchain verifies all transaction hash codes and if data is not altered or hacked then the same hash code will be generated and verification will be successful and a new block will be added and if data is changed then a different hash code will be generated and verification will be failed which indicates the node is hacked.

# Contents

<b>S.no</b>	<b>Description</b>	<b>Page number</b>
1	Introduction	1
1.1	Motivation	1
1.2	Scope	2
2	Literature Survey	3
3	Problem Definition	5
3.1	Existing System	5
3.2	Proposed System	5
3.3	System Requirements	6
3.3.1	Hardware Requirements	6
3.3.2	Software Requirements	6
3.4	Components of the System	6
3.5	Functionality of System	8
4	System study	9
4.1	Feasibility study	9
4.1.2	Economical Feasibility	9
4.1.3	Technical Feasibility	9
4.1.4	Social Feasibility	10
5	System Design	11
5.1	System Architecture	11
5.2	Algorithm Implementation	12
5.3	Algorithm Analysis	13
6	Implementation	14
6.1	Basic Implementation	14
6.2	Modules	16
6.3	Uml Diagrams	19
6.3.1	Use Case Diagram	20
6.3.2	Class Diagram	21
6.3.3	Sequence Diagram	22
6.3.4	Activity Diagram	23
7	Software Environment	24
7.1	What Is Python	24
7.2	Advantages Of Python	25
7.3	Disadvantages Of Python	27
7.4	History Of Python	29
7.5	What Is Machine Learning	29
7.5.1	Categories Of Machine Learning	30
7.5.2	Need Of Machine Learning	30
7.5.3	Challenges In Machine Learning	31
7.5.4	Applications Of Machine Learning	32

7.6	How To Start Learning Machine Learning	32
7.7	Modules Used In Project	39
7.8	Install Python Step In Windows And Mac	41
8	Coding	49
8.1	Source code	49
8.2	Output Screenshot	51
9	System Tests	58
9.1	Types Of Tests	58
9.2	Test Strategy And Approach	60
9.3	Test cases	61
	Conclusion	65
	References	66

# **CHAPTER-1**

## **INTRODUCTION**

Online real estate Registration is performed according to country-specific procedures. However, there are some features which are common for all post-socialist countries. It may be possible to implement and transfer into the Polish system the good management practice which has been developed by leading countries. On the other hand, Poles may have a chance to become acquainted with the rules governing public real estate management in other countries and to identify some practices which ought to be avoided. There is no need to implement faithfully those procedures which in other countries have been recognized as general

The aim of the paper has been to present Online real estate Registration in India in the context of good governance, and to suggest some indicators for assessing the procedures in these systems in terms of their efficiency.

### **1.1 Motivation**

Digitalization and the development of new technologies is the strongest force of change in society. In the old accustomed system, if a user lost original physical agreements which acts as concrete proof of the ownership or if documents get altered or damaged then it is very difficult to navigate all the details in regards with the assets. Traditionally it takes a huge amount of time for verification of owner, land papers manually which in turn slows down the legitimate transactions. Another alarming concern is that of fraudulent activities including hampering, bribery, forgery or alteration carried out by middle agents in the process which results in lack of security.

We began to propound our idea of a blockchain based land registration system as an alternative to the traditional one by taking various factors into account. Proposed system will speed up the verification process of owner, land deeds and also accelerate a speedy recovery of data in case of disaster, cache all the changes done in a blockchain and ensure that no existing transactions are meddled with. Thus transactions will be more secure. Data of the owner and land is encrypted so that alteration of data will be avoided.



We advocate a decentralised system or peer to peer system which does not involve a middleman for making deeds and all the transactions are directly dealt between buyer and seller using digitally created and verified agreements. So this updated system can avoid fraudulent activities as blockchain uses hashing techniques and any alteration is recorded. All changes are stored in the next block so that no user is unaware of the current state of any asset and all transactions are stored in a blockchain with appropriate timestamps associated with them for strong auditability.

## **1.2 Scope**

The Land registration system incorporating blockchain using blockchain provides features like registration of owner and land by uploading mandatory verified documents. After verification of the owner/land using smart contract using smart contract and consensus protocols implemented in the model, land can be put up for the sale and then assets will be visible to all the potential buyers. Simultaneously the sale revenue of the land including stamp duty, cost of the land as per the official criteria and registration fees is calculated automatically and the final selling cost of land is generated. After agreement between both the parties, purchase of land gets completed and transactions are recorded and added to the blockchain. Thus, this system stores the history of transactions and backup data in blocks which is immutable.

## **CHAPTER-2**

### **LITERATURE SURVEY**

Firstly we understand the seven major prerequisites before blockchain were introduced into property based applications like land registry systems and they are identity solution, digitized records, multi-signature wallets, a private blockchain, accurate data, broad internet connectivity and training of professional community that interacts with registration of property. An agile framework for blockchain is adopted here by proposing levels of blockchain recording, smart workflow, blockchain registry and peer to peer transaction to avoid middleman and interoperability. Case studies like bitfury, comaway, consenSys have set proper examples of platforms for implementation of blockchain in property and registry.

Further, we come to realize that implementation of blockchain and thus modifying the traditional system makes the system easier and efficient and thus the process of digitization of land records using blockchain technology to overcome the drawbacks of existing land registration systems was introduced.

The existing problems such as delayed ownership verification, Slowdown of legitimate transactions and the worst-case scenario of frauds which may happen during purchase process. With an attempt to overcome these, according to case studies and research conducted in the cities of Honduras and Georgia, use of proof of existence, proof of audit and proof of process for establishing permanent timestamped digital records is introduced to avoid visual manual verification and thus the first step towards replacement of their existing land registration system with a transparent, faster, secure, convenient, efficient system was taken.

Further in depth description on blockchain technology and its applications with a motive to discuss its taxation, architecture and key characteristics is understood and simultaneously an emphasis is projected on learning different types of consensus algorithm that can be used and various challenges faced. The characteristics of blockchain include decentralisation, persistency, anonymity and audibility that help overcome the drawbacks of traditional system with a major focus on eliminating the necessity of a third party for validation of transactions. The architecture of this technology refers to forming a chain with blocks so as to adhere to the idea of immutability. Consensus model is to be employed in this process to determine which block is added to the chain along with consensus strategies like proof of work, proof of concept and so on and the way in

which blocks are validated whereas taxonomy deals with questions like who can access the blockchain network and how the permissions are consigned, This technology's major applications are well rooted in the field of finance and taxation, asset management whereas the challenges faced pertain to business domain and technology. Now the major focus is laid on correctness of knowledge stored and resolving which type of implementation - permissionless or permissioned can be used.

Next, Hyperledger Fabric blockchain technology is introduced. It lays down various features of a hyperledger fabric environment. This fabric provides a permissioned network that runs a blockchain among a group of known, identified participants and the way this helps overcome the drawbacks of permissionless networks is discussed elaborately. Fabric aims to be flexible, scalable and confidential and at an equivalent time its design is all about modularity and extensible general purpose permissioned blockchain. It supports standard programming languages that are executed consistently across many nodes, making Fabric a distributed OS for permissioned blockchains. The architecture with its various components just like the peers, organizations, endorsement policies, ordering services and other components are described intimately.

Alongside, the ecosystem that consists of the application layer, the smart contracts or the business logic, the consensus algorithm and the blockchain ledger, has also been discussed. Furthermore, reader's and researcher's insight to further explore possibilities of this technology to work in the domains of IoT security, healthcare, business and many others, such as, vehicle tracking - real estate - Banking is discussed while highlighting explains how blockchain adds value to a business and how there has been an investment growth with the use of this technology in the business world.

Blockchain is a mechanism to bring everyone to the highest degree of accountability. Many giant IT firms believe that a blockchain technological system can help businesses to increase the operational efficiency and speed up the process, reducing cost and time related to reconciliations and disputes, as well as possibly enable new business models by increasing revenues and savings. Blockchain has diverse applications and has the potential to be leveraged in different aspects of management and technology. The use of cryptocurrencies will help our life to be more comfortable by 24/7 services, secured, get rid of material oriented notes and coins, and directly and indirectly help to sustain financial ecosystems.

## **CHAPTER-3**

### **PROBLEM DEFINITION**

#### **3.1 Existing system**

Now-a-days all applications which require huge security are migrating their application to Blockchain as Blockchain inbuilt security for data. All existing techniques were not having any facility to check whether data store at decentralized (same data will be saved at multiple nodes and if one node hack or down then data will be gather from other working node) server is intact or change.

#### **3.2 Proposed System**

To check data is intact we can use Blockchain technology to maintain land registration details as this technology maintain tree to store each transaction (any data storage will be consider as transaction) and while storing new data then Blockchain verify all transaction hash code and if data is not alter or hack then same hash code will be generated and verification will be successful and new block will be added and if data is changed then different hash code will be generate and verification will be failed which indicate node is hack.

If we manage land registration details in Blockchain then users can verify data from any other working node upon failure of other node. Blockchain also support tamper or alter proof storage as the data store in Blockchain will get verify upon adding new transaction and if any data block alter then verification will be failed and user can understand his data is alter.

- 1) Blockchain maintain each transaction/storage in blocks
- 2) All blocks may store inside MERKLE TREE
- 3) Before adding new block Blockchain will verify all blocks hash code and each block may have link to previous block and current block
- 4) If any block data alter then its hash code will change and verification will be failed.

### **3.3 System Requirements**

#### **3.3.1 Hardware Requirements**

- System : Pentium IV 2.4 GHz.
- Hard Disk : 40 GB.
- Floppy Drive : 1.44 Mb.
- Monitor : 15 VGA Colour.
- Mouse : Logitech.
- Ram : 512 Mb.

#### **3.3.2 Software Requirements**

- Operating System : Windows
- Coding Language : Python 3.7

### **3.4 Components of the system**

The currently existing land registration system is proposed to be replaced by the blockchain technology of hyperledger fabric. Hyperledger Fabric is a modular and extensible open-source system for deploying and operating permissioned blockchains . It is a business specific distributed ledger technology platform that contains the following elements as seen in figure 1.

The components involve peers, certificate authorities(CA),chaincode, orderer, membership services(MSPs), channels and Hyperledger Fabric Client(HFC). There are 2 types of peers, the endorsing peers who can make changes and have the smart contract and the committer who commits all transactions that others are performing. CA verify and authorize each peer. This can be a pluggable entity. Smart Contract / Chaincode contains the business logic and it runs on the blockchain. Every node on the network executes it. This contains all the land registration related validations and changes in the assets. The Orderer orders the transaction in a correct order and writes a transaction on the ledger only when the majority of the peers order the transaction in

that order. MSPs provide identities to users performing transactions. Channels are networks on which if peers are present, they can access the ledger using the chain code. SDK/HFC is used to communicate with the blockchain and perform transactions.

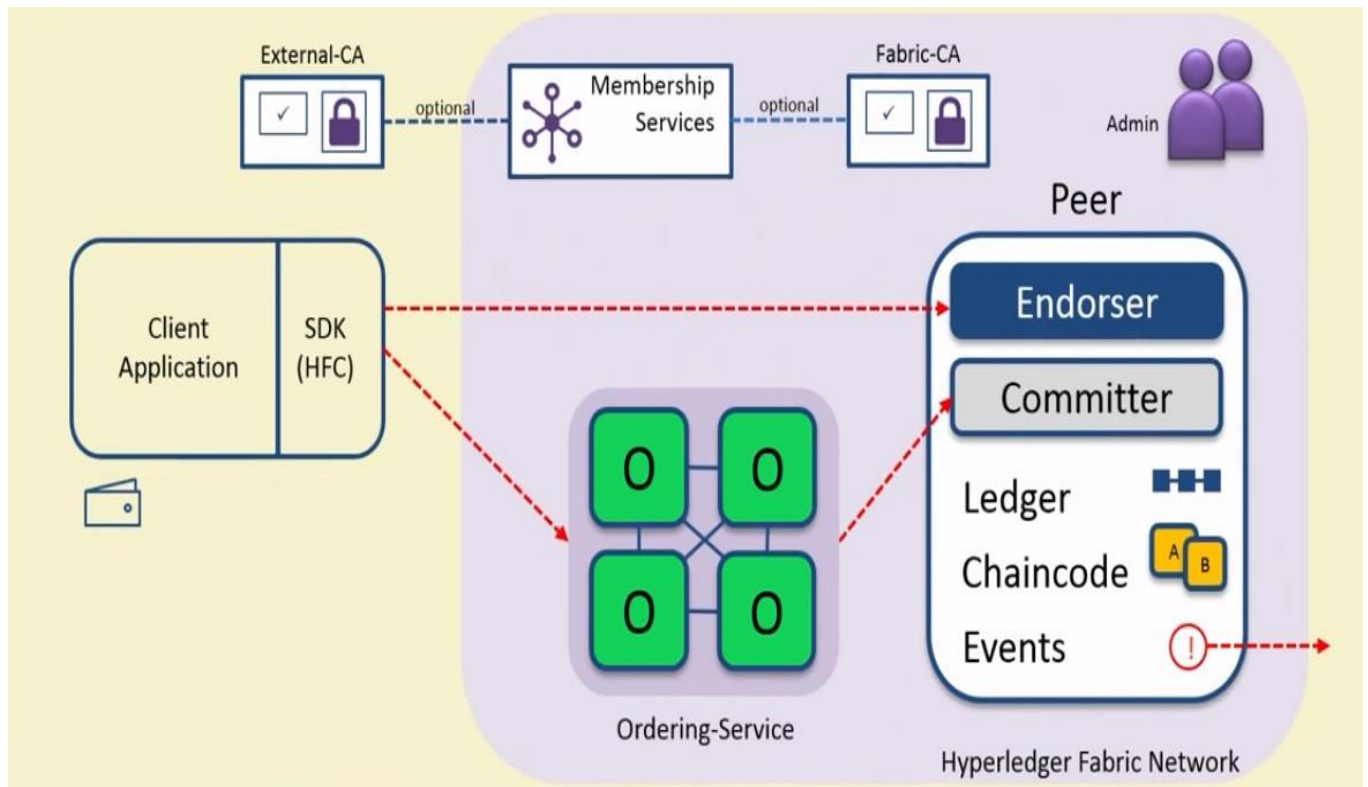


Fig.1. Hyperledger Fabric Architecture

### 3.5 Functionality of the System

The transaction flow in a Hyperledger Fabric [9] [12] is as follows:

- 1) Propose Transactions: The Client Application proposes a transaction to multiple endorsing peers. The number of peers is determined by the endorsing policy. The client application needs to satisfy this Endorsement policy to communicate with enough peers to collect endorsements.
- 2) Execute Proposed Transactions: Each of the endorsers has to execute the transactions proposed. Each execution will capture read and write sets. Once captured these sets are collected for the transaction and each endorser will sign it.
- 3) Proposal Response to Client: Endorsers communicate back to validate the output with their signature. The client or SDK will now receive the read and write sets asynchronously.
- 4) Ordering Transactions: Once the client gets sufficient endorsements according to the endorsement policy, it will submit the transaction to the ordering service. Multiple client applications or users across the network simultaneously send their transactions to the ordering service. Ordering service determines how to order the transactions and also ensures that all peers on the network can see the same order.
- 5) Deliver Transaction: Ordering service delivers ordered sets of transactions (block) to all the peers in the network, it asks them to add this block to their blockchain.
- 6) Validate Transaction: All peers receive a block of transaction, but not all transactions in the block are valid because some of them do not get sufficient endorsements. When all peers on the network come across such invalid transactions, they reject or mask that transaction.
- 7) Notify Transaction: All peers, on a per peer basis, commit a set of valid transactions (block). This block is then added to the blockchain and each block emits events to notify that the block has been added. Events may be block events, transaction level events or smart contract events.

## **CHAPTER-4**

### **SYSTEM STUDY**

#### **4.1 Feasibility Study**

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ◆ **ECONOMICAL FEASIBILITY**
- ◆ **TECHNICAL FEASIBILITY**
- ◆ **SOCIAL FEASIBILITY**

##### **4.1.1 Economical Feasibility**

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

##### **4.1.2 Technical Feasibility**

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.



#### **4.1.3 Social Feasibility**

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

## **CHAPTER-5**

### **SYSTEM DESIGN**

#### **5.1 System Architecture**

Blockchain is a peer-to-peer network; the word 'blockchain' is made up of two separate terms, 'block' and 'chain'. A block being referred to a collection of data, alias data records, and chain being referred to a public database of these blocks, stored as a list.

These lists are linked using cryptography, making it the most essential and fundamental requirement for creating a blockchain. Blockchain is a growing list of records, and the blocks get appended to the list with time.

Cryptography in blockchain can be a tricky concept, but we have tried to simplify it for your better understanding. Blockchains make use of two types of cryptographic algorithms, asymmetric-key algorithms, and hash functions.

Hash functions are used to provide the functionality of a single view of blockchain to every participant. Blockchains generally use the SHA-256 hashing algorithm as their hash function.

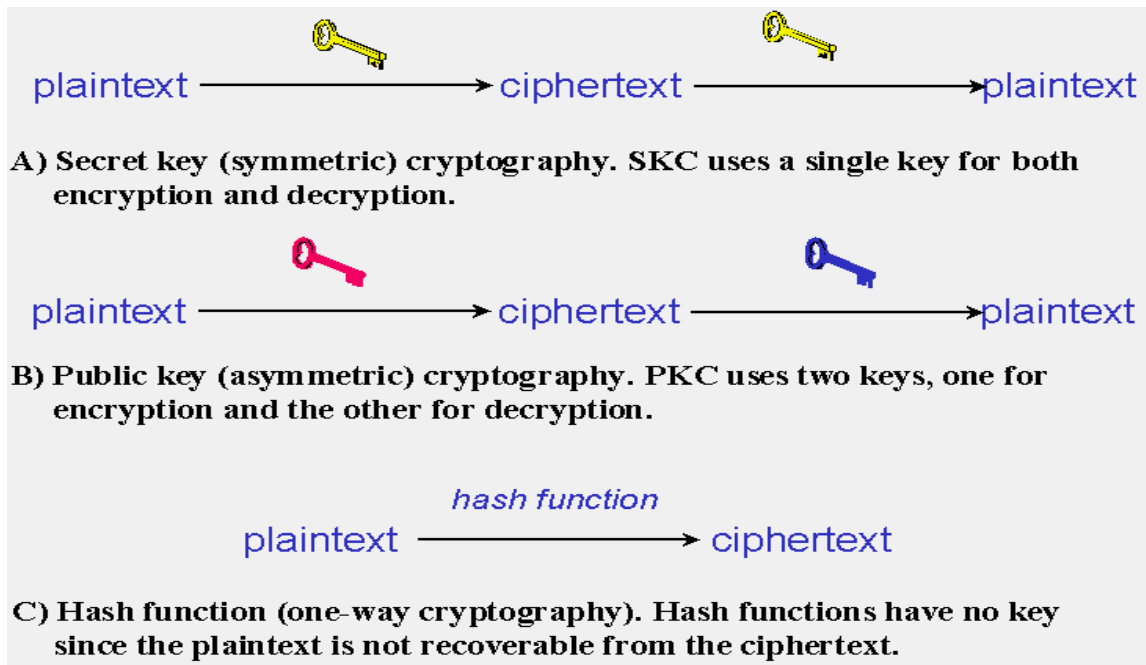


Fig: Types of functions in cryptography

## 5.2 Algorithm Implementation

Land registration needs special attention to all its constraints. If a seller wants to sell a piece of land to the buyer A at a certain price  $x$  while to the buyer B at price  $y$ . The buyer A should be unaware of the price quoted to buyer B and vice versa. In this way the seller can deal with his buyers in a more personalized manner. Such transactions are possible only when using a permissioned blockchain network. This would not only help in increasing confidentiality of data among multiple customers, but also maintain the privacy of the business between the buyer and the seller. Other participants involved in the business are also not aware of the internal details of the deal. They only focus on whether the transaction can be validated according to the constraints specified in the smart contract.

A hyperledger is thus used to recreate the land registration system as it is a permissioned blockchain platform that can be specialized for each business, in our case, the land registration system. It can be considered as a ledger, that contains all entries of the lands and users. This ledger is only changed when an application invokes a smart contract which is called a chaincode in hyperledger.

### 5.3 Algorithm Analysis

Blockchain technology has many approaches to a different problem statements. All these approaches have to be compared and based on the analysis the best approach for the current problem has to be selected. Some of the blockchain approaches include ethereum, cosmos, EOS and hyperledger. These blockchain technologies were filtered out based on its usability for our application. Thus the shortlisted blockchain approaches were Ethereum and Hyperledger. These seemed to be more suitable for our use case. Based on the comparison chart above a deduction was made that Hyperledger was best suited to replace a Land Registration System. A detailed comparison between ethereum and hyperledger that helped choose the blockchain technology is given in table I

Ethereum	Hyperledger
Any node can be added to the peer to peer network. Nodes may not know each other.	Only nodes that belong to the business are allowed to enter the peer to peer network.
The blockchain network is permissionless so all nodes in the network can access the blockchain and execute transactions on it.	The blockchain network is permissioned so only nodes that are participants of the business can access the blockchain and execute transactions on it.
For a peer to execute a transaction the requirement is to have proper storage, processing power and computing speed to solve a complex.	For a peer to execute a transaction the requirement is to be a participant of the business.
It is based on the algorithm of consensus used, a node can access the information based on the computer's capability.	It is based on the algorithm of consensus plugged, the nodes can access the information based on the order of transactions submitted.
Privacy and confidentiality of the business deal are compromised	Privacy and confidentiality of the business deal are maintained.
Ethereum is a generalized and standard method that is applied the same for all the businesses.	Hyperledger is a more specific and business oriented that applies different logic to different businesses.

Fig: Comparison between Ethereum and Hyperledger

## CHAPTER-6

### IMPLEMENTATION

#### 6.1 Basic implementation

The basic implementation of a hyperledger fabric [10] takes place as shown in the Fig 4. The elaborate step wise working is explained below

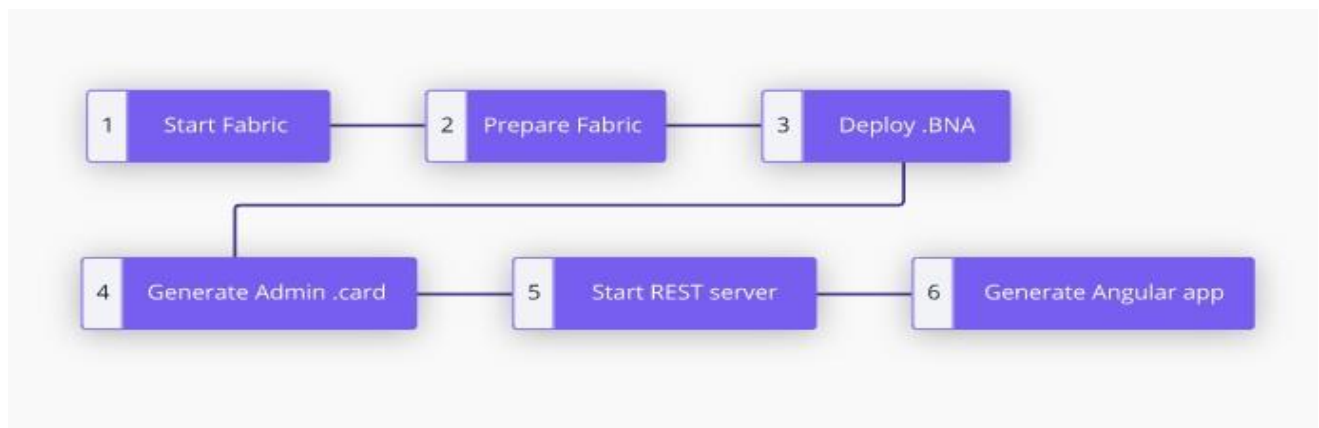


Fig: Basic Implementation

A network is created and all the required entities like the certificate authority the orderer, the database (couchdb) and the peer of the organization are created that are required initially to set up the hyperledger environment. Then the firstnetwork admin card called the PeerAdmin card is generated. A peer admin business network card must be created in order to deploy a Hyperledger Composer business network to a Hyperledger Fabric instance.

The yeoman generator is used to create a skeleton of a business network structure. The main feature of a hyperledger composer is to have a business network definition(BND) that defines the data model, the transaction logic(chaincode) and the access control rules that manages the business altogether. This will create a directory containing all of the components of a business network. The bna file is an archive of the above 3 files created by

the yeoman generator. The business is now in a deployable state on the hyperledger fabric by installing the business network onto the peers.

The network is deployed and started where the specifications like network name, version, admin and the network card on which the admin is deployed is specified. Then the network administrator identity as a usable business network card has to be imported. Checking of the business network card created above is done by pinging it. It returns the participant and gives it a system identity. The hyperledger composer rest server is started using the network card to give it a test interface. Using this Rest Server contains all the elements of our business network and the hyperledger fabric contacts the angular front end using this interface

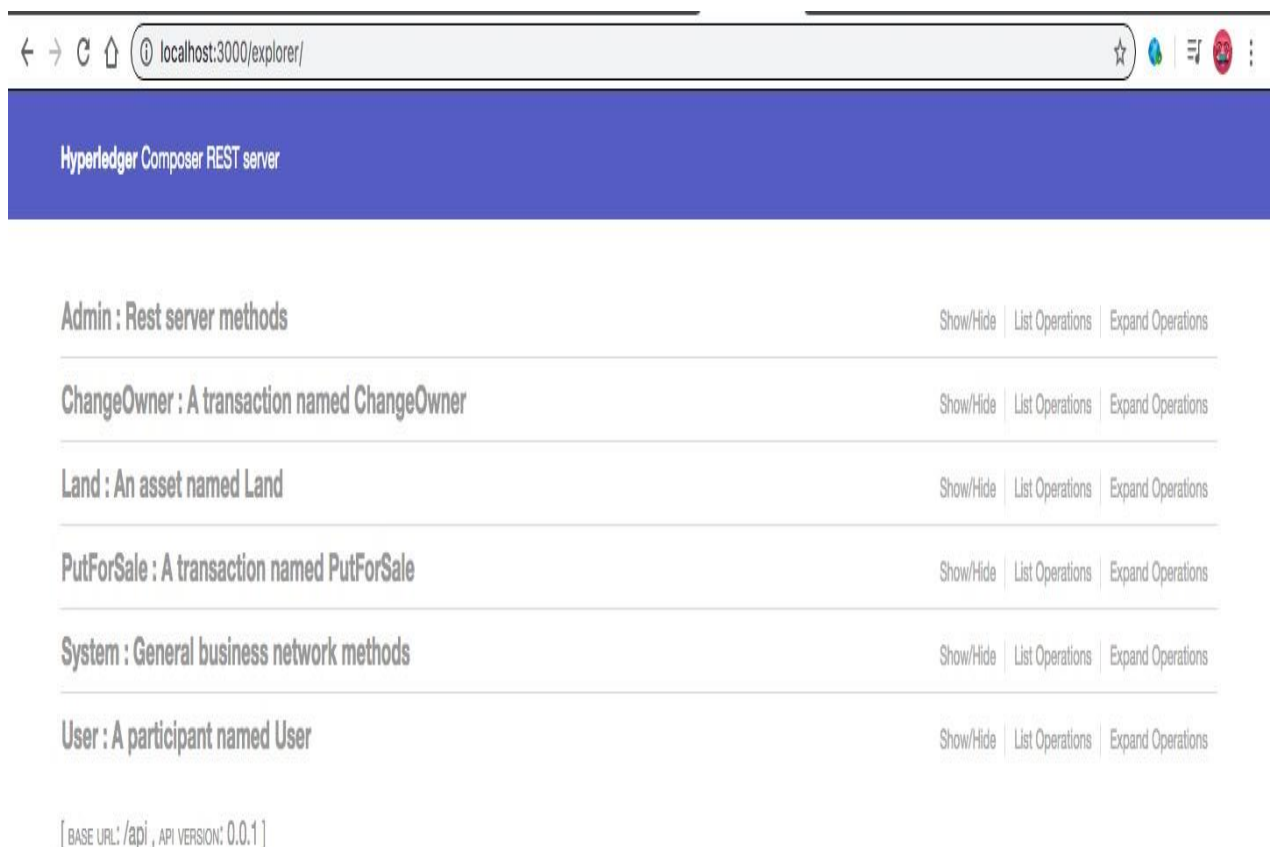


Fig: Hyperledger composer rest server

The yeoman generator is used again for the purpose of building the front-end for the existing business network using Angular. This will create a basic angular interface that is ready to communicate with the rest server.

## 6.2 Modules

To implement this project we have designed following modules

- 1) **Admin:** Admin user can login to application by using username as admin and password as admin and after login admin can add new land registration details and then can search land details. Admin will issue registration number to each user land.

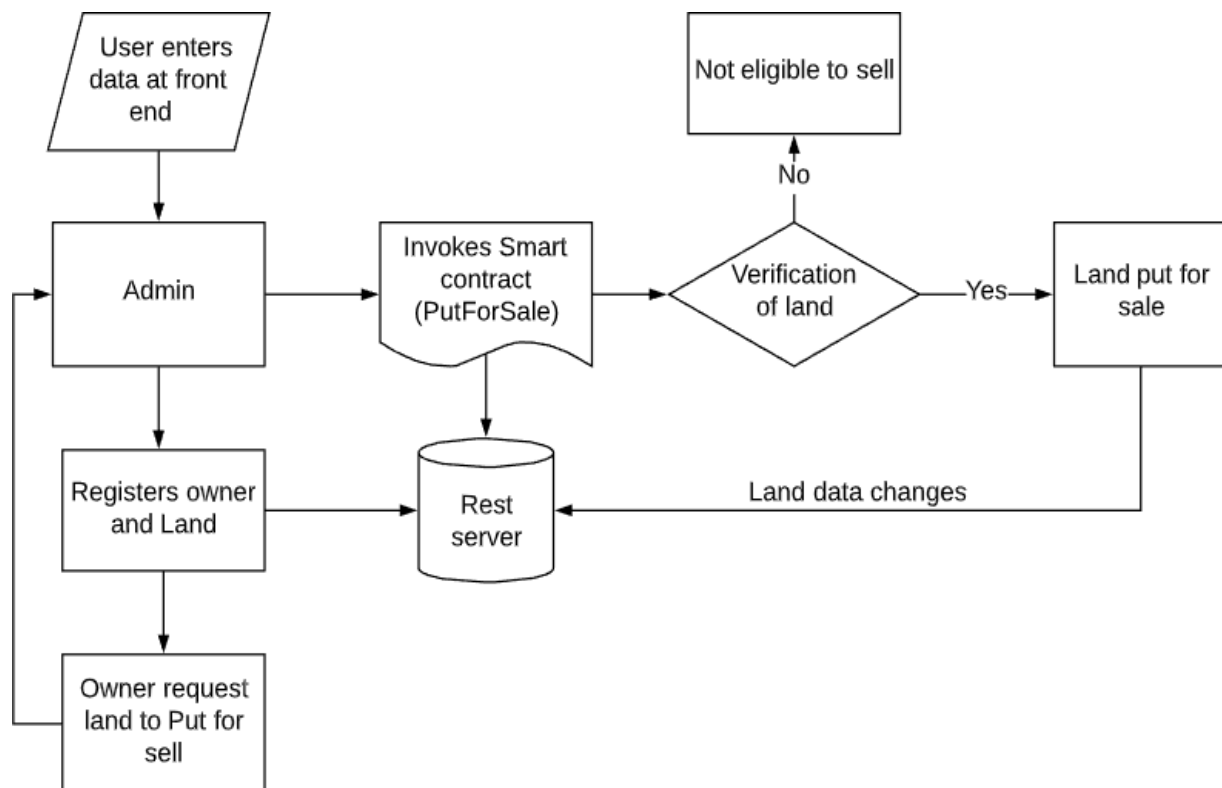


Fig: Admin module

- **Register Users :** The admin adds users to the platform by filling in a form with their details that include their name, email, phone number, their unique identification (like aadhar and pan card) details, their occupation, their account balance, their electricity bill to verify the address entry and the criminal history details of the

user(if any).

- **Register Land:** The admin then adds the land asset record by filling a form that contains the land identity number, the location of the land, the type of land, the price of land in units, the size of the land in acres, the 7/12 contract details to verify the land, the corresponding contract number and finally the identity number of previous owner and the current owner of the land.
- **Put a land for Sale:** When requested by the User(owner) to put his land for sale, the admin invokes the PutForSale transaction that in turn invokes the smart contract that contains the business logic for putting his land for sale. A land asset can only be put to sale if the following conditions are satisfied :
  - **Government Verification:** The land asset will be verified by the government if the price of the land is in the given lower and upper ranges of the acceptable price of the land as mentioned by the Maharashtra government. The values of the price range vary from time to time and city to city.
  - **Registrar Verification:** The land asset will be verified by the registrar and the sub registrar only if the registrar accepts the land documents and the seller identity as he claims. The seller's criminal record is also taken into account to verify the land.
  - **Collector Verification:** The land asset will be verified by the collector only in extreme cases when lands that are Forest, Government or Religious based, to avoid any discrepancies.
- **Put the Land for Sale :** The land asset is put for sale only if all the verification is done.



2) **User module:** User can search registered plot details by entering plot registering number.

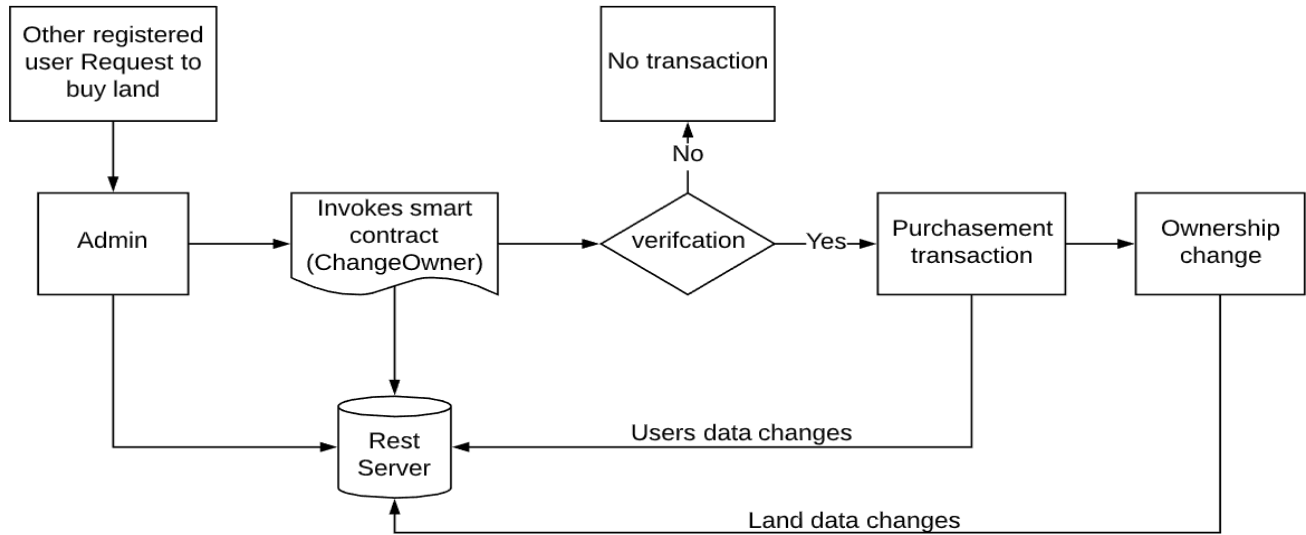


Fig: User Module

- **Change Owner of Land:** When a User (buyer) requests to buy a land asset, there needs to be a change of owner of the land. Prior to this change, some conditions are to be cross checked. The buyer is not supposed to have any criminal record. The buyer should have an account balance that must be greater than the amount that the land registration is going to cost him. The land must have been put to sale by the seller. After these conditions are satisfied the following steps take place:
- **Changing Owner:** The current owner is assigned to the previous owner attribute, while the buyer is assigned to the new owner attribute of the land asset.
- **Money Transfer :** The seller gets the amount he quoted on the land into his account, while the buyer has to pay the quoted price along with some additional charges like the stamp duty and registration fee (to the registrar). The value of the fees vary from time to time and city to city.
- **Initializing state of land :** The land asset now belongs to the new owner. It is up to him to put the land for sale or not. So this attribute of the land is reset for the new seller until he decides to sell the land later.

### **6.3 Uml Diagrams**

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

#### **Goals**

The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.
6. Support higher level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

### 6.3.1 Use Case Diagram

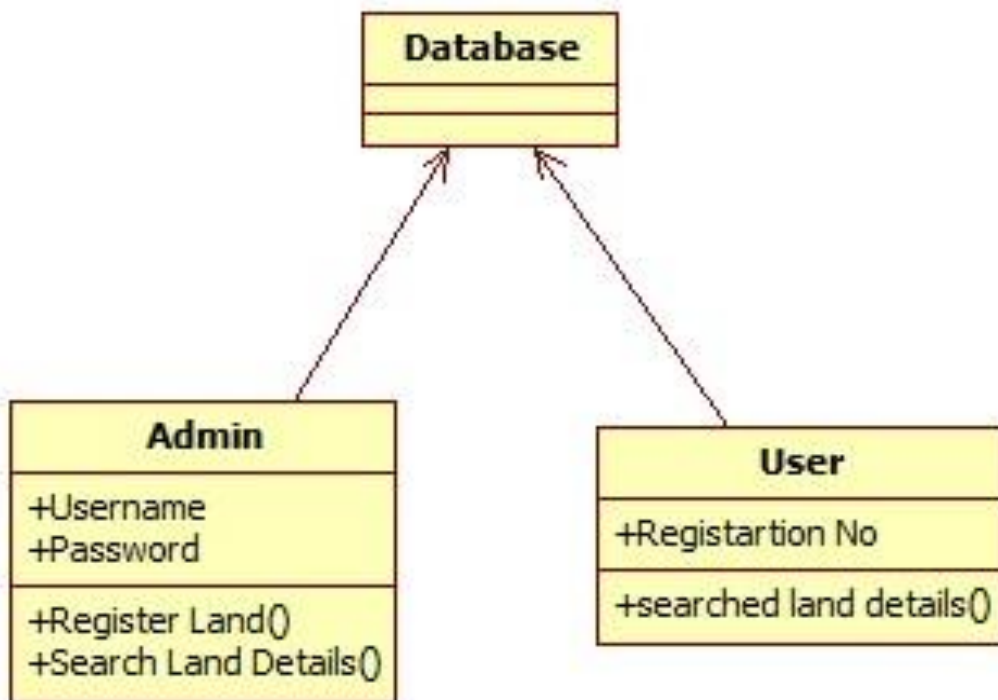
A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.



**Fig: Use case diagram**

### 6.3.2 Class Diagram

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.



**Fig: Class diagram**

### 6.3.3 Sequence Diagram

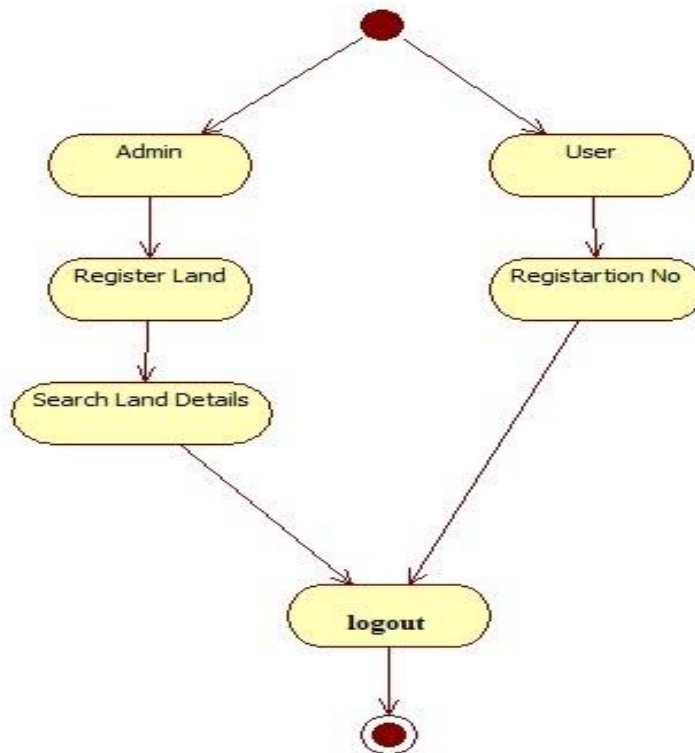
A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



**Fig: sequence diagram**

### 6.3.4 Activity Diagram

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.



## **CHAPTER-7**

### **SOFTWARE ENVIRONMENT**

#### **7.1 What is Python**

Below are some facts about Python.

Python is currently the most widely used multi-purpose, high-level programming language.

Python allows programming in Object-Oriented and Procedural paradigms. Python programs generally are smaller than other programming languages like Java.

Programmers have to type relatively less and indentation requirement of the language, makes them readable all the time.

Python language is being used by almost all tech-giant companies like – Google, Amazon, Facebook, Instagram, Dropbox, Uber... etc.

The biggest strength of Python is huge collection of standard library which can be used for the following –

- MachineLearning
- GUI Applications (like Kivy, Tkinter , PyQt etc. )
- Web frameworks like Django (used by YouTube, Instagram, Dropbox)
- Image processing (like Opencv, Pillow)
- Web scraping (like Scrapy, BeautifulSoup, Selenium)
- Test frameworks
- Multimedia

## 7.2 Advantages of Python

**Let's see how Python dominates over other languages.**

### 1. Extensive Libraries

Python downloads with an extensive library and it contains code for various purposes like regular expressions, documentation-generation, unit-testing, web browsers, threading, databases, CGI, email, image manipulation, and more. So, we don't have to write the complete code for that manually.

### 2. Extensible

As we have seen earlier, Python can be extended to other languages. You can write some of your code in languages like C++ or C. This comes in handy, especially in projects.

### 3. Embeddable

Complimentary to extensibility, Python is embeddable as well. You can put your Python code in your source code of a different language, like C++. This lets us add scripting capabilities to our code in the other language.

### 4. Improved Productivity

The language's simplicity and extensive libraries render programmers more productive than languages like Java and C++ do. Also, the fact that you need to write less and get more things done.

### 5. IOT Opportunities

Since Python forms the basis of new platforms like Raspberry Pi, it finds the future bright for the Internet of Things. This is a way to connect the language with the real world.



## 6. Simple and Easy

When working with Java, you may have to create a class to print 'Hello World'. But in Python, just a print statement will do. It is also quite easy to learn, understand, and code. This is why when people pick up Python, they have a hard time adjusting to other more verbose languages like Java.

## 7. Readable

Because it is not such a verbose language, reading Python is much like reading English. This is the reason why it is so easy to learn, understand, and code. It also does not need curly braces to define blocks, and indentation is mandatory. This further aids the readability of the code.

## 8. Object-Oriented

This language supports both the procedural and object-oriented programming paradigms. While functions help us with code reusability, classes and objects let us model the real world. A class allows the encapsulation of data and functions into one.

## 9. Free and Open-Source

Like we said earlier, Python is freely available. But not only can you download Python for free, but you can also download its source code, make changes to it, and even distribute it. It comes with an extensive collection of libraries to help you with your tasks.

## 10. Portable

When you code your project in a language like C++, you may need to make some changes to it if you want to run it on another platform. But it isn't the same with Python. Here, you need to code only once, and you can run it anywhere. This is called Write Once Run Anywhere (WORA). However, you need to be careful enough not to include any system-dependent features.

## 11. Interpreted

Lastly, we will say that it is an interpreted language. Since statements are executed one by one, debugging is easier than in compiled languages.

## Advantages of Python Over Other Languages

### 1. Less Coding

Almost all of the tasks done in Python requires less coding when the same task is done in other languages. Python also has an awesome standard library support, so you don't have to search for any third-party libraries to get your job done. This is the reason that many people suggest learning Python to beginners.

### 2. Affordable

Python is free therefore individuals, small companies or big organizations can leverage the free available resources to build applications. Python is popular and widely used so it gives you better community support.

The 2019 Github annual survey showed us that Python has overtaken Java in the most popular programming language category.

### 3. Python is for everyone

Python code can run on any machine whether it is Linux, Mac or Windows. Programmers need to learn different languages for different jobs but with Python, you can professionally build web apps, perform data analysis and machine learning, automate things, do web scraping and also build games and powerful visualizations. It is an all-rounder programming language.

## 7.3 Disadvantages of Python

So far, we've seen why Python is a great choice for your project. But if you choose it, you should be aware of its consequences as well. Let's now see the downsides of choosing Python over another language.

## 1. Speed Limitations

We have seen that Python code is executed line by line. But since Python is interpreted, it often results in slow execution. This, however, isn't a problem unless speed is a focal point for the project. In other words, unless high speed is a requirement, the benefits offered by Python are enough to distract us from its speed limitations.

## 2. Weak in Mobile Computing and Browsers

While it serves as an excellent server-side language, Python is much rarely seen on the client-side. Besides that, it is rarely ever used to implement smartphone-based applications. One such application is called Carbonnelle.

The reason it is not so famous despite the existence of Brython is that it isn't that secure.

## 3. Design Restrictions

As you know, Python is dynamically-typed. This means that you don't need to declare the type of variable while writing the code. It uses duck-typing. But wait, what's that? Well, it just means that if it looks like a duck, it must be a duck. While this is easy on the programmers during coding, it can raise run-time errors.

## 4. Underdeveloped Database Access Layers

Compared to more widely used technologies like JDBC (Java DataBase Connectivity) and ODBC (Open DataBase Connectivity), Python's database access layers are a bit underdeveloped. Consequently, it is less often applied in huge enterprises.

## 5. Simple

No, we're not kidding. Python's simplicity can indeed be a problem. Take my example. I don't do Java, I'm more of a Python person. To me, its syntax is so simple that the verbosity of Java code seems unnecessary.

## 7.4 History of Python

What do the alphabet and the programming language Python have in common? Right, both start with ABC. If we are talking about ABC in the Python context, it's clear that the programming language ABC is meant. ABC is a general-purpose programming language and programming environment, which had been developed in the Netherlands, Amsterdam, at the CWI (Centrum Wiskunde & Informatica). The greatest achievement of ABC was to influence the design of Python. Python was conceptualized in the late 1980s. Guido van Rossum worked that time in a project at the CWI, called Amoeba, a distributed operating system. In an interview with Bill Venners<sup>1</sup>, Guido van Rossum said: "In the early 1980s, I worked as an implementer on a team building a language called ABC at Centrum voor Wiskunde en Informatica (CWI). I don't know how well people know ABC's influence on Python. I try to mention ABC's influence because I'm indebted to everything I learned during that project and to the people who worked on it." Later on in the same Interview, Guido van Rossum continued: "I remembered all my experience and some of my frustration with ABC. I decided to try to design a simple scripting language that possessed some of ABC's better properties, but without its problems. So I started typing. I created a simple virtual machine, a simple parser, and a simple runtime. I made my own version of the various ABC parts that I liked. I created a basic syntax, used indentation for statement grouping instead of curly braces or begin-end blocks, and developed a small number of powerful data types: a hash table (or dictionary, as we call it), a list, strings, and numbers."

## 7.5 What is Machine Learning

Before we take a look at the details of various machine learning methods, let's start by looking at what machine learning is, and what it isn't. Machine learning is often categorized as a subfield of artificial intelligence, but I find that categorization can often be misleading at first brush. The study of machine learning certainly arose from research in this context, but in the data science application of machine learning methods, it's more helpful to think of machine learning as a means of *building models of data*.

Fundamentally, machine learning involves building mathematical models to help understand data. "Learning" enters the fray when we give these models *tunable parameters* that can be adapted to observed data; in this way the program can be considered to be "learning" from the data. Once these models have been fit to previously seen data, they can be used to predict and understand aspects of newly observed data. I'll leave to the reader the more philosophical digression regarding the extent to which this type of mathematical, model-based "learning" is similar to the "learning" exhibited by the human brain. Understanding the problem setting in machine learning is essential to using these tools effectively, and so we will start with some broad categorizations of the types of approaches we'll discuss here.

### **7.5.1 Categories Of Machine Learning**

At the most fundamental level, machine learning can be categorized into two main types: supervised learning and unsupervised learning.

*Supervised learning* involves somehow modeling the relationship between measured features of data and some label associated with the data; once this model is determined, it can be used to apply labels to new, unknown data. This is further subdivided into *classification* tasks and *regression* tasks: in classification, the labels are discrete categories, while in regression, the labels are continuous quantities. We will see examples of both types of supervised learning in the following section.

*Unsupervised learning* involves modeling the features of a dataset without reference to any label, and is often described as "letting the dataset speak for itself." These models include tasks such as *clustering* and *dimensionality reduction*. Clustering algorithms identify distinct groups of data, while dimensionality reduction algorithms search for more succinct representations of the data. We will see examples of both types of unsupervised learning in the following section.

### **7.5.2 Need for Machine Learning**

Human beings, at this moment, are the most intelligent and advanced species on earth because they can think, evaluate and solve complex problems. On the other side, AI is still

in its initial stage and haven't surpassed human intelligence in many aspects. Then the question is that what is the need to make machine learn? The most suitable reason for doing this is, "to make decisions, based on data, with efficiency and scale".

Lately, organizations are investing heavily in newer technologies like Artificial Intelligence, Machine Learning and Deep Learning to get the key information from data to perform several real-world tasks and solve problems. We can call it data-driven decisions taken by machines, particularly to automate the process. These data-driven decisions can be used, instead of using programming logic, in the problems that cannot be programmed inherently. The fact is that we can't do without human intelligence, but other aspect is that we all need to solve real-world problems with efficiency at a huge scale. That is why the need for machine learning arises.

### **7.5.3 Challenges in Machines Learning**

While Machine Learning is rapidly evolving, making significant strides with cybersecurity and autonomous cars, this segment of AI as whole still has a long way to go. The reason behind is that ML has not been able to overcome number of challenges. The challenges that ML is facing currently are –

**Quality of data** – Having good-quality data for ML algorithms is one of the biggest challenges. Use of low-quality data leads to the problems related to data preprocessing and feature extraction.

**Time-Consuming task** – Another challenge faced by ML models is the consumption of time especially for data acquisition, feature extraction and retrieval.

**Lack of specialist persons** – As ML technology is still in its infancy stage, availability of expert resources is a tough job.

**No clear objective for formulating business problems** – Having no clear objective and well-defined goal for business problems is another key challenge for ML because this technology is not that mature yet.

**Issue of overfitting & underfitting** – If the model is overfitting or underfitting, it cannot be represented well for the problem.

**Curse of dimensionality** – Another challenge ML model faces is too many features of data points. This can be a real hindrance.

**Difficulty in deployment** – Complexity of the ML model makes it quite difficult to be deployed in real life.

#### **7.5.4 Applications of Machines Learning**

Machine Learning is the most rapidly growing technology and according to researchers we are in the golden year of AI and ML. It is used to solve many real-world complex problems which cannot be solved with traditional approach. Following are some real-world applications of ML

- Emotion analysis
- Sentiment analysis
- Error detection and prevention
- Weather forecasting and prediction
- Stock market analysis and forecasting
- Speech synthesis
- Speech recognition
- Customer segmentation
- Object recognition
- Fraud detection
- Fraud prevention

#### **7.5.5 How to Start Learning Machine Learning?**

Arthur Samuel coined the term “Machine Learning” in 1959 and defined it as a “Field of study that gives computers the capability to learn without being explicitly programmed”.

And that was the beginning of Machine Learning! In modern times, Machine Learning is one of the most popular (if not the most!) career choices. According to Indeed, Machine Learning Engineer Is The Best Job of 2019 with a 344% growth and an average base salary of \$146,085 per year.

But there is still a lot of doubt about what exactly is Machine Learning and how to start learning it? So this article deals with the Basics of Machine Learning and also the path you can follow to eventually become a full-fledged Machine Learning Engineer. Now let's get started!!!

### **How to start learning ML?**

This is a rough roadmap you can follow on your way to becoming an insanely talented Machine Learning Engineer. Of course, you can always modify the steps according to your needs to reach your desired end-goal!

### **Step 1 – Understand the Prerequisites**

In case you are a genius, you could start ML directly but normally, there are some prerequisites that you need to know which include Linear Algebra, Multivariate Calculus, Statistics, and Python. And if you don't know these, never fear! You don't need a Ph.D. degree in these topics to get started but you do need a basic understanding.

#### **(a) Learn Linear Algebra and Multivariate Calculus**

Both Linear Algebra and Multivariate Calculus are important in Machine Learning. However, the extent to which you need them depends on your role as a data scientist. If you are more focused on application heavy machine learning, then you will not be that heavily focused on maths as there are many common libraries available. But if you want to focus on R&D in Machine Learning, then mastery of Linear Algebra and Multivariate Calculus is very important as you will have to implement many ML algorithms from scratch.

#### **(b) Learn Statistics**

Data plays a huge role in Machine Learning. In fact, around 80% of your time as an ML expert will be spent collecting and cleaning data. And statistics is a field that handles the collection, analysis, and presentation of data. So it is no surprise that you need to learn it!!! Some of the key concepts in statistics that are important are Statistical Significance, Probability



Distributions, Hypothesis Testing, Regression, etc. Also, Bayesian Thinking is also a very important part of ML which deals with various concepts like Conditional Probability, Priors, and Posteriors, Maximum Likelihood, etc.

### **(c) Learn Python**

Some people prefer to skip Linear Algebra, Multivariate Calculus and Statistics and learn them as they go along with trial and error. But the one thing that you absolutely cannot skip is Python! While there are other languages you can use for Machine Learning like R, Scala, etc. Python is currently the most popular language for ML. In fact, there are many Python libraries that are specifically useful for Artificial Intelligence and Machine Learning such as Keras, TensorFlow, Scikit-learn, etc.

So if you want to learn ML, it's best if you learn Python! You can do that using various online resources and courses such as Fork Python available Free on GeeksforGeeks.

### **Step 2 – Learn Various ML Concepts**

Now that you are done with the prerequisites, you can move on to actually learning ML (Which is the fun part!!!) It's best to start with the basics and then move on to the more complicated stuff. Some of the basic concepts in ML are:

#### **(a) Terminologies of Machine Learning**

- **Model** – A model is a specific representation learned from data by applying some machine learning algorithm. A model is also called a hypothesis.
- **Feature** – A feature is an individual measurable property of the data. A set of numeric features can be conveniently described by a feature vector. Feature vectors are fed as input to the model. For example, in order to predict a fruit, there may be features like color, smell, taste, etc.
- **Target (Label)** – A target variable or label is the value to be predicted by our model. For the fruit example discussed in the feature section, the label with each set of input would be the name of the fruit like apple, orange, banana, etc.

- **Training** – The idea is to give a set of inputs (features) and it's expected outputs (labels), so after training, we will have a model (hypothesis) that will then map new data to one of the categories trained on.
- **Prediction** – Once our model is ready, it can be fed a set of inputs to which it will provide a predicted output (label).

### **(b) Types of Machine Learning**

- **Supervised Learning** – This involves learning from a training dataset with labeled data using classification and regression models. This learning process continues until the required level of performance is achieved.
- **Unsupervised Learning** – This involves using unlabelled data and then finding the underlying structure in the data in order to learn more and more about the data itself using factor and cluster analysis models.
- **Semi-supervised Learning** – This involves using unlabelled data like Unsupervised Learning with a small amount of labeled data. Using labeled data vastly increases the learning accuracy and is also more cost-effective than Supervised Learning.
- **Reinforcement Learning** – This involves learning optimal actions through trial and error. So the next action is decided by learning behaviors that are based on the current state and that will maximize the reward in the future.

### **Advantages of Machine learning**

#### **1. Easily identifies trends and patterns**

Machine Learning can review large volumes of data and discover specific trends and patterns that would not be apparent to humans. For instance, for an e-commerce website like Amazon, it serves to understand the browsing behaviors and purchase histories of its users to help cater to the right products, deals, and reminders relevant to them. It uses the results to reveal relevant advertisements to them.

## **2. No human intervention needed (automation)**

With ML, you don't need to babysit your project every step of the way. Since it means giving machines the ability to learn, it lets them make predictions and also improve the algorithms on their own. A common example of this is anti-virus softwares; they learn to filter new threats as they are recognized. ML is also good at recognizing spam.

## **3. Continuous Improvement**

As ML algorithms gain experience, they keep improving in accuracy and efficiency. This lets them make better decisions. Say you need to make a weather forecast model. As the amount of data you have keeps growing, your algorithms learn to make more accurate predictions faster.

## **4. Handling multi-dimensional and multi-variety data**

Machine Learning algorithms are good at handling data that are multi-dimensional and multi-variety, and they can do this in dynamic or uncertain environments.

## **5. Wide Applications**

You could be an e-tailer or a healthcare provider and make ML work for you. Where it does apply, it holds the capability to help deliver a much more personal experience to customers while also targeting the right customers.

## **Disadvantages of Machine Learning**

### **1. Data Acquisition**

Machine Learning requires massive data sets to train on, and these should be inclusive/unbiased, and of good quality. There can also be times where they must wait for new data to be generated.

### **2. Time and Resources**

ML needs enough time to let the algorithms learn and develop enough to fulfill their purpose with a considerable amount of accuracy and relevancy. It also needs massive resources to function. This can mean additional requirements of computer power for you.

### **3. Interpretation of Results**

Another major challenge is the ability to accurately interpret results generated by the algorithms. You must also carefully choose the algorithms for your purpose.

### **4. High error-susceptibility**

Machine Learning is autonomous but highly susceptible to errors. Suppose you train an algorithm with data sets small enough to not be inclusive. You end up with biased predictions coming from a biased training set. This leads to irrelevant advertisements being displayed to customers. In the case of ML, such blunders can set off a chain of errors that can go undetected for long periods of time. And when they do get noticed, it takes quite some time to recognize the source of the issue, and even longer to correct it.

## **7.6 Python Development Steps**

Guido Van Rossum published the first version of Python code (version 0.9.0) at alt.sources in February 1991. This release included already exception handling, functions, and the core data types of list, dict, str and others. It was also object oriented and had a module system. Python version 1.0 was released in January 1994. The major new features included in this release were the functional programming tools lambda, map, filter and reduce, which Guido Van Rossum never liked. Six and a half years later in October 2000, Python 2.0 was introduced. This release included list comprehensions, a full garbage collector and it was supporting unicode. Python flourished for another 8 years in the versions 2.x before the next major release as Python 3.0 (also known as "Python 3000" and "Py3K") was released. Python 3 is not backwards compatible with Python 2.x. The emphasis in Python 3 had been on the removal of duplicate programming constructs and modules, thus fulfilling or coming close to fulfilling the 13th law of the Zen of Python: "There should be one -- and preferably only one -- obvious way to do it." Some changes in Python 7.3:

- Print is now a function

- Views and iterators instead of lists
- The rules for ordering comparisons have been simplified. E.g. a heterogeneous list cannot be sorted, because all the elements of a list must be comparable to each other.
- There is only one integer type left, i.e. int. long is int as well.
- The division of two integers returns a float instead of an integer. "/" can be used to have the "old" behavior.
- Text Vs. Data Instead Of Unicode Vs. 8-bit

## **Purpose**

We demonstrated that our approach enables successful segmentation of intra-retinal layers—even with low-quality images containing speckle noise, low contrast, and different intensity ranges throughout—with the assistance of the ANIS feature.

## **Python**

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace.

Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

- Python is Interpreted – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- Python is Interactive – you can actually sit at a Python prompt and interact with the interpreter directly to write your programs.

Python also acknowledges that speed of development is important. Readable and terse code is part of this, and so is access to powerful constructs that avoid tedious repetition of code. Maintainability also ties into this may be an all but useless metric, but it does say something about how much code you have to scan, read and/or understand to troubleshoot problems or tweak behaviors. This speed of development, the ease with which a programmer of other languages can pick up basic Python skills and the huge standard library is key to another area where Python excels. All its tools have been quick to implement, saved a lot of time, and several

of them have later been patched and updated by people with no Python background - without breaking.

## **7.7 Modules Used in Project**

### **Tensor flow**

Tensor Flow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at Google.

Tensor Flow was developed by the Google Brain team for internal Google use. It was released under the Apache 2.0 open-source license on November 9, 2015.

### **Numpy**

Numpy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays.

It is the fundamental package for scientific computing with Python. It contains various features including these important ones:

- A powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

Besides its obvious scientific uses, Numpy can also be used as an efficient multi-dimensional container of generic data. Arbitrary data-types can be defined using Numpy which allows Numpy to seamlessly and speedily integrate with a wide variety of databases.

### **Pandas**

Pandas is an open-source Python Library providing high-performance data manipulation and analysis tool using its powerful data structures. Python was majorly used for data munging and

preparation. It had very little contribution towards data analysis. Pandas solved this problem. Using Pandas, we can accomplish five typical steps in the processing and analysis of data, regardless of the origin of data load, prepare, manipulate, model, and analyze. Python with Pandas is used in a wide range of fields including academic and commercial domains including finance, economics, Statistics, analytics, etc.

## **Matplotlib**

Matplotlib is a Python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in Python scripts, the Python and IPython shells, the Jupyter Notebook, web application servers, and four graphical user interface toolkits. Matplotlib tries to make easy things easy and hard things possible. You can generate plots, histograms, power spectra, bar charts, error charts, scatter plots, etc., with just a few lines of code. For examples, see the sample plots and thumbnail gallery.

For simple plotting the pyplot module provides a MATLAB-like interface, particularly when combined with IPython. For the power user, you have full control of line styles, font properties, axes properties, etc , via an object oriented interface or via a set of functions familiar to MATLAB users.

## **Scikit – learn**

Scikit-learn provides a range of supervised and unsupervised learning algorithms via a consistent interface in Python. It is licensed under a permissive simplified BSD license and is distributed under many Linux distributions, encouraging academic and commercial use.

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## **7.8 Install Python Step-by-Step in Windows and Mac**

Python a versatile programming language doesn't come pre-installed on your computer devices. Python was first released in the year 1991 and until today it is a very popular high-level programming language. Its style philosophy emphasizes code readability with its notable use of great whitespace.

The object-oriented approach and language construct provided by Python enables programmers to write both clear and logical code for projects. This software does not come pre-packaged with Windows.

### **How to Install Python on Windows and Mac**

There have been several updates in the Python version over the years. The question is how to install Python? It might be confusing for the beginner who is willing to start learning Python but this tutorial will solve your query. The latest or the newest version of Python is version 3.7.4 or in other words, it is Python 3.

**Note:** The python version 3.7.4 cannot be used on Windows XP or earlier devices.



Before you start with the installation process of Python. First, you need to know about your System Requirements. Based on your system type i.e. operating system and based processor, you must download the python version. My system type is a Windows 64-bit operating system. So the steps below are to install python version 3.7.4 on Windows 7 device or to install Python 3. Download the Python Cheatsheet here .The steps on how to install Python on Windows 10, 8 and 7 are divided into 4 parts to help understand better.

## Download the Correct version into the system

**Step 1:** Go to the official site to download and install python using Google Chrome or any other web browser. OR Click on the following link: <https://www.python.org>



Now, check for the latest and the correct version for your operating system.

**Step 2:** Click on the Download Tab.



**Step 3:** You can either select the Download Python for windows 3.7.4 button in Yellow Color or you can scroll further down and click on download with respective to their version. Here, we are downloading the most recent python version for windows 3.7.4

Looking for a specific release?

Python releases by version number:

Release version	Release date	Click for more	
<a href="#">Python 3.7.4</a>	July 8, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.6.9</a>	July 2, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.7.3</a>	March 25, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.4.10</a>	March 18, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.5.7</a>	March 18, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 2.7.16</a>	March 4, 2019	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.7.2</a>	Dec. 24, 2018	<a href="#">Download</a>	<a href="#">Release Notes</a>

**Step 4:** Scroll down the page until you find the Files option.

**Step 5:** Here you see a different version of python along with the operating system.

Files					
Version	Operating System	Description	MD5 Sum	File Size	PGP
<a href="#">Gzipped source tarball</a>	Source release		68111671a5b2db4ae77b9ab01b709be	23017663	<a href="#">S/G</a>
<a href="#">XZ compressed source tarball</a>	Source release		d33e4aae6697051c2eca45ee3604803	17131432	<a href="#">S/G</a>
<a href="#">macOS 64-bit/32-bit installer</a>	Mac OS X	for Mac OS X 10.6 and later	6428b4fa7583daf1a4c2cba8ee08e6	34898416	<a href="#">S/G</a>
<a href="#">macOS 64-bit installer</a>	Mac OS X	for OS X 10.9 and later	5dd05c38217a45773bf5e4a936b243f	28082845	<a href="#">S/G</a>
<a href="#">Windows help file</a>	Windows		053999573a2c56b2ac56cade6b477cd2	8131761	<a href="#">S/G</a>
<a href="#">Windows x86-64 embeddable zip file</a>	Windows	for AMD64/EM64T/x64	90003cfd89c0b9a8e319a4072ba2	7504391	<a href="#">S/G</a>
<a href="#">Windows x86-64 executable installer</a>	Windows	for AMD64/EM64T/x64	a702b4b0ad76d4bd3543a583e563400	26880368	<a href="#">S/G</a>
<a href="#">Windows x86-64 web-based installer</a>	Windows	for AMD64/EM64T/x64	28cb1c6088bd73a89e53a3bd351b4bd2	1362904	<a href="#">S/G</a>
<a href="#">Windows x86 embeddable zip file</a>	Windows		9fab3b819841879fda94133574129d8	6741628	<a href="#">S/G</a>
<a href="#">Windows x86 executable installer</a>	Windows		33cc802942a54446a3d0451476394789	25663848	<a href="#">S/G</a>
<a href="#">Windows x86 web-based installer</a>	Windows		1b670cfa5d3117d812c30983ea371d87c	1324608	<a href="#">S/G</a>

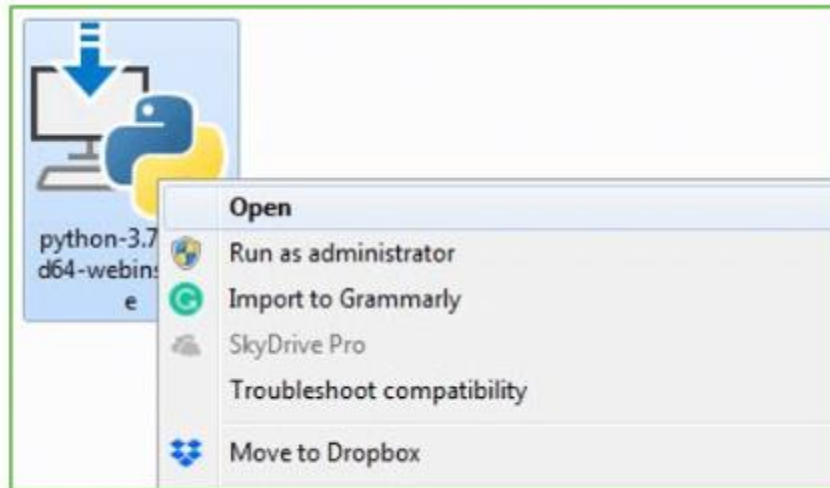
- To download Windows 32-bit python, you can select any one from the three options: Windows x86 embeddable zip file, Windows x86 executable installer or Windows x86 web-based installer.
- To download Windows 64-bit python, you can select any one from the three options: Windows x86-64 embeddable zip file, Windows x86-64 executable installer or Windows x86-64 web-based installer.

Here we will install Windows x86-64 web-based installer. Here your first part regarding which version of python is to be downloaded is completed. Now we move ahead with the second part in installing python i.e. Installation

**Note:** To know the changes or updates that are made in the version you can click on the Release Note Option.

## Installation of Python

**Step 1:** Go to Download and Open the downloaded python version to carry out the installation process.



**Step 2:** Before you click on Install Now, Make sure to put a tick on Add Python 3.7 to PATH.



**Step 3:** Click on Install NOW After the installation is successful. Click on Close.



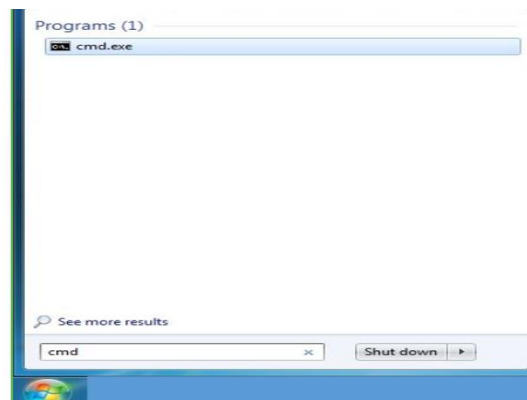
With these above three steps on python installation, you have successfully and correctly installed Python. Now is the time to verify the installation.

**Note:** The installation process might take a couple of minutes.

### **Verify the Python Installation**

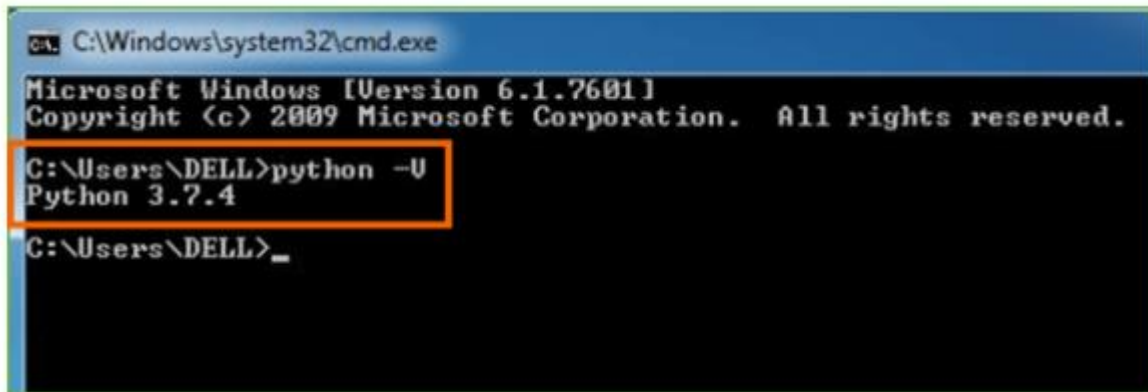
**Step 1:** Click on Start

**Step 2:** In the Windows Run Command, type “cmd”.



**Step 3:** Open the Command prompt option.

**Step 4:** Let us test whether the python is correctly installed. Type **python -V** and press Enter.



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\DELL>python -V
Python 3.7.4

C:\Users\DELL>_
```

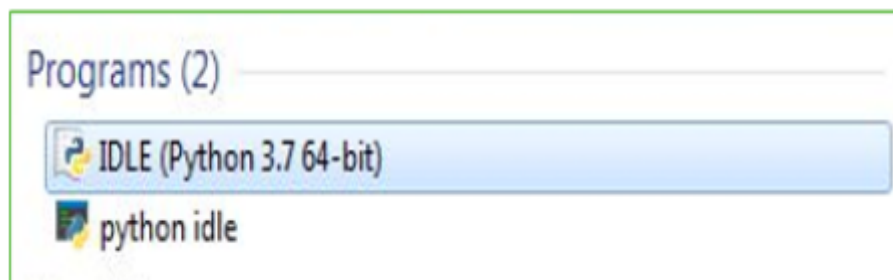
**Step 5:** You will get the answer as 3.7.4

**Note:** If you have any of the earlier versions of Python already installed. You must first uninstall the earlier version and then install the new one.

### Check how the Python IDLE works

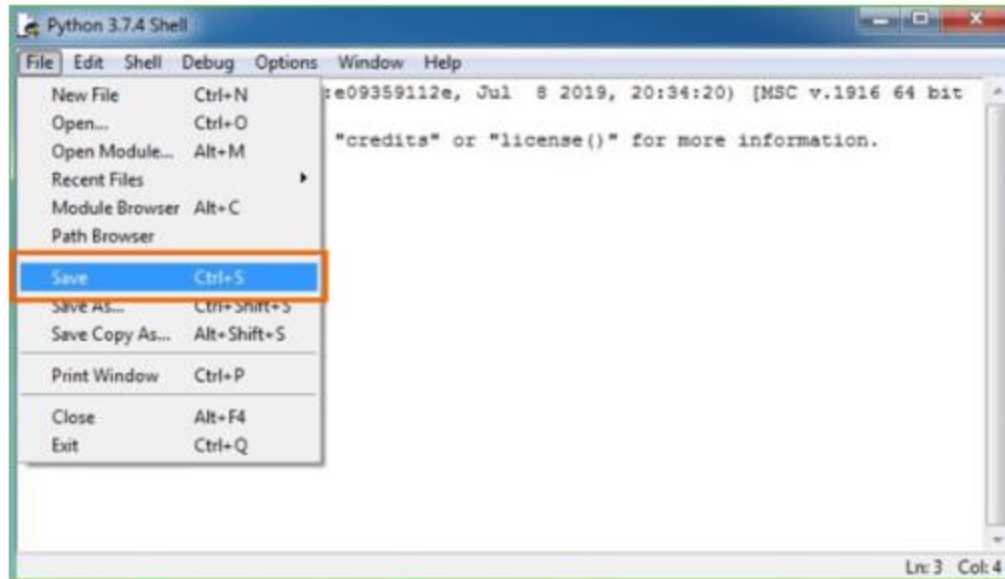
**Step 1:** Click on Start

**Step 2:** In the Windows Run command, type “python idle”.



**Step 3:** Click on IDLE (Python 3.7 64-bit) and launch the program

**Step 4:** To go ahead with working in IDLE you must first save the file. **Click on File > Click on Save**



**Step 5:** Name the file and save as type should be Python files. Click on SAVE. Here I have named the files as Hey World.

**Step 6:** Now for e.g. enter print

## CHAPTER-8

### CODING

#### 8.1 Source code

```
from hashlib import sha256
import json
import time
import pickle
from datetime import datetime
import random
import base64
from Block import *
class Blockchain:
    # difficulty of our PoW algorithm
    difficulty = 2 #using difficulty 2 computation
    def __init__(self):
        self.unconfirmed_transactions = []
        self.chain = []
        self.create_genesis_block()
        self.peer = []
        self.translist = []
    def create_genesis_block(self): #create genesis block
        genesis_block = Block(0, [], time.time(), "0")
        genesis_block.hash = genesis_block.compute_hash()
        self.chain.append(genesis_block)
    @property
    def last_block(self)
```



```

return self.chain[-1]

def add_block(self, block, proof): #adding data to block by computing new and previous hashes
    previous_hash = self.last_block.hash
    if previous_hash != block.previous_hash:
        return False
    if not self.is_valid_proof(block, proof):
        return False
    block.hash = proof
    #print("main "+str(block.hash))
    self.chain.append(block)
    return True

def is_valid_proof(self, block, block_hash): #proof of work
    return (block_hash.startswith('0' * Blockchain.difficulty) and block_hash ==
    block.compute_hash())

def proof_of_work(self, block): #proof of work
    block.nonce = 0
    computed_hash = block.compute_hash()
    while not computed_hash.startswith('0' * Blockchain.difficulty):
        block.nonce += 1
        computed_hash = block.compute_hash()
    return computed_hash

def add_new_transaction(self, transaction):
    self.unconfirmed_transactions.append(transaction)

def addPeer(self, peer_details):
    self.peer.append(peer_details)

def addTransaction(self,trans_details): #add transaction
    self.translist.append(trans_details)

def mine(self):#mine transaction

```

```

if not self.unconfirmed_transactions:
    return False

last_block = self.last_block

new_block = Block(index=last_block.index + 1,
                  transactions=self.unconfirmed_transactions,
                  timestamp=time.time(),
                  previous_hash=last_block.hash)

proof = self.proof_of_work(new_block)

self.add_block(new_block, proof)

self.unconfirmed_transactions = []

return new_block.index

def save_object(self,obj, filename):

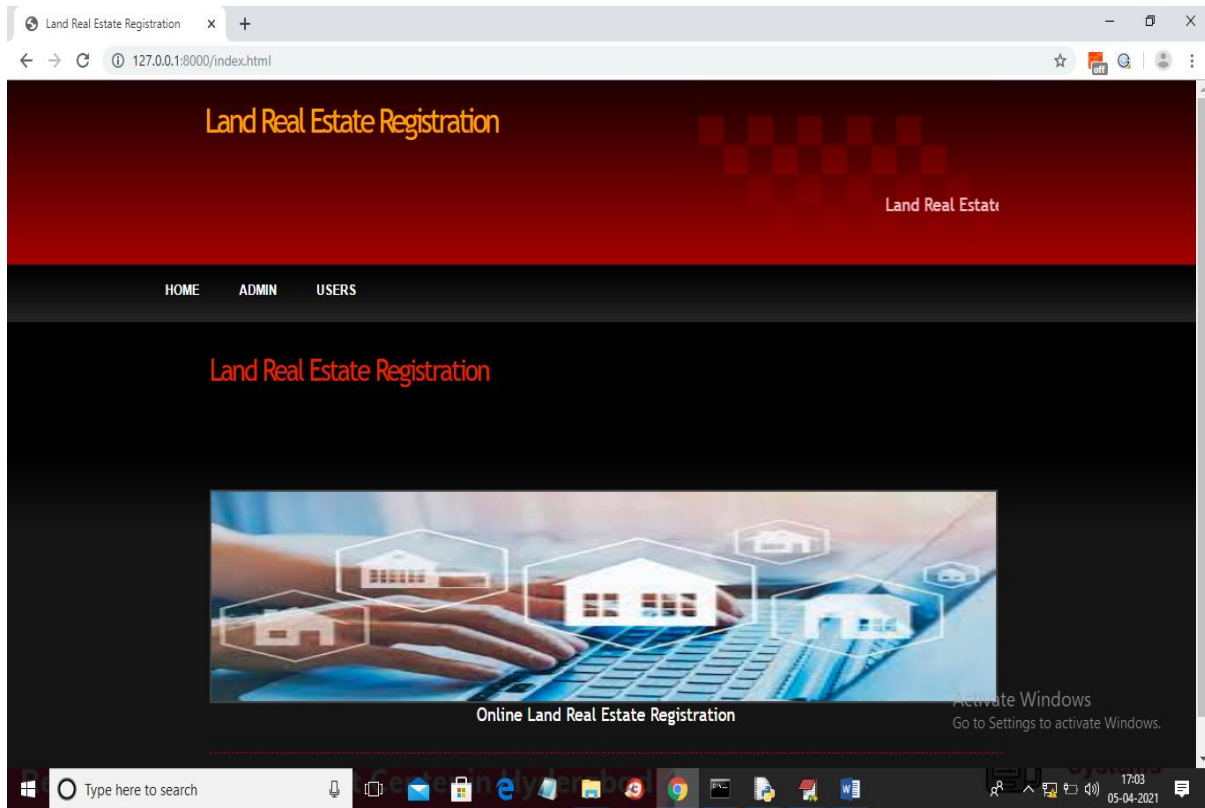
    with open(filename, 'wb') as output:

        pickle.dump(obj, output, pickle.HIGHEST_PROTOCOL)

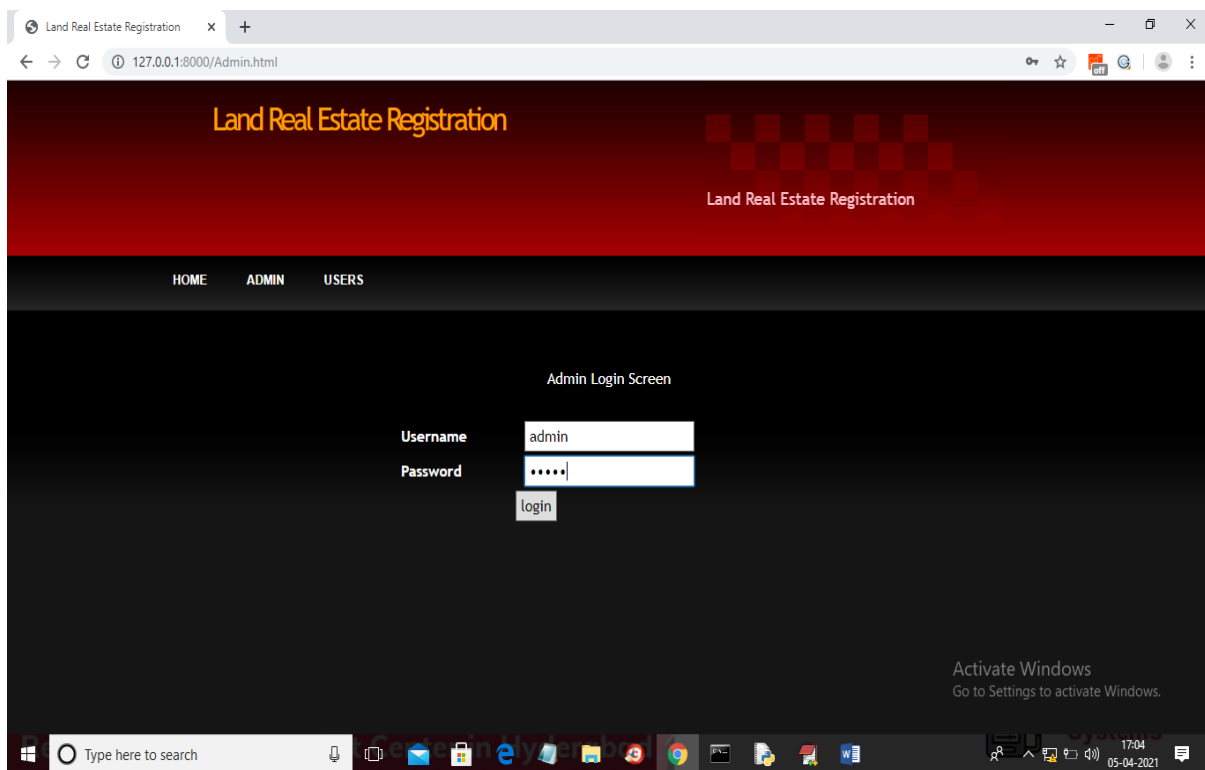
```

## 8.2 screen shots

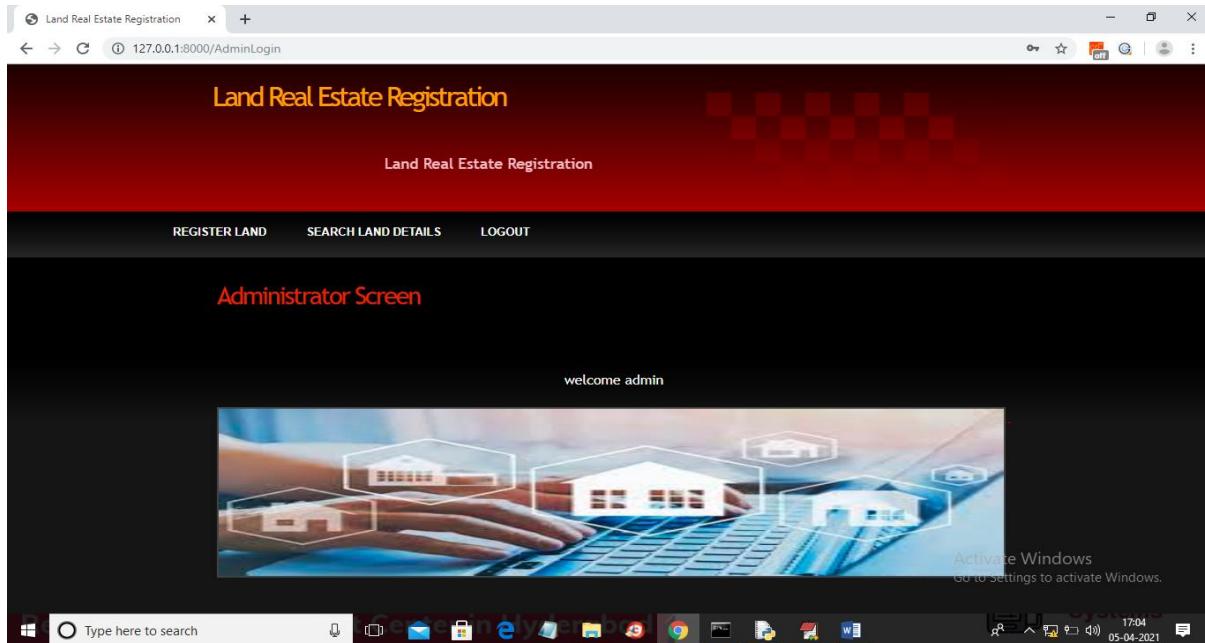
To run project install python 3.7 and then install DJANGO server and then create Python folder inside system 'C' directory and then put 'LandRealState' folder inside that C:/Python folder and then start DJANGO server by double click on 'runserver.bat file. Now open browser and enter URL as <http://127.0.0.1:8000/index.html> and press enter key to get below home page



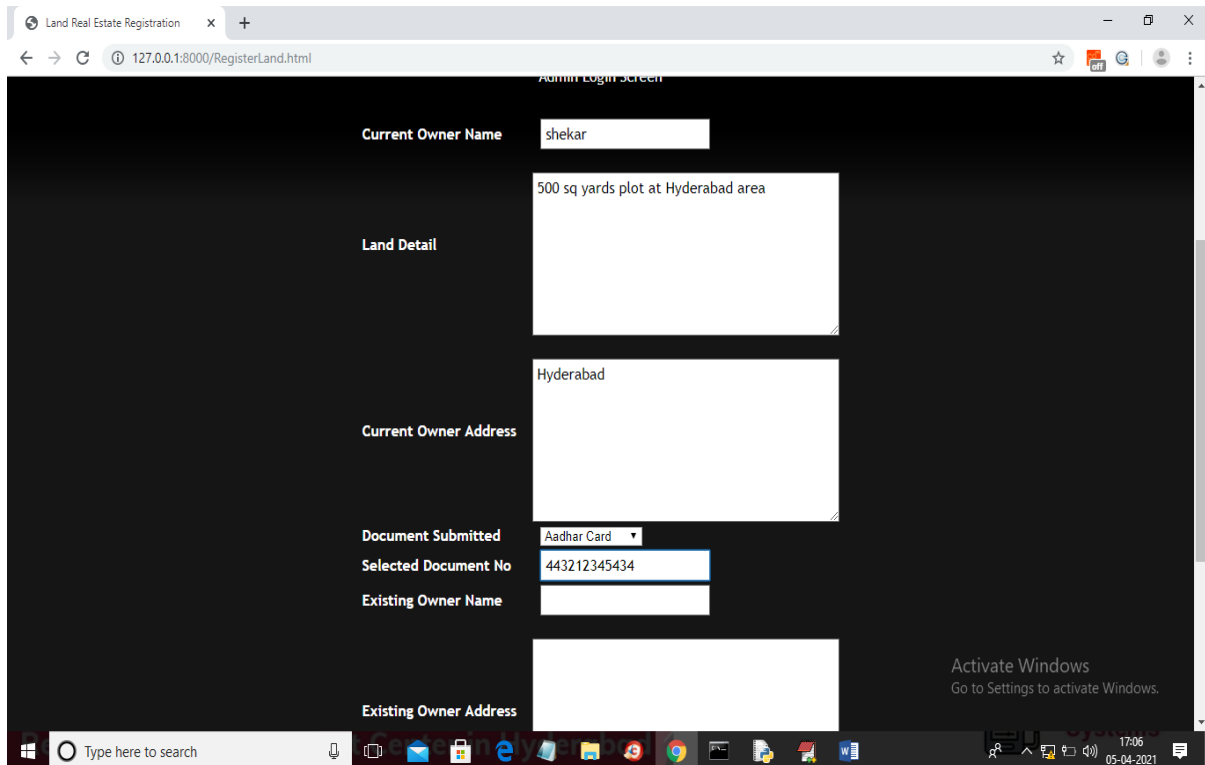
In above screen click on 'Admin' link to get below screen



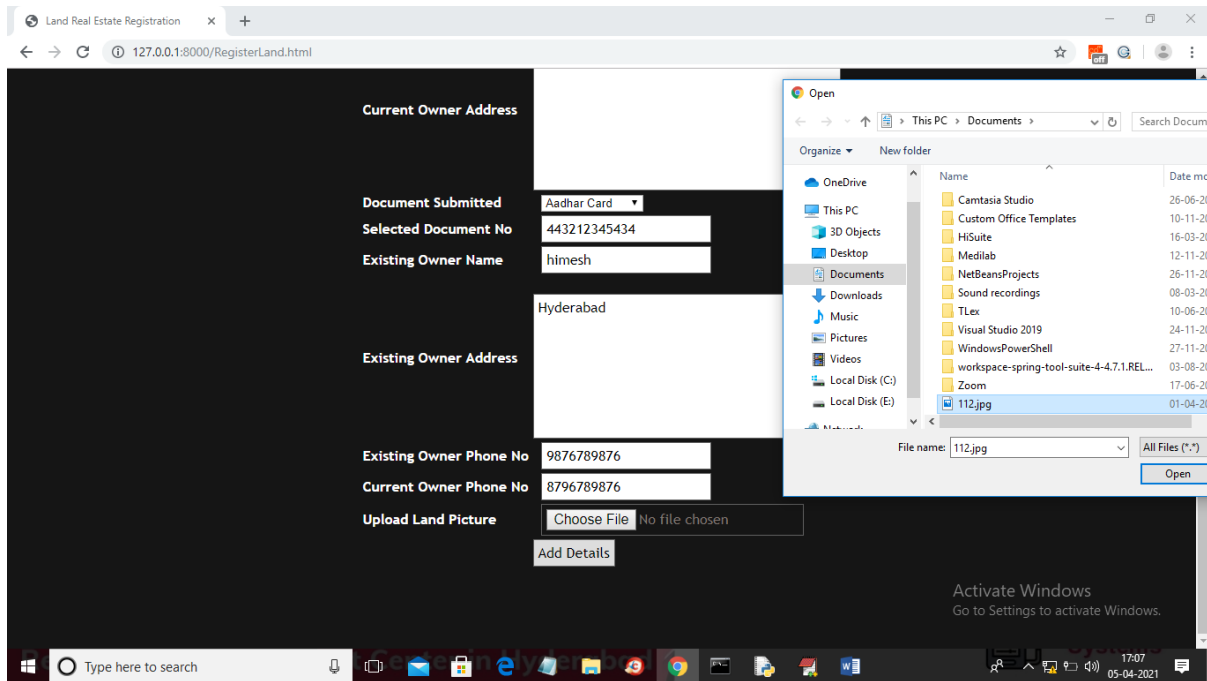
In above screen enter username as 'admin' and password as 'admin' and then click on 'login' button to get below Admin Screen



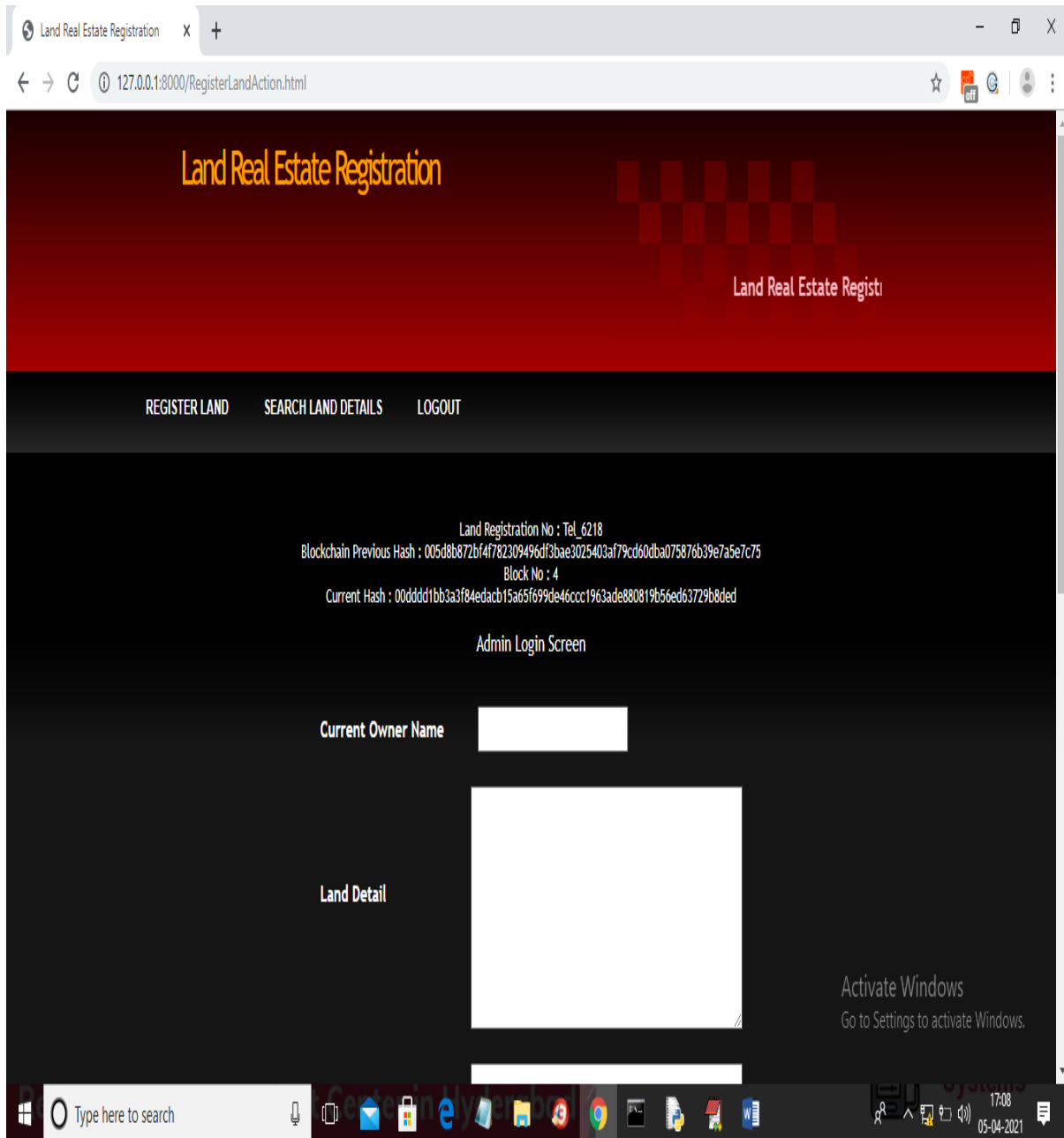
In above screen admin can click on 'Register Land' link to add new land registration details



In above screen admin will enter plot details



In above screen admin can upload land photo also and then click on ‘Open’ button and then click on ‘Add Details’ button to get below screen



In above screen land details added and we can get land registration number and will get index number of Blockchain at which this land details stored and then will get previous block hash code and current block hash code and for each transaction we can see current block hash code will match with previous hash code of upcoming new transaction. Now data is stored at Blockchain and now admin can click on 'Search Land Details' link to get all registered land details

Land Real Estate Registration X +

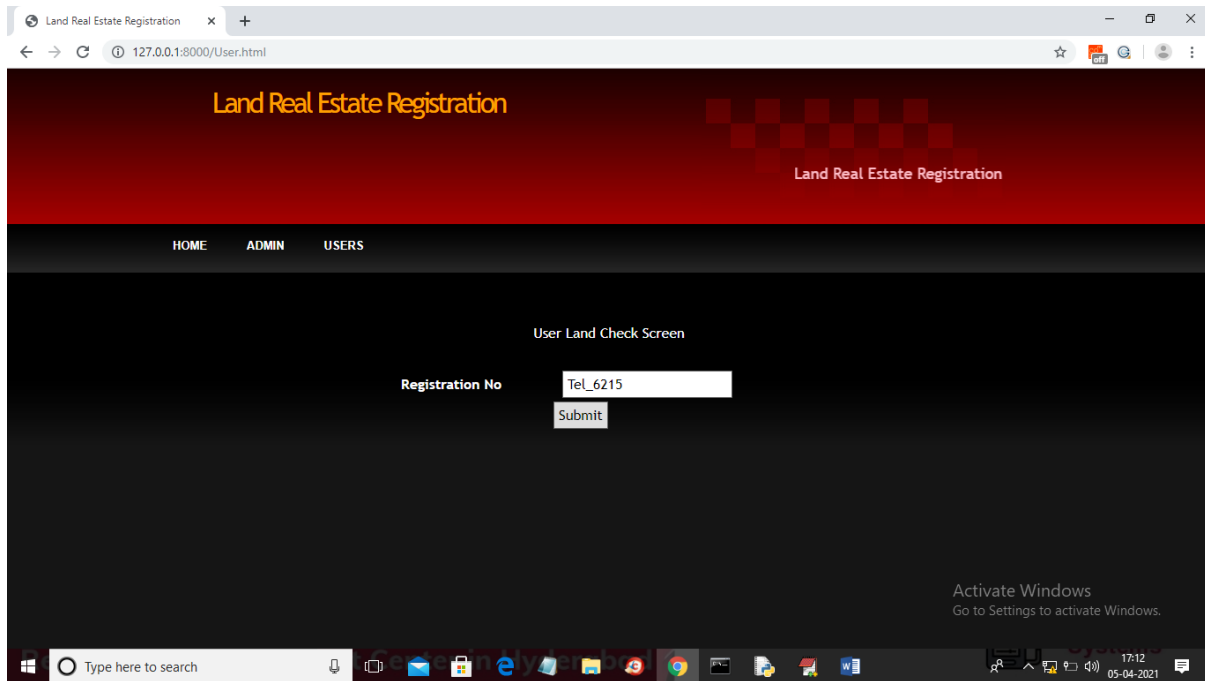
127.0.0.1:8000/AdminLandSearch.html

Registration ID	Current Owner Name	Land Details	Current Owner Address	Document Submitted	Document No	Existing Owner Name	Existing Owner Address	Existing Owner Phone	Current Owner Phone	Land Picture
Tel_6215	kumar	100 sq yards plot at XYZ location	Ameerpet	Aadhar Card	12345678987	rajesh	Punjagutta	8887776665	5555777888	1.1 What is computer vision? As humans, we perceive the three-dimensional structure of the world case. Think of how vivid the three-dimensional percept is when you sitting on the table next to you. You can tell the shape and transduce the subtle patterns of light and shading that play across its surface; each flower from the background of the scene (Figure 1.1). Looking trait, you can easily count (and name) all of the people in the picture; emotions from their facial appearance. Perceptual psychologists have understand how the visual system works and, even though they can to tease apart some of its principles (Figure 1.3), a complete solution elusive (Mar 1982; Palmer 1999; Livingstone 2000).
Tel_6216	kiran	1000 sq yards open land at mehdipatnam	mehdipatnam	Passport	P12345	john	Somajiguda	4445553332	2223334443	Activate Windows Go to Settings to activate Windows.

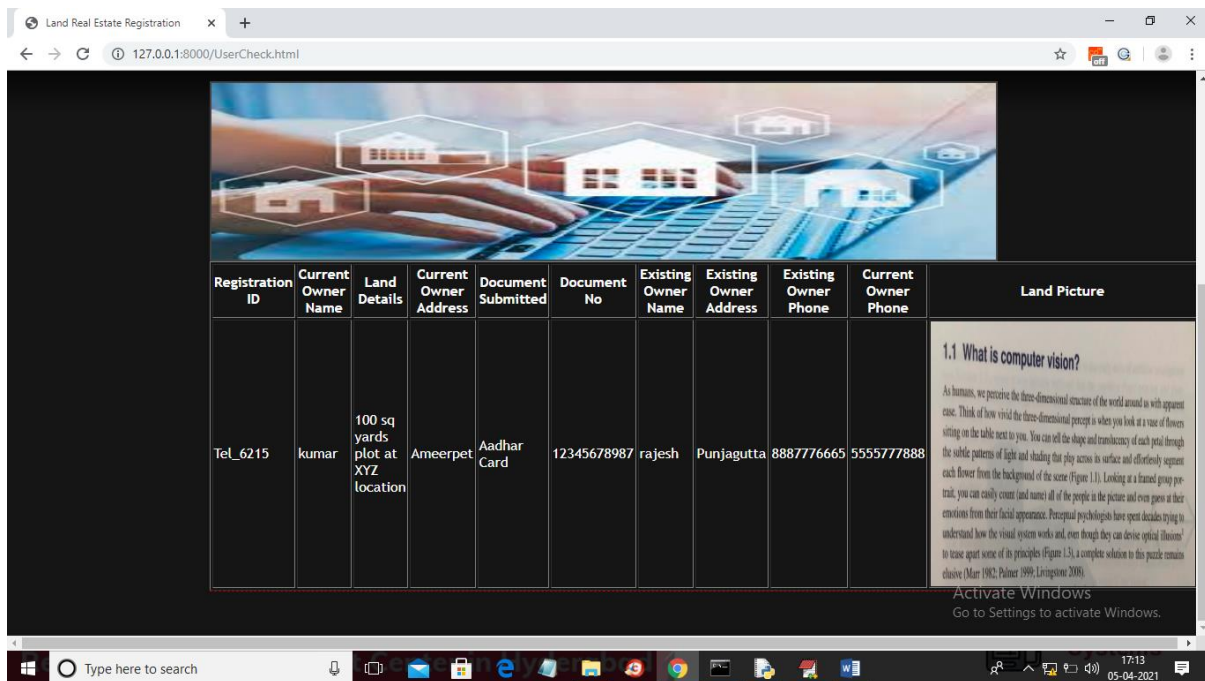
Type here to search

17:11 05-04-2021

In above screen admin can view all registered plot details and can see land image also as I uploaded some other images so you upload correct land pictures. Now logout and click on 'Users' link to get below screen



In above screen user can enter his desired land registration number and then click on ‘Submit’ button to get below output



above screen user can view searched land details. Similarly any number of records you can store and searched from block chain server.



## **CHAPTER-9**

### **SYSTEM TEST**

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

#### **9.1 Types Of Tests**

##### **Unit testing**

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

##### **Integration testing**

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successful unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

## **Functional test**

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

- Valid Input : identified classes of valid input must be accepted.
- Invalid Input : identified classes of invalid input must be rejected.
- Functions : identified functions must be exercised.
- Output : identified classes of application outputs must be exercised.
- Systems/Procedures : interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

## **System Test**

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

## **White Box Testing**

White Box Testing is a testing in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is used to test areas that cannot be reached from a black box level.

## **Black Box Testing**

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

## **Unit Testing**

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

## **9.2 Test strategy and approach**

Field testing will be performed manually and functional tests will be written in detail.

### **Test objectives**

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

### **Features to be tested**

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page.

### **Integration Testing**

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

**Test Results:** All the test cases mentioned above passed successfully. No defects encountered.

### Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

**Test Results:** All the test cases mentioned above passed successfully. No defects encountered.

### 9.3 Test cases1: Test case for Login form

FUNCTION	LOGIN
Expected results	Should Validate the user and check his existence in database
Actual results	Validate the user and checking the user against the database
Low priority	No
High priority	Yes

**Test case2: Test case for User Registration form**

<b>FUNCTION</b>	<b>USER REGISTRATION</b>
Expected results	Should check if all the fields are filled by the user and saving the user to database.
Actual results	Checking whether all the fields are field by user or not through validations and saving user.
Low priority	No
High priority	Yes

**Test Case 3: Test case for Change Password**

When the old password does not match with the new password ,then this results in displaying an error message as “ OLD PASSWORD DOES NOT MATCH WITH THE NEW PASSWORD”.

<b>FUNCTION:</b>	<b>Change Password</b>
Expected results	Should check if old password and new password fields are filled by the user and saving the user to database.
Actual results	Checking whether all the fields are field by user or not through validations and saving user.
Low priority	No
High priority	Yes

#### Test case 4: Test case for Forget Password

When a user forgets his password he is asked to enter Login name, ZIP code, Mobile number. If these are matched with the already stored ones then user will get his Original password.

Module	Functionality	Test Case	Expected Results	Actual Results	Result	Priority
User	Login Usecase	1.Navigate To Wwww.Sample.Com 1.2.Click On Submit Button Without Entering Username and Password	A Validation Should Be As Below “Please Enter Valid Username & Password”	A Validation Has Been Populated As Expected	Pass	High
		1.aNavigate To Wwww.Sample.Com 1.2. Click On Submit Button With Out Filling Password And With Valid Username  Test UsernameField	A Validation Should Be As Below “Please Enter Valid Password Or Password Field Can Not Be Empty “	A Validation Is Shown As Expected	Pass	High

		1.Navigate To Www.Sample.Com 2.Enter Both Username And Password Wrong And Hit Enter	A Validation Shown As Below “The Username Entered Is Wrong”	A Validation Is Shown As Expected	Pass	High
		1.Navigate To Www.Sample.Com 2.Enter Validate Username And Password And Click On Submit	Validate Username And Password In DataBase And Once If They Correct Then Show The Main Page	Main Page/ Home Page Has Been Displayed	Pass	High

## **CONCLUSION**

Our system provides the facilities of registration and search land registration details in a user-friendly format. The Admin can upload property registration details. Our real estate system allows users to browse the property according to this requirement.

Blockchain is one of the most secure ways of storing data without it being changed. It is a distributed ledger that is open to anyone and once data is put into it, it is very difficult to change or meddle with it. Using this property of blockchain we want to put it to use into one of the most fraudulent systems in India, the Land Registration System. Our system uses blockchain with the employment of hyperledger. This gives rise to a system that is more evolved and features all the activities like buying and selling in an efficient and reliable way. Blockchain technology made this system secure and faster. If this kind of system is upgraded further and integrated with useful API then this will lead to faster transactions and will eventually lead to easement of the entire process, thus making the entire system hassle free and convenient in the long run which would be beneficial to the mankind.



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